

National Aeronautics and
Space Administration



NASA Astrophysics Update

Astrophysics Advisory Committee | March 29-30, 2023

Dr. Mark Clampin

Director, NASA's Astrophysics Division

Science Mission Directorate

Science Mission Directorate
ASTROPHYSICS
 Organizational Chart

DIVISION MANAGEMENT



Dr. Mark Clampin
Director



Sandra Cauffman
Deputy Director

ADMINISTRATIVE SUPPORT
 Kelly Johnson, Jennifer Baker (C), Pamela King-Williams (C)

DIVISION LIAISONS

Resource Management Erik Edwardson (Lead) Danielle Gervallis Jennifer Holt	Policy Peter Meister (Lead) Enida Santiago-Arce
Communications Alise Fisher (Lead)	Program Support Specialist Sara Schwartzman

CROSS CUTTING

Technologist
 Mario Perez (Chief)
 Omid Noroozian (Deputy)

APD Communications
 Hashima Hasan (Lead)
 Doris Daou (Deputy)
 Liz Landau (C - OCOMM Liaison)
 Natasha Pinol (C - Public Engagement Liaison)

Inclusion, Diversity, Equity, and Accessibility
 Kartik Sheth (Lead)
 Antonino Cucchiara (Deputy)

GOMAP Program
 Julie Crooke (Executive)
 Shawn Domagal-Goldman (Scientist)

APD Information Manager
 Rhiannon Roberts (C)

FLIGHT PROGRAMS

Associate Director
 Joseph Smith

PROGRAM EXECUTIVES

Rachele Cocks
 Lucien Cox
 Shahid Habib
 Janet Letchworth
 Mark Sistilli

RESEARCH & ANALYSIS

Associate Director
 Eric Smith

R&A Lead
 Stefan Immler

PROGRAM SCIENTISTS

Manuel Bautista	Patricia Knezek
Dominic Benford	Bill Latter
Valerie Connaughton	Sangeeta Malhortra
Antonino Cucchiara (C)	Roopesh Ojha
Doris Daou	Joshua Pepper
Michael Garcia	Mario Perez
Thomas Hams (C)	Kartik Sheth
Hashima Hasan	Eric Smith
Doug Hudgins	Linda Sparke
Stefan Immler	Sanaz Vahidinia
Hannah Jang-Condell	

PROGRAM SUPPORT SPECIALIST
 Ingrid Farrell (C)

ASTROPHYSICS STRATEGIC MISSIONS

Program Director
 Sandra Cauffman

Program Manager (Acting)
 Garth Henning

PROGRAM EXECUTIVES

Ed Griego
 Lucas Paganini
 Miles Skow

PROGRAM SUPPORT
 Tony Comberiate (C), Andre Davis (C)

Legend
 C - Contractor

RESEARCH

~**400** U.S. Science PIs Funded
~**128** Individual Institutions Selected
~**\$135M** Awarded Annually

TECHNOLOGY DEVELOPMENT

~**\$220M** Invested Annually

SMALLSATS/ CUBESATS

2 Science Missions Launched
8 Science Missions in Development
1 ISS-attached Science Mission

SOUNDING ROCKETS

14 Science Missions Launched (Suborbital)
4 In Development

BALLOONS

14 Suborbital Balloons Launched
20 Missions in Development

REFEREED PUBLICATIONS

20,122 Total Publications
4,857 Hubble Publications (2017-2021)
101 JWST Publications (First 6 months)

MISSIONS

11 Missions Operating
11 Missions in Development

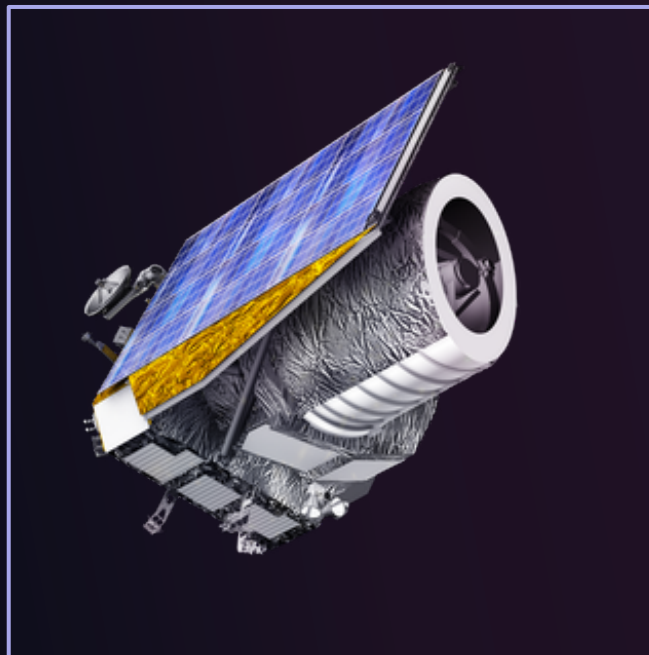
Astrophysics by the **NUMBERS**

Astrophysics Division Launches: CY2024



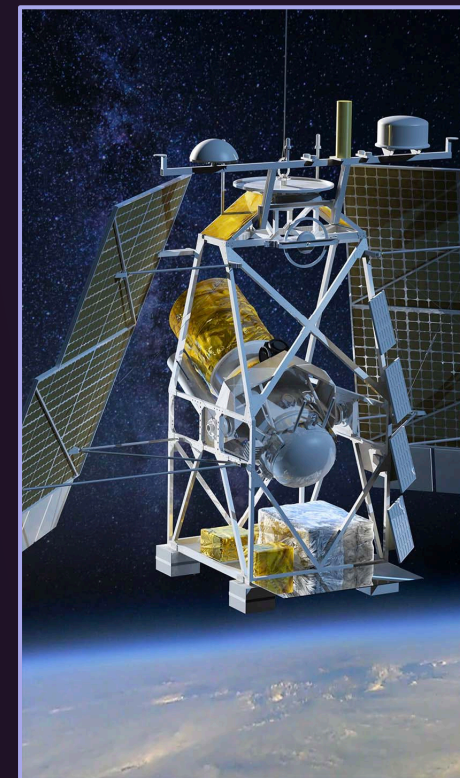
XRISM:

Tanegeshima, Japan 2023



Euclid

Kennedy Space Center, July 2023

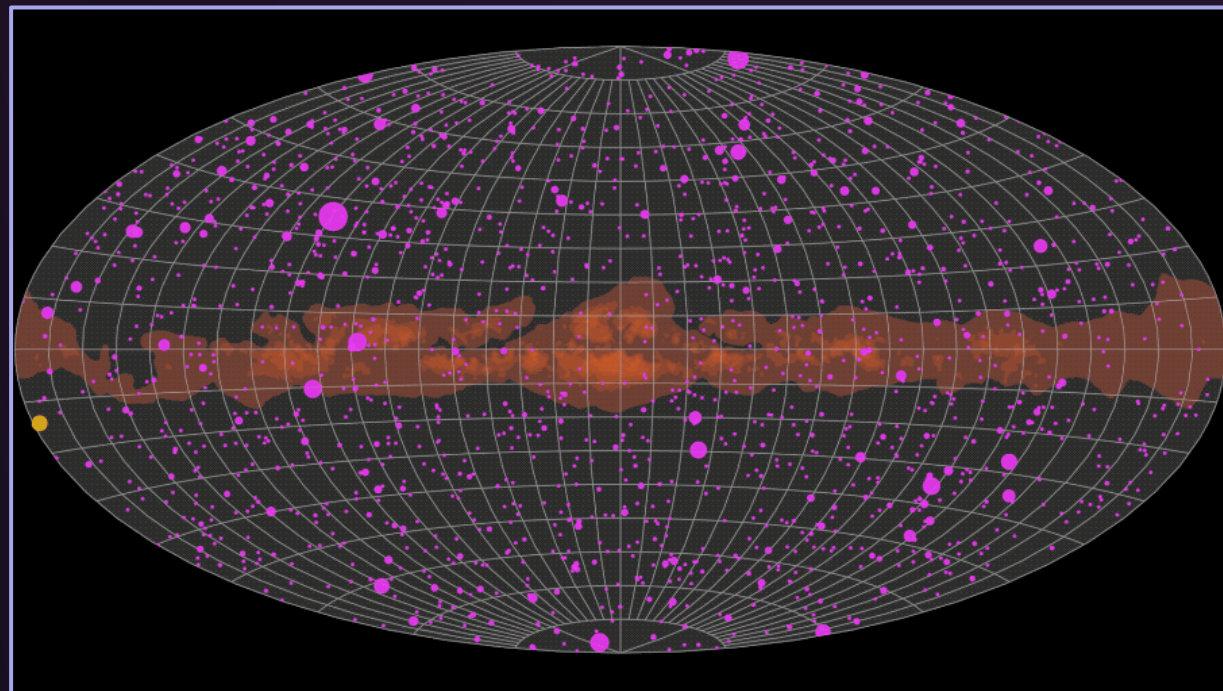


GUSTO (SMEX Balloon)

Antarctica December 2023

NASA's Fermi Captures Dynamic Gamma-Ray Sky

- This animation shows a year of observations from February 2022 to February 2023 taken with the Large Area Telescope (LAT) aboard NASA's Fermi Gamma-ray Space Telescope
- The pulsing circles represent just a subset of more than 1,500 light curves that were collected by the LAT over nearly 15 years in space.
- Over 90% of the sources in the dataset are blazars, central regions of galaxies hosting active supermassive black holes that produce powerful particle jets pointed almost directly at Earth.
- This database could lead to new multimessenger insights into past events.

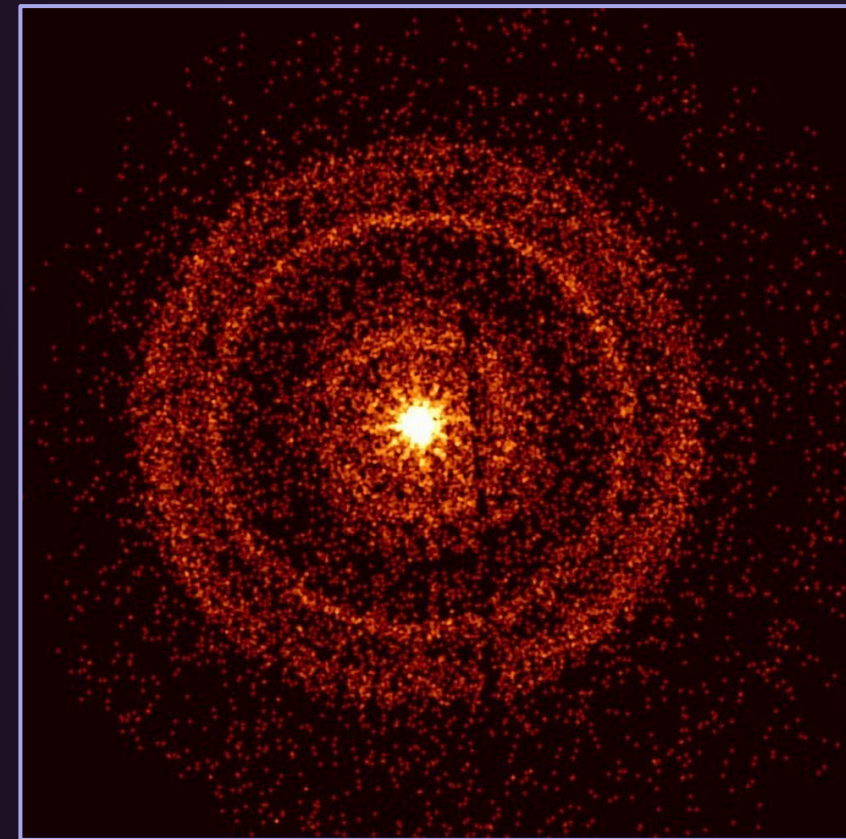


Credits: NASA's Marshall Space Flight Center/Daniel Kocevski

Caption: The animation shows a subset of the LAT gamma-ray records now available for more than 1,500 objects in a new, continually updated repository. Each frame represents three days of observations. Each object's magenta circle grows as it brightens and shrinks as it dims. The yellow circle represents the Sun following its apparent annual path across the sky.

NASA's Swift, Fermi Missions Detect Exceptional Cosmic Blast

- An unusually bright and long-lasting pulse of high-energy radiation that swept over Earth Sunday, October 9, 2022.
- The emission came from a gamma-ray burst (GRB) – the most powerful class of explosions in the universe – that ranks among the most luminous events known.
- Called GRB 221009A, the wave of X-rays and gamma rays triggered detectors aboard NASA's Fermi Gamma-ray Space Telescope, Neil Gehrels Swift Observatory, and Wind spacecraft, as well as others.
- This signal had traveled an estimated 1.9 billion years to reach Earth and provides new insights into stellar collapse, the birth of a black hole.

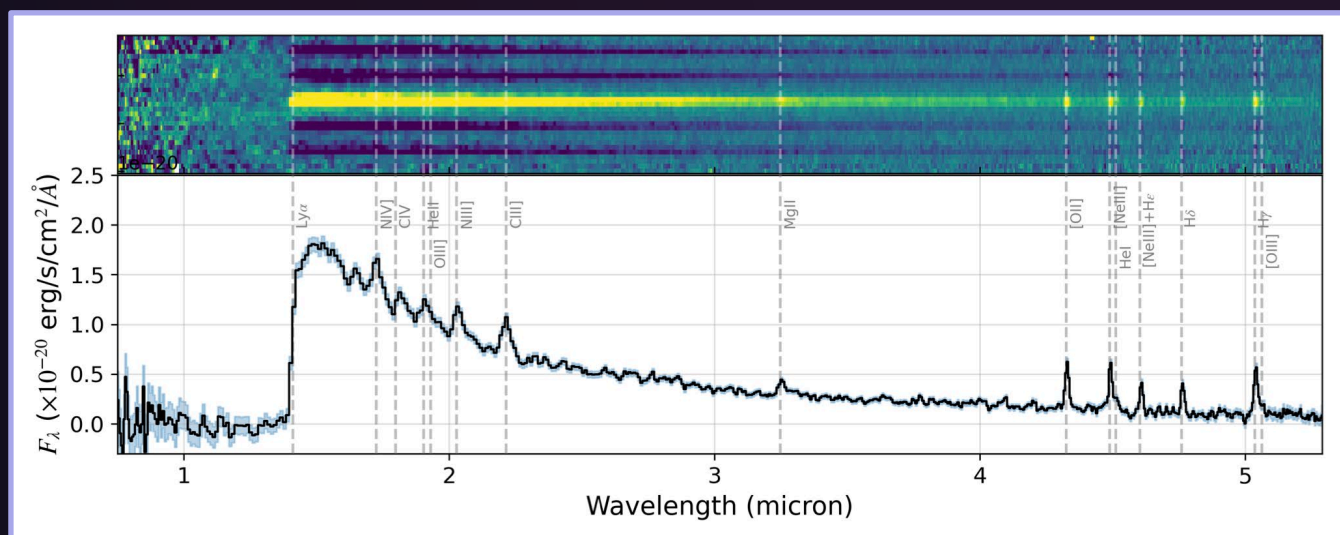
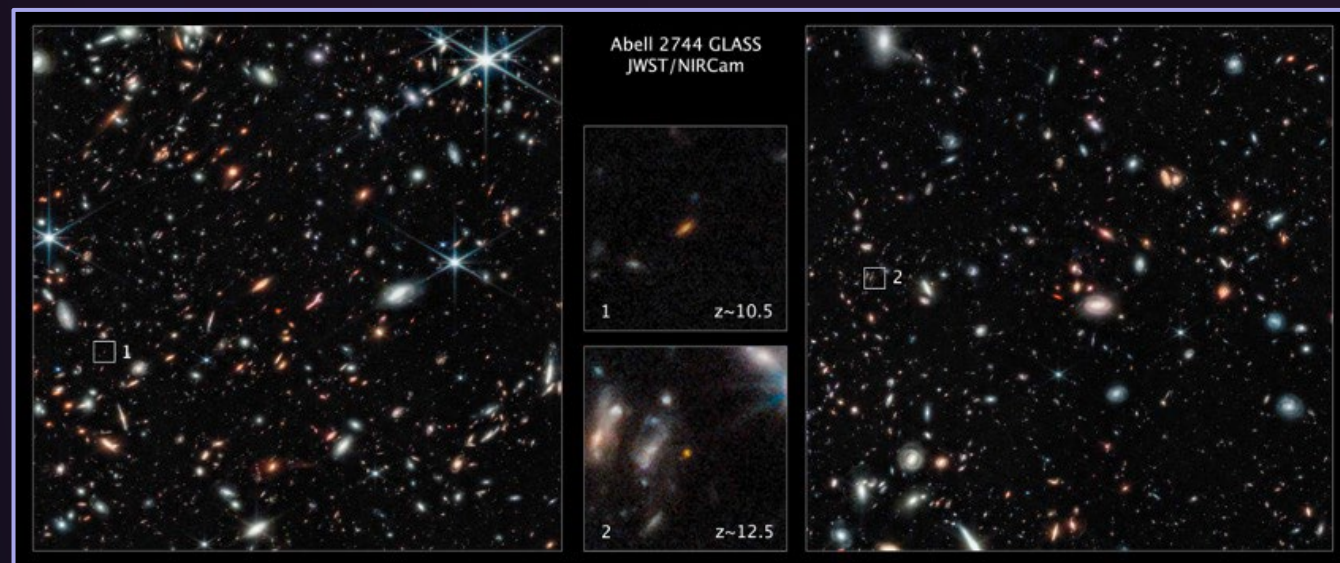


Swift's X-Ray Telescope captured the afterglow of GRB 221009A about an hour after it was first detected. The bright rings form as a result of X-rays scattered from otherwise unobservable dust layers within our galaxy that lie in the direction of the burst.

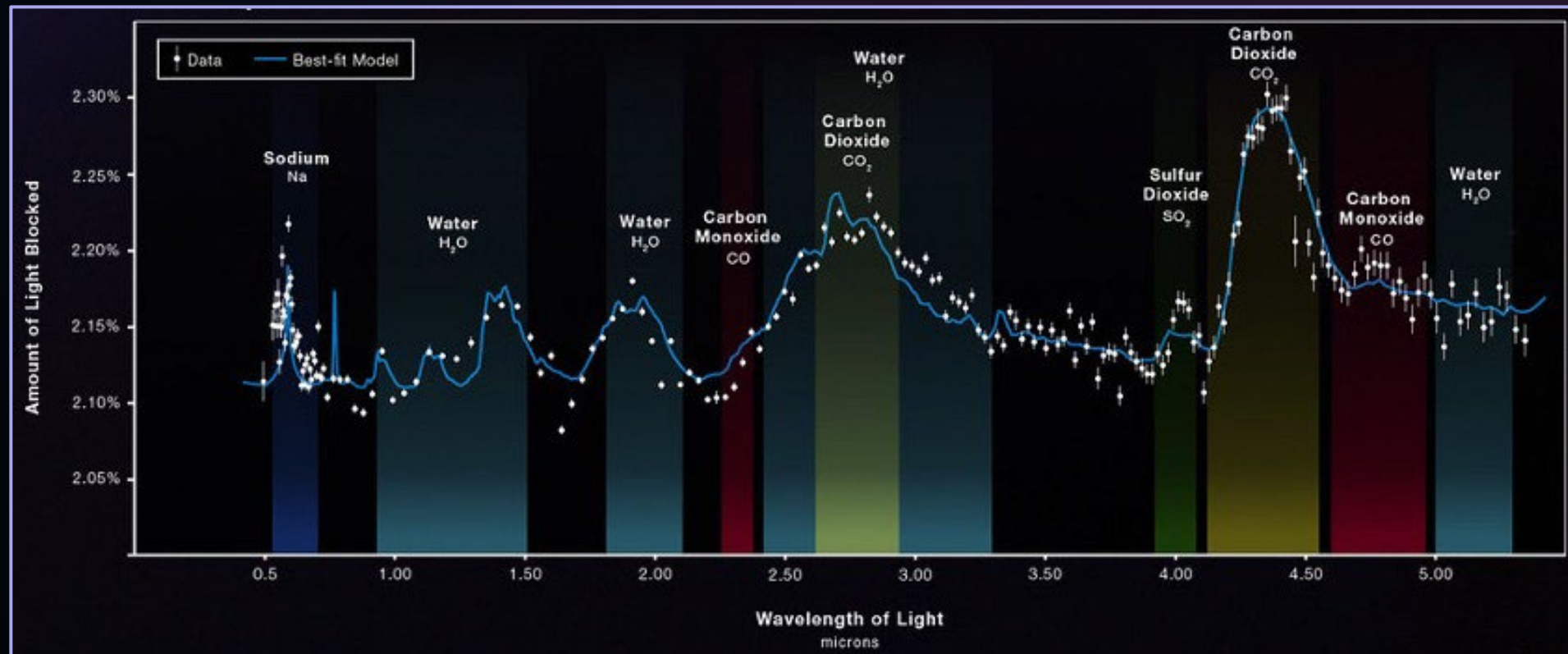
Credits: Credit: NASA/Swift/A. Beardmore (University of Leicester)

JWST Early Universe: First Results

- Abell 2744 with insets showing galaxies that existed 350 and 450 million years after the big bang.
Credit: NASA, ESA, CSA, T. Treu (UCLA)
- Webb's findings suggest that the galaxies would have had to begin coming together about 100 million years after the big bang.
- JADES NIRSpec Spectroscopy of GN-z11: a unlensed $z = 10.60$ luminous galaxy
- Bunker et al. 2023 (arXiv:2302.07256v1)



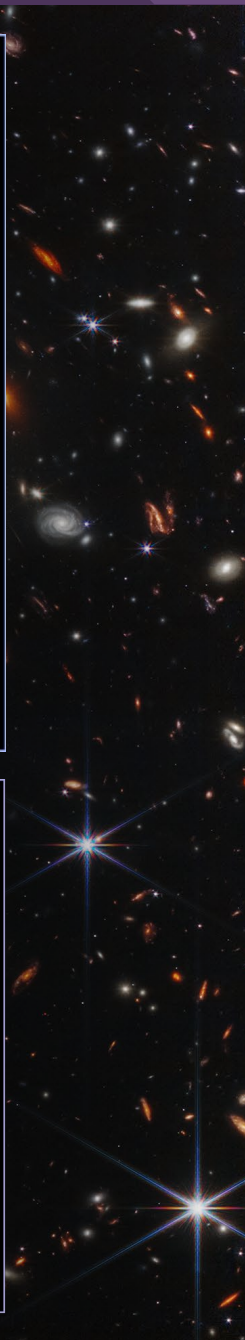
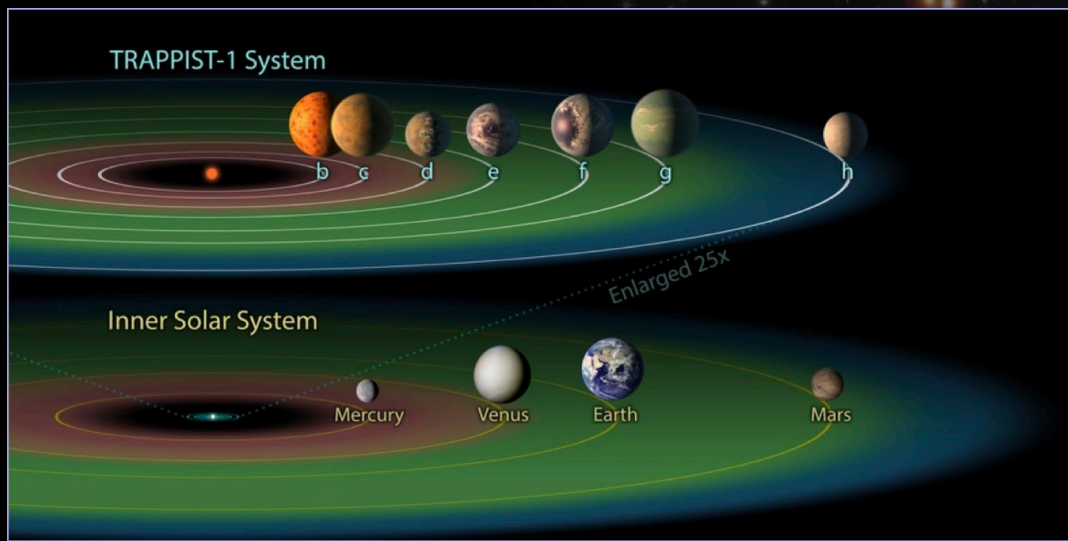
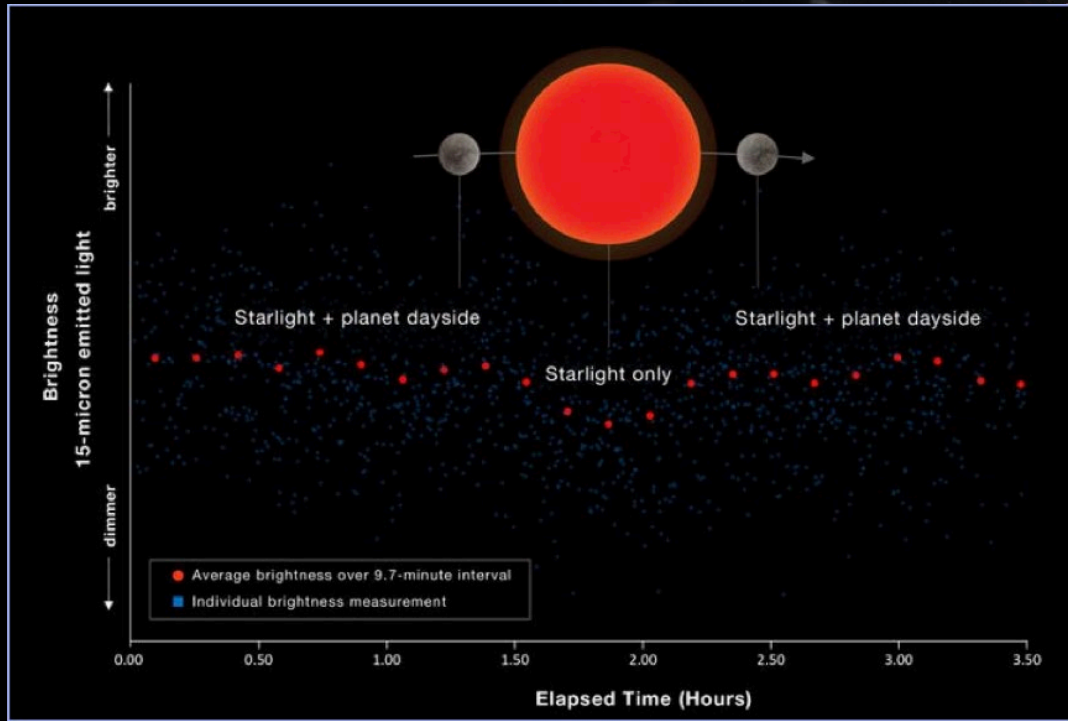
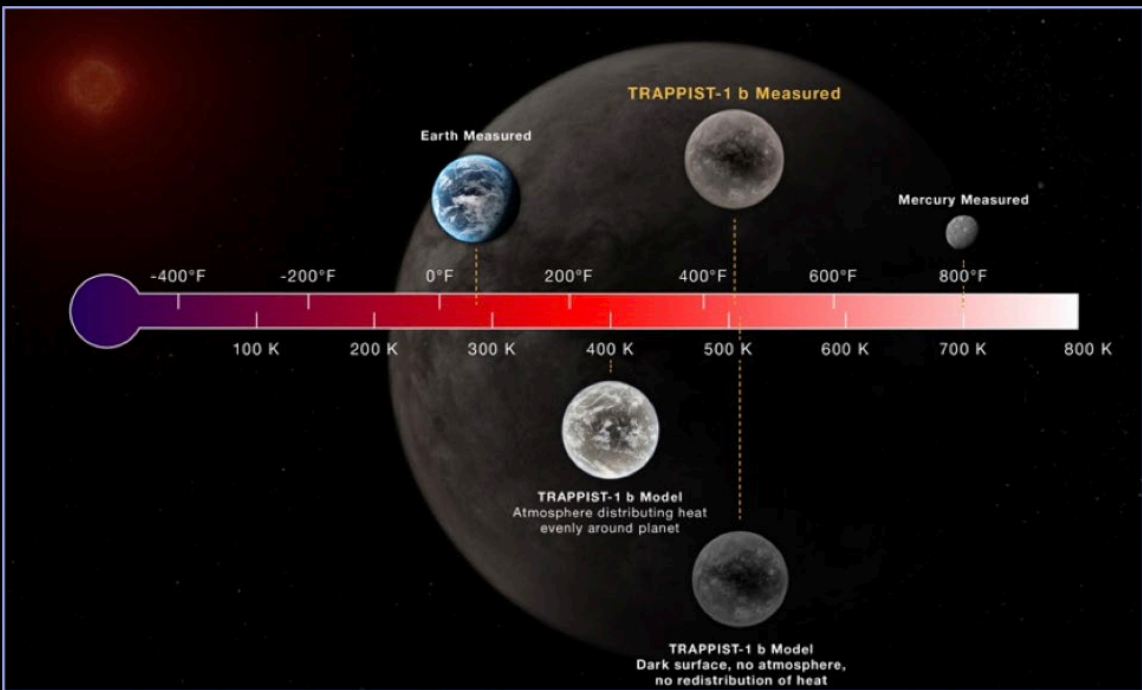
JWST Exoplanet First Science Results



- JWST spectrum of the gas giant exoplanet WASP-39b showing the first molecular and chemical profile of an exoplanet's atmosphere, revealing the presence of H₂O, SO₂, CO, Na and K, as well as signs of clouds, and the first clear evidence of carbon dioxide in a planet outside our solar system. This planet is what is known as a "hot Saturn". The data shown here provide the first concrete evidence of photochemistry.

Credits: NASA, ESA, CSA, J. Olmsted (STScI)

Trappist 1b



APAC Recommendations



APAC Recommendations from October 2022

Recommendation (Webb naming, mission naming policy, TDAMM)	Response
<p>The APAC requests a full briefing regarding the Webb investigation and record of decision at its next meeting.</p>	<p>See Brian Odom's presentation on Day 1</p>
<p>The APAC requests a presentation on the new, pending (currently in the process of Agency approval) mission naming and memorialization policy and guidelines-of-practice and its implementation in APD at its next meeting.</p>	<p>See next chart</p>
<p>The APAC recommends APD initiate coordinated inter-agency activities, including the possibility of a community stand-up of a TDAMM-related Science Interest Group (SIG) /Science Advisory Group (SAG), that also is international in scope to identify actionable and timely paths to effect TDAMM science as outlined in the Astronomy and Astrophysics 2020 Decadal Survey.</p>	<p>See Valerie Connaughton's "TDAMM" presentation on Day 1 of this meeting</p>

Policy for Naming NASA Projects and Facilities



- NPD 7620.1J outlines the policies and procedures for formally naming a Project or Facility
- **Responsibility**
 - The NASA Associate Administrators and other Agency leadership, including Center Directors, as outlined and defined in NPD 1000.0, NASA Governance and Strategic Management Handbook, and further detailed in NPD 1000.3
- **Primary Approach**
 - Ensure that each major NASA project is assigned an official name as early as possible after approval by the Administrator and in time for use in the Office of Management and Budget (OMB) budget cycle.
- **Process**
 - Initiate the name selection process by assembling an ad hoc name selection team consisting of at least one member representing the office in which a project name is under consideration, and at least one member representing every other NASA Headquarters office participating in the management of a significant element of or having other major involvement in the project. An Office of Communication (OCOMM) historian should be a member of any naming team.

APAC Recommendations from October 2022

Recommendation (Inter-agency partnerships, GUSTO, GOMAP)	Response
<p>The APAC suggests APD consider if there are workable industry-agency-center partnerships enabling workforce development and retention opportunities within the scope of the NPP fellow program.</p>	<p>NPP program does not offer workable industry-agency-center partnerships</p>
<p>The APAC acknowledges the Galactic/Extragalactic ULDB Spectroscopic Terahertz Observatory (GUSTO) Project successfully met their thermal-vacuum (TVAC) test milestone and advises APD to consider the science return on investment if there are further issues as GUSTO marches towards their launch in 2023.</p>	<p>See GUSTO PI's PPT on day 1.</p>
<p>The APAC requests at its next meeting a thorough discussion by APD leadership of a Great Observatory Mission and Technology Maturation Program (GOMAP) implementation roadmap commensurate with the prioritization of this activity over the next decade dictated within the 2020 Decadal Survey recommendations.</p>	<p>See Mark Clampin and Julie Crooke's presentation on Day 1</p>

APAC Recommendations from October 2022

Recommendation (SAT, NHFP)	Response
<p>The APAC recommends APD continually assess the balance in technology funding opportunities in the Strategic Astrophysics Technology (SAT) and APRA to assure that a range of opportunities are available to diverse scientific communities developing mission concepts.</p>	<p>See Mark Clampin's "Astrophysics Division Update" presentation on Day 1 of this meeting</p>
<p>The APAC recommends APD promptly develop a mission and vision statement for the NASA Hubble Fellowship Program (NHFP) that align with the SMD six core values as recommended by the 2022 Fellowship Review Committee.</p>	<p>See Mark Clampin's "Astrophysics Division Update" presentation on Day 1 of this meeting</p>
<p>The APAC recommends continued implementation of the NHFP Review's recommendations, particularly the evaluation criteria of candidates based on inclusive leadership requirements.</p>	<p>See Mark Clampin's "Astrophysics Division Update" presentation on Day 1 of this meeting</p>

APAC Recommendations from October 2022

Recommendation (Athena, LISA, Ultrasat)	Response
<p>The APAC requests a complete briefing at its next meeting of the overall mission feasibility assessment of NASA's Athena and Large Interferometer Space Antenna (LISA) posture based on development commitments within the European Space Agency (ESA).</p>	<p>A presentation will be provided at a future APAC meeting.</p>
<p>The APAC requests a brief on the Ultraviolet Transient Astronomy Satellite (ULTRASAT) mission (funded by the Israel Space Agency) mission science objectives and the management structure of the data products and analysis tools curated at NASA hosted archives facilitating community access.</p>	<p>See James Rhoads' presentation on Day 2 of this meeting</p>

APAC Recommendations from October 2022

Recommendation (PAGs)	Response
<p>The APAC advises that the PAGs elicit feedback from their respective communities of practice on the impacts of minimal exclusive use periods associated with APD mission data, especially on early-career scientists.</p>	<p>PAG presentation on Day 2</p>
<p>The APAC advises that APD not only support cross-PAG SAGs and SIGs as community interfaces to the GOMAP process, but to explore the efficacy of establishing formal GOMAP structures operated by the Division for all three Great Observatories simultaneously.</p>	<p>Not Accepted. See Mark Clampin's presentation</p>
<p>The APAC advises APD to consider formal stewardship of early GOMAP Integration/Strategy teams for the X-ray and FIR concept missions envisaged within the Astronomy and Astrophysics 2020 Decadal Survey that can interface with community-led initiatives such as SAGs and SIGs.</p>	<p>Not Accepted. See Mark Clampin's presentation</p>
<p>The APAC encourages all three PAGs to develop terms of reference for a cross-PAG TDAMM SAG or SIG.</p>	<p>In process</p>

APAC Recommendations from October 2022

Recommendation (LISA)	Response
<p>The APAC recommends that APD adopt a US stance on data access, data release policy, and publication rights that support the Astronomy and Astrophysics 2020 Decadal Survey recommendations to ensure the LISA achieves the full scientific scope of its capabilities as a flagship mission as envisioned by the Astronomy and Astrophysics 2010 Decadal Survey.</p>	<p>In process and NASA will work with our international partners to negotiate access for the US science community</p>
<p>The APAC fully endorses the conclusions in the LISA Science Ground Segment study for NASA to invest in a substantial US role in LISA data analysis, interpretation, and science. The report is consistent with the Astronomy and Astrophysics 2020 Decadal Survey recommendation that NASA should establish funding for a LISA science ground segment at an aggressive level to ensure that US scientists can fully participate in LISA analysis, interpretation, and theory.</p>	<p>No response required</p>
<p>The APAC requests frequent updates on the roles NASA is taking in the LISA mission, particularly in terms of the APD response to the recommendations from the LISA Science Ground Segment study.</p>	<p>See Mark Clampin's "Astrophysics Division Update" presentation on Day 1 of this meeting</p>
<p>The APAC recommends that NASA should continue calls for the LISA Preparatory Science Program with a yearly cadence to maximize the US participation in LISA science and to explore synergies with TDAMM.</p>	<p>See Mark Clampin's "Astrophysics Division Update" presentation on Day 1 of this meeting</p>

APAC Recommendations from October 2022

Recommendation (Webb, Roman)	Response
The APAC advises the Webb Project to provide timely and well-publicized community updates and alerts on the performance status of the Observatory and mission.	See Eric Smith's presentation on Day 1 of this meeting
The APAC advises APD to understand whether the demands on the telecom infrastructure and the data downlink bandwidth environment and access is sufficiently robust for Webb alongside simultaneous operations of pending missions such as Euclid and Roman, and those envisioned in the GOMAP vision, in concert with the broader portfolio of mission operations conducted by NASA.	See Mark Clampin's presentation on Day 1 of this meeting
The APAC requests regular updates on the cost and schedule of the Roman Observatory.	See Julie McEnery's presentation on Day 1 of this meeting
The APAC requests an update at the next meeting regarding the Roman project's response to the Committee on Astronomy and Astrophysics (CAA) recommendations about approaches to designing the Roman survey program.	See Julie McEnery's presentation on Day 1 of this meeting
The APAC requests additional conversations with Roman regarding the stand-up of infrastructure teams, especially those with focus on pipeline and user-tool software architectures.	See Julie McEnery's presentation on Day 1 of this meeting

Budget



Astrophysics Budget

- FY23 appropriation \$1510M, versus FY22 appropriation of \$1589M.
- FY24 President's Budget:
 - FY24 request \$1557M (FY23 PBR \$1556M)
 - Modest decadal wedge begins in FY24 for technology maturation in support of Decadal Survey-recommended GOMAP for Habitable Worlds Observatory
 - Extend operating missions per Senior Review recommendations, including Hubble, Chandra and the Transiting Exoplanet Survey Satellite (TESS)
 - SOFIA close out budget FY23-25 permits responsible closeout, dispositioning of assets, data reprocessing and archiving, and career transition for early careers
 - Delays in Explorers program up to one year
 - Reduction in ATHENA funding pending ESA re-formulation activities

Mission Status



LISA

Laser Interferometer Space Antenna

ESA and NASA Partnership

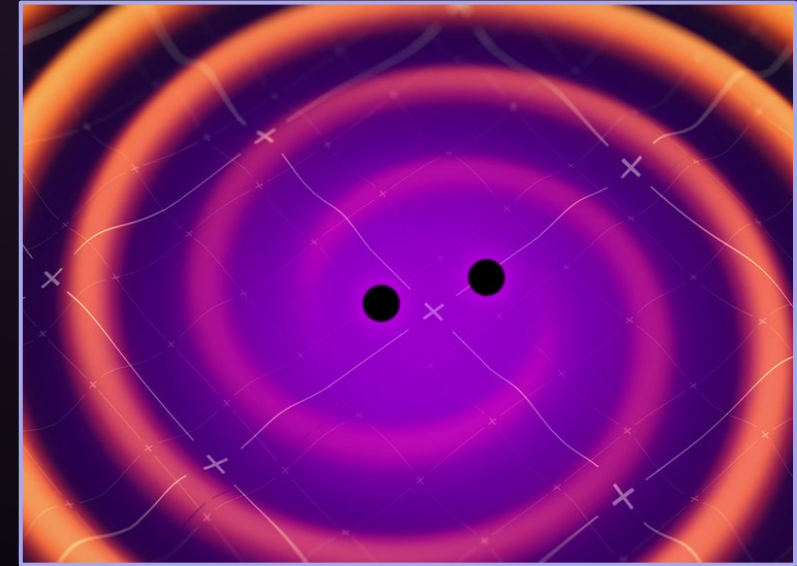
- LISA will be the first space-based gravitational wave observatory (LRD~2037)
- Sources in LISA's milliHertz band range from white dwarf binaries in our galaxy to merging massive black holes at extreme redshift

NASA Contributions:

- Stable telescopes to facilitate inter-spacecraft interferometry
- Laser Systems for interferometer light source
- Charge Management Device for test mass charge control
- Data analysis pipelines and support for science investigations

Status:

- NASA in pre-Phase A Study and technology development managed by Physics of the Cosmos Program Office at GSFC. Systems engineering & science support from JPL & MSFC.
- ESA approaching end of Phase B1, Mission Adoption milestone planned for Nov. 2023 (TBC)
- The LISA Preparatory Science Program (LPS) accepted proposals as part of ROSES-22. Closed on March 16, 2023.



Merging black holes produce gravitational waves that distort the fabric of spacetime.

Credit: NASA/GSFC Conceptual Image Lab

ATHENA

Advanced Telescope for High Energy Astrophysics

ESA and NASA Partnership

- ATHENA will look deep into the X-ray Universe, studying the evolution of super-massive black holes and hot gas in and out of galaxies over the life of the Universe.

Status:

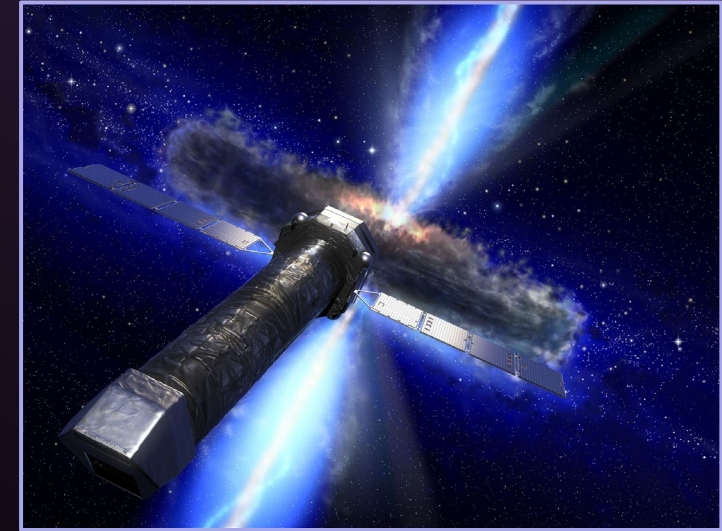
- Mission is being reformulated by ESA, whilst retaining flagship-level science. NASA has reiterated support for Athena and willingness to reprioritize its contributions.
- Rachel Osten (STScI) and Lía Corrales (U. Michigan) selected as the NASA representatives to the Athena Science Redefinition Team (SRDT). Andy Ptak (NASA Athena PS) selected as Mission Redefinition Team (MRT) point-of-contact.

Current “NewAthena” mission concept

- Effectively dependent on the US contribution of a 50K → 4K cryocooler to the X-IFU
- Mission profile results in reductions to performance relative to original Athena, but retains a large X-ray mirror, the X-IFU calorimeter with at least 4 eV energy resolution, and the Wide-Field Imager (WFI)

Budget Impacts

- In light of deferred Adoption date ~ (2027), FY24 PBR contains significant slowdown to Athena.
- With planned switch to a cryocooler as a NASA contribution, the FY24PBR Athena budget withdraws support for the XRCF testing element (FY25 onwards), with a significant reduction in FY24 for XRCF testing.



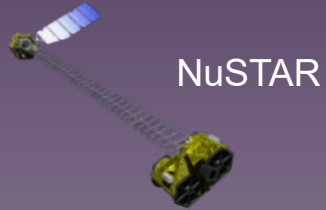
Artist's concept of ATHENA.
Credit: ESA

Astrophysics Explorers Program

Selected before 2011



Gehrels Swift

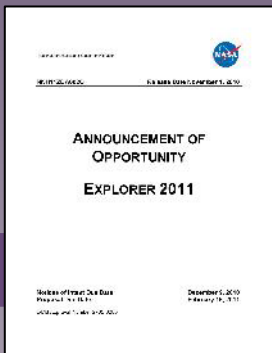


NuSTAR

PROBE 2023

SMEX 2024 2025

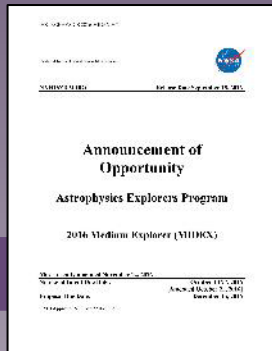
4 AOs per decade



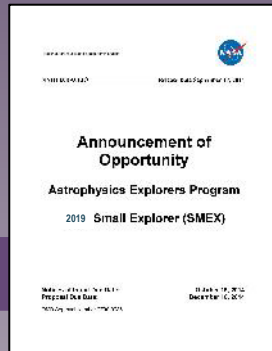
MIDEX 2011



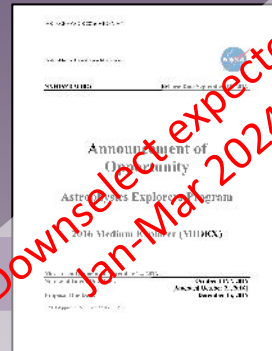
SMEX 2014



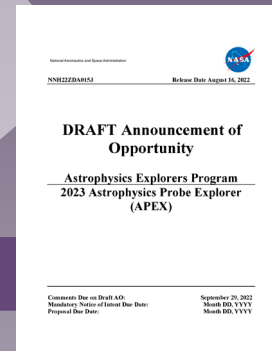
MIDEX 2016



SMEX 2019



MIDEX 2021



Directed 2013



Directed 2017

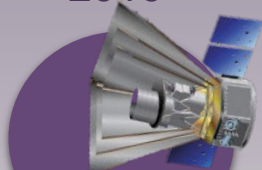
Small and Mid-Size Missions



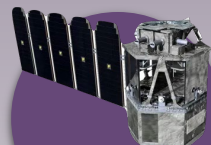
TESS



IXPE



SPHEREX



COSI

STAR-X UVEX



Euclid

Missions of Opportunity



NICER



GUSTO



ARIEL

LEAP MoonBEAM



XRISM

Download expected Jan-Mar 2024

ARIEL/CASE

Atmospheric Remote-sensing Infrared Exoplanet Large survey Contribution to ARIEL Spectroscopy of Exoplanets

ESA and NASA Partnership

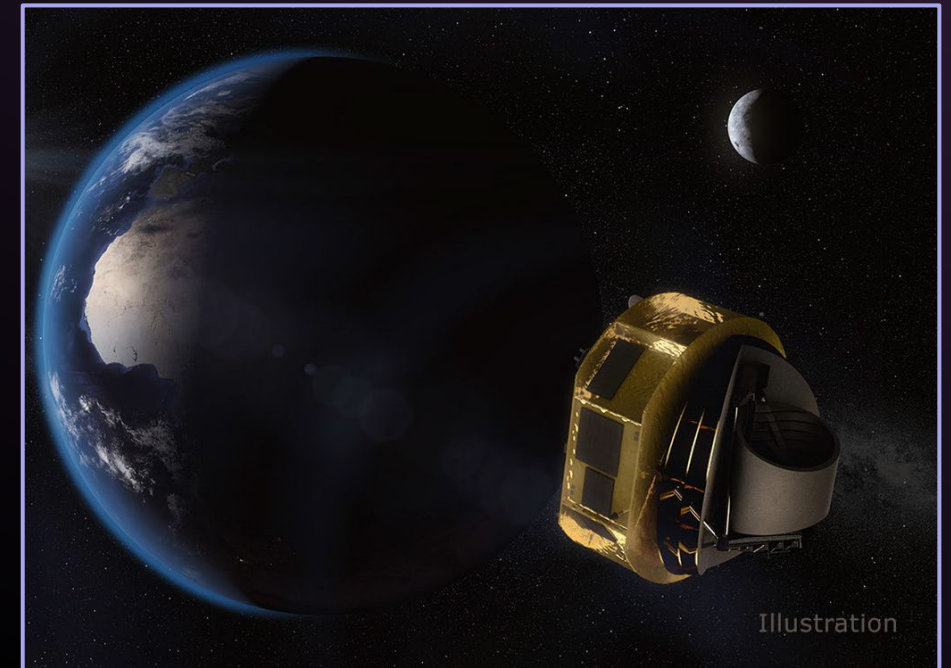
- ARIEL with the CASE, which provides the optical and near-infrared science capabilities and fine guidance sensors will survey and characterize the atmospheres of ~1000 exoplanets.

NASA Contributions:

- Detectors and cold front-end electronics
- Packaging
- Thermal Management
- Cryoflex cables for ARIEL Fine Guidance System
- Providing US participation in science team, mission survey design, and scientific discoveries

Status:

- Project has entered Phase C in February 2023

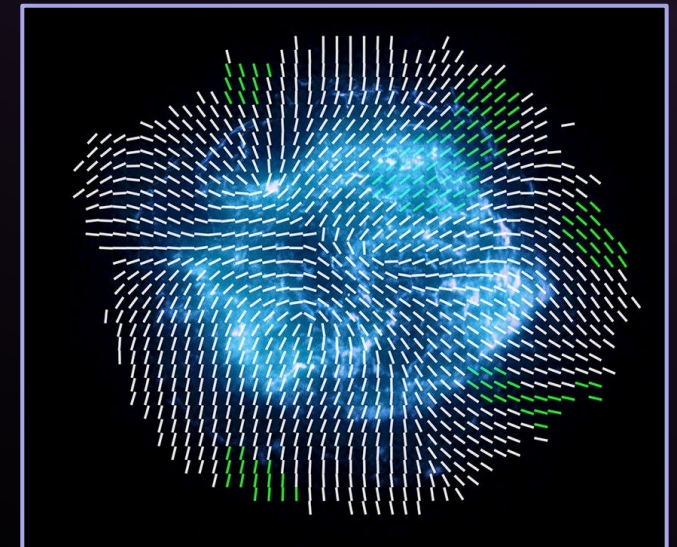


*An artist's concept showing ARIEL in orbit.
Credit: ESA/STFC RAL Space/UCL/Europlanet Science Office*

IXPE

Imaging X-ray Polarimetry Explorer

- IXPE (collaboration between NASA and the Italian Space Agency) launched on December 9, 2021.
- IXPE is NASA's first mission to study the polarization of X-rays from many different types of celestial objects.
 - Source classes with robust detections of polarization include magnetars, accreting neutron stars, blazars, accreting stellar mass black holes, and supernova remnants.
- As IXPE approaches the end of its prime mission, APD will make a decision on whether to extend IXPE operations until the 2025 Senior Review
 - Requires an independent assessment of the progress the mission has achieved toward:
 - Meeting its science objectives
 - Fulfilling its technical success criteria
 - Potential for the General Observer

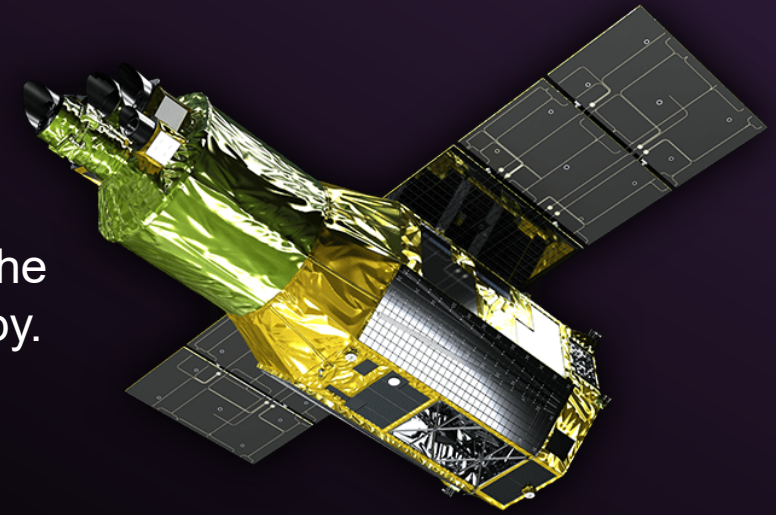


IXPE observation showing the direction of the magnetic field across regions of the remnant Cas A
 Credits: X-ray: Chandra: NASA/CXC/SAO; IXPE: NASA/MSFC/J. Vink et al.

XRISM

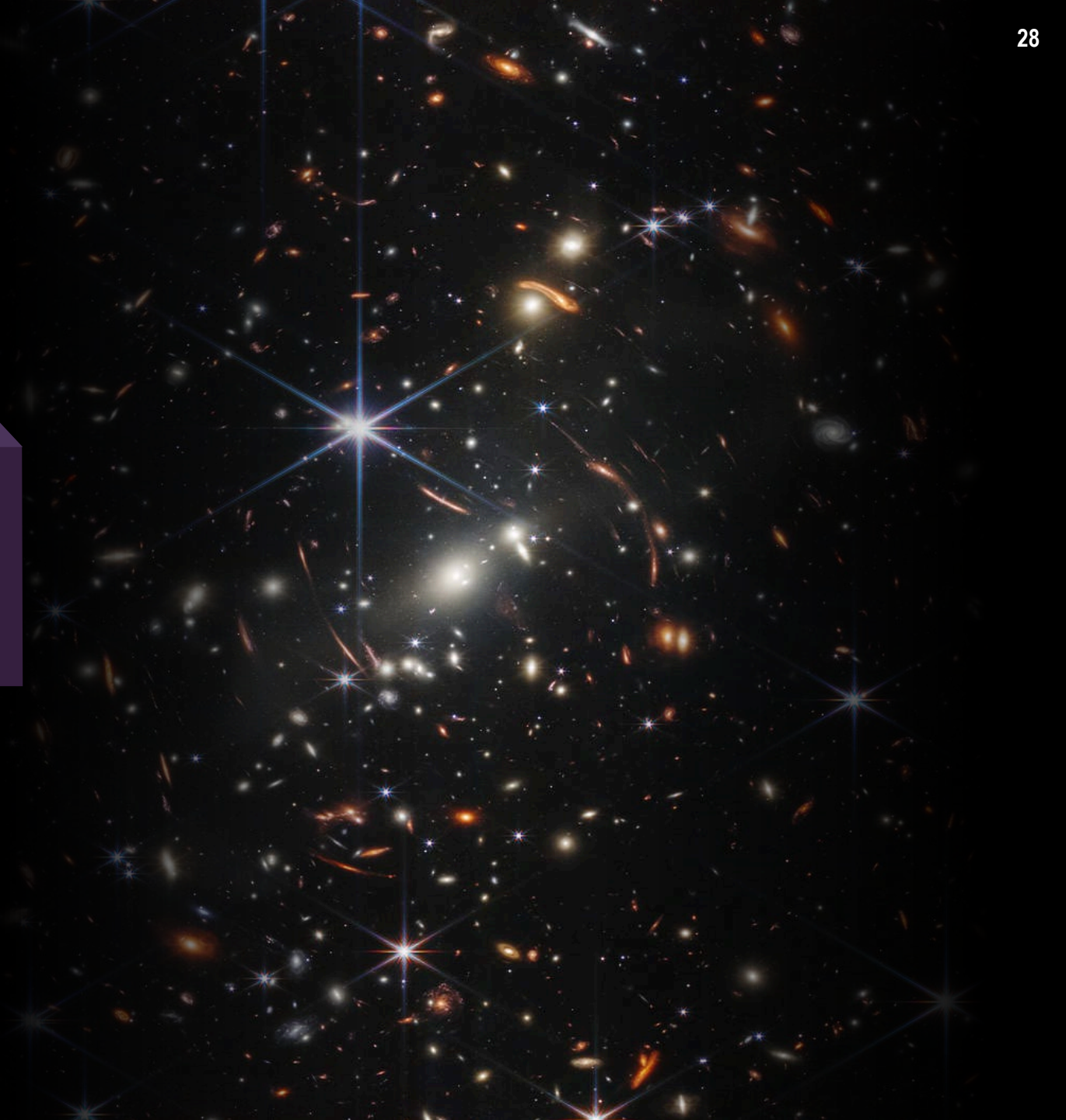
X-Ray Imaging and Spectroscopy Mission

- XRISM, formerly known as XARM, is a JAXA/NASA collaborative mission with ESA participation and is expected to launch 2023.
- The objective of the mission is to investigate celestial X-ray objects in the Universe with high-throughput imaging and high-resolution spectroscopy.
- The XRISM payload consisted of two instruments:
 - Resolve - a soft X-ray spectrometer
 - Xtend – a soft X-ray imager
- The first XRISM Data Analysis Workshop was held on Feb 22/23, 2023.
 - The objective of this workshop was to prepare the astronomical community for the upcoming Cycle 1 General Observer Call for Proposals for XRISM.



Credit: JAXA

ASTRO2020 Forward Plan

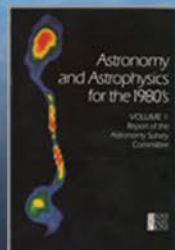


Astrophysics

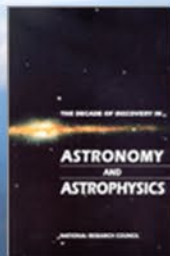
Decadal Survey Missions



1972
Decadal
Survey
Hubble



1982
Decadal
Survey
Chandra



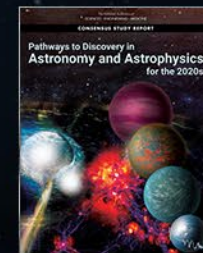
1991
Decadal
Survey
Spitzer



2001
Decadal
Survey
Webb



2010
Decadal
Survey
Roman



2021
Decadal
Survey

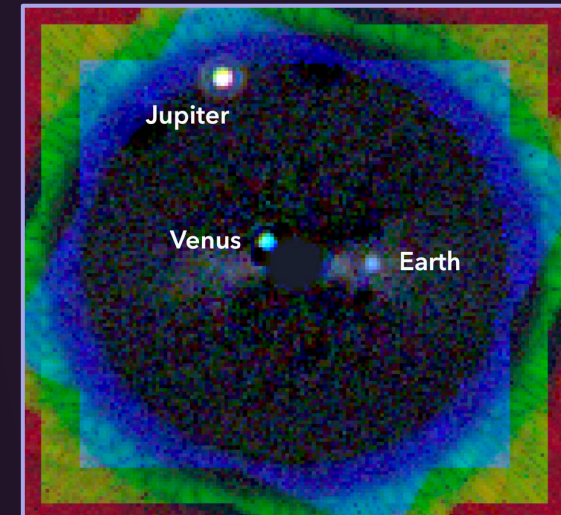
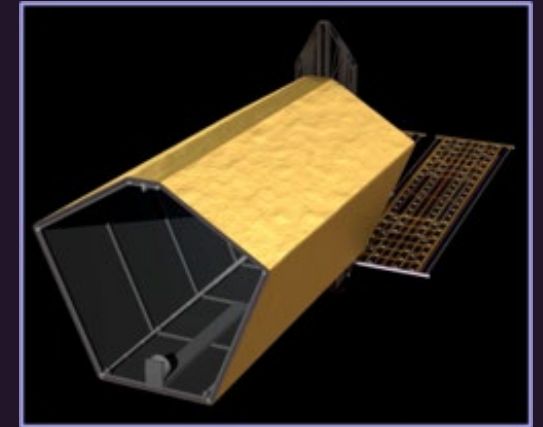
Status of Astro2020 Key Recommendations

Key Mission Recommendations	Latest Action	Next Planned Action
Near-Infrared/Optical/Ultraviolet 6-m telescope with high-contrast imaging capability (part of GOMAP program)		
Great Observatory Mission and Technology Maturation Program (GOMAP)	GOMAP discussions underway within NASA, Precursor Science workshops held April, October 2022	APAC Spring Meeting, March 29-30, 2023
Space-based time-domain and multi-messenger counterparts program (TDAMM)	APD conducted a 8/22-24/2022 Workshop	APAC Spring Meeting, March 29-30, 2023
Astrophysics Probe Mission	8/16/2022 Draft Call for Proposals	APAC Spring Meeting, March 29-30, 2023
End SOFIA operations by 2023	SOFIA operations ended. NASA's Press Release 9/30/2022	Action complete

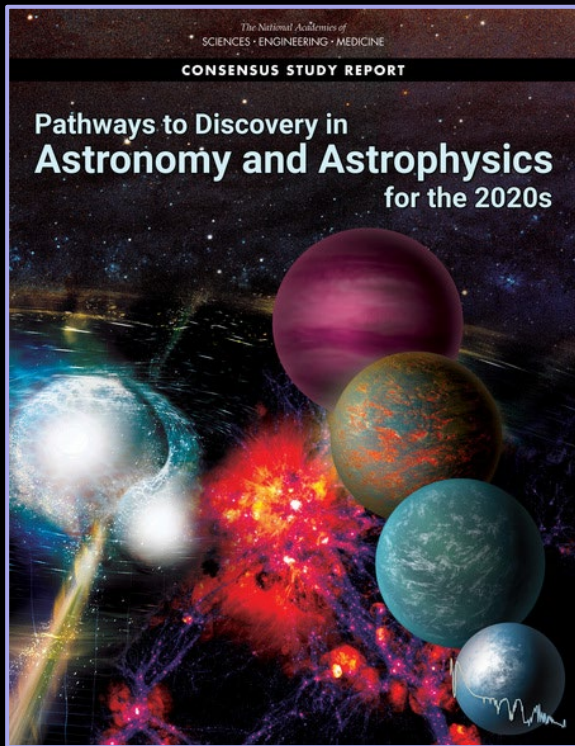


Pathways to Habitable Worlds: Astro2020

- Are there habitable planets harboring life elsewhere in the universe?
- **Primary recommendation:**
 - Space telescope, with ~6 meter aperture and coronagraphic imaging capability
 - Observe ~100 nearby sun-like stars, and detect potentially habitable planets
 - Survey habitable planet candidates for evidence of life
 - Conduct program of general astrophysics
- Primary Technical requirements
 - Segmented mirror telescope w/active control of WFE achieving ~10s pm stability
 - Coronagraph achieving contrast levels of 10^{-10}
- **Habitable Worlds Observatory**



The Habitable Worlds Observatory: *Big Picture Strategy*



The Habitable Worlds Observatory: *Big Picture Strategy*

- **Build to schedule:** Mission Level 1 Requirement e.g. Planetary mission strategy
- **Evolve technology:**
 - Build upon current NASA investments and TRL-9 technology
 - JWST segmented optical telescope system,
 - Roman coronagraph
- **Next Generation Rockets:**
 - Larger telescope aperture sizes
 - Leverage opportunities offered by large fairings to facilitate mass & volume trades
- **Planned Servicing:** Robotic servicing at L2
- **Robust Margins:** Design with large scientific, technical, and programmatic margins
- **Mature technologies first:** Reduce risk by fully maturing the technologies prior to development phase.

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The Habitable Worlds Observatory

Big Picture Strategy

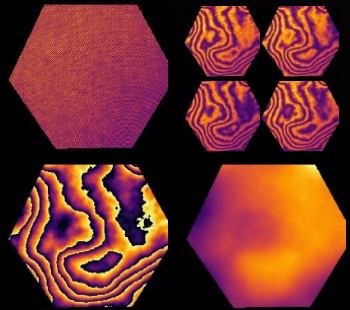
ASTRO2020 recommendation and timescale drives a focused technology program

Telescope

- Large segmented mirror investments with ongoing technology program
- Scalable for launcher fairing options and next 5 years of metrics work
- Legacy of JWST technology investments (TRL-9) and infrastructure
- JWST as an on-orbit testbed
- Industry capabilities
- Focus investments on technology tall-poles rather than investing in infrastructure
- **Coronagraph**
 - Significant investment in Roman coronagraph (future on-orbit testbed)
 - Significant investments through SAT & APRA coronagraph programs

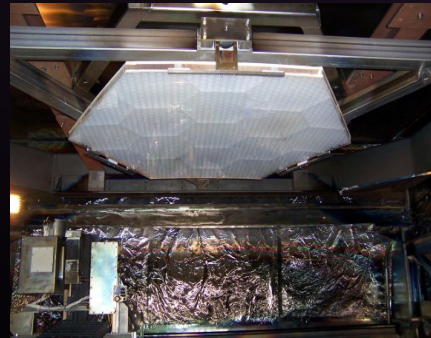
Astrophysics Technology Investments

Big Picture Strategy



Credit: NASA GSFC

Picometer-scale dynamics measured with high-speed interferometry

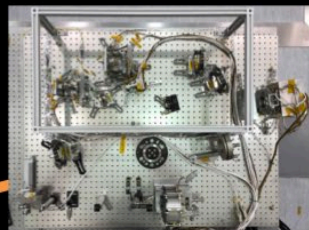


Credit: L3/Harris

Lightweight ULE mirror segment

CGI is an advanced technology demonstrator for future missions that will directly image Earth-like exoplanets.

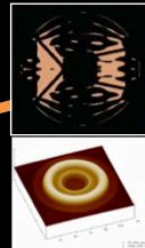
Ultra-Precise Wavefront Sensing & Control



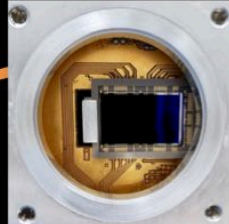
Large-format Deformable Mirrors



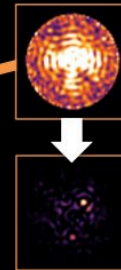
High-contrast Coronagraph Masks



Ultra-low noise photon counting EMCCD Detectors



Data Post-Processing



Bertrand Mennesson (JPL)

The Habitable Worlds Observatory

Habitable Worlds: Primary Science Goal

- Survey nearby stars for habitable planets, and spectroscopically characterize them for evidence of life (biosignatures)

Observatory: General Astrophysics Program

Future Great Observatories

- Decadal Survey recommends future X-Ray and Far-IR future great observatories
 - Note that investments would begin towards the end of the decade per the Survey's recommendations
 - APD will maintain X-Ray/Far-IR technical capabilities this decade via:
 - SAT and APRA program investments
 - 2023 Probe solicitation for X-Ray and Far-IR mission concepts
 - Explorers program

Astrophysics Technology Program - FY23

Technology Inception & Experimentation APRA & RTF

- 44 new technology projects awarded
- 13 additional non-technology awards
- Average selection rate: 28%
- Portfolio:
 - Supporting Balloons, Sounding Rockets & CubeSats
 - Detectors across wavelengths
 - Mirrors, coatings and gratings

Total: \$55M

Technology Maturation SAT & ISFM

- Portfolio has 36 active SAT & 10 ISFM projects
- 14 new SAT projects awarded in FY23
- 10 new ISFM projects (FY23-FY25)
- Next SAT solicitation planned in FY24 (ROSES-2023).
- Average SAT award: \$1.8M (3 years)
- Average SAT selection rate: 32% (historically is ~30%)

Total: \$26M

Directed Technologies

- Roman CGI (\$42.5M)
- LISA (\$29.6M)
- Athena (\$16.2M)
- Euclid (\$9.9M)
- NN-Explore – NEID (\$3.3M)

Total: \$100M

Post-Decadal Initiatives

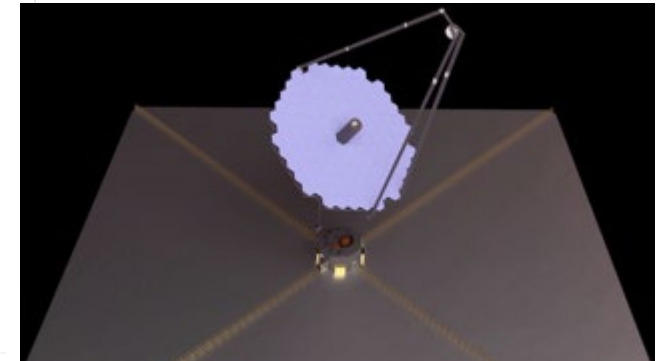
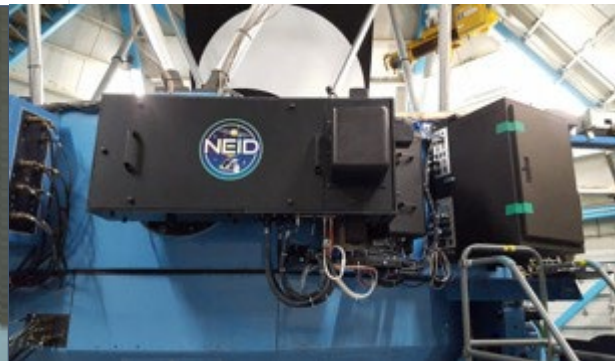
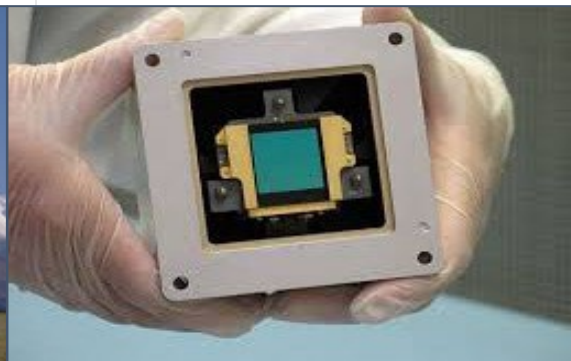
- Coronagraph Testbed
- Ultra-stable Testbed
- Segmented Mirror Telescope Program (SMTP) – Industry Contract

Total: \$15M

Not technology elements:

- TDAMM – \$2M
- Precursor Science - \$3M

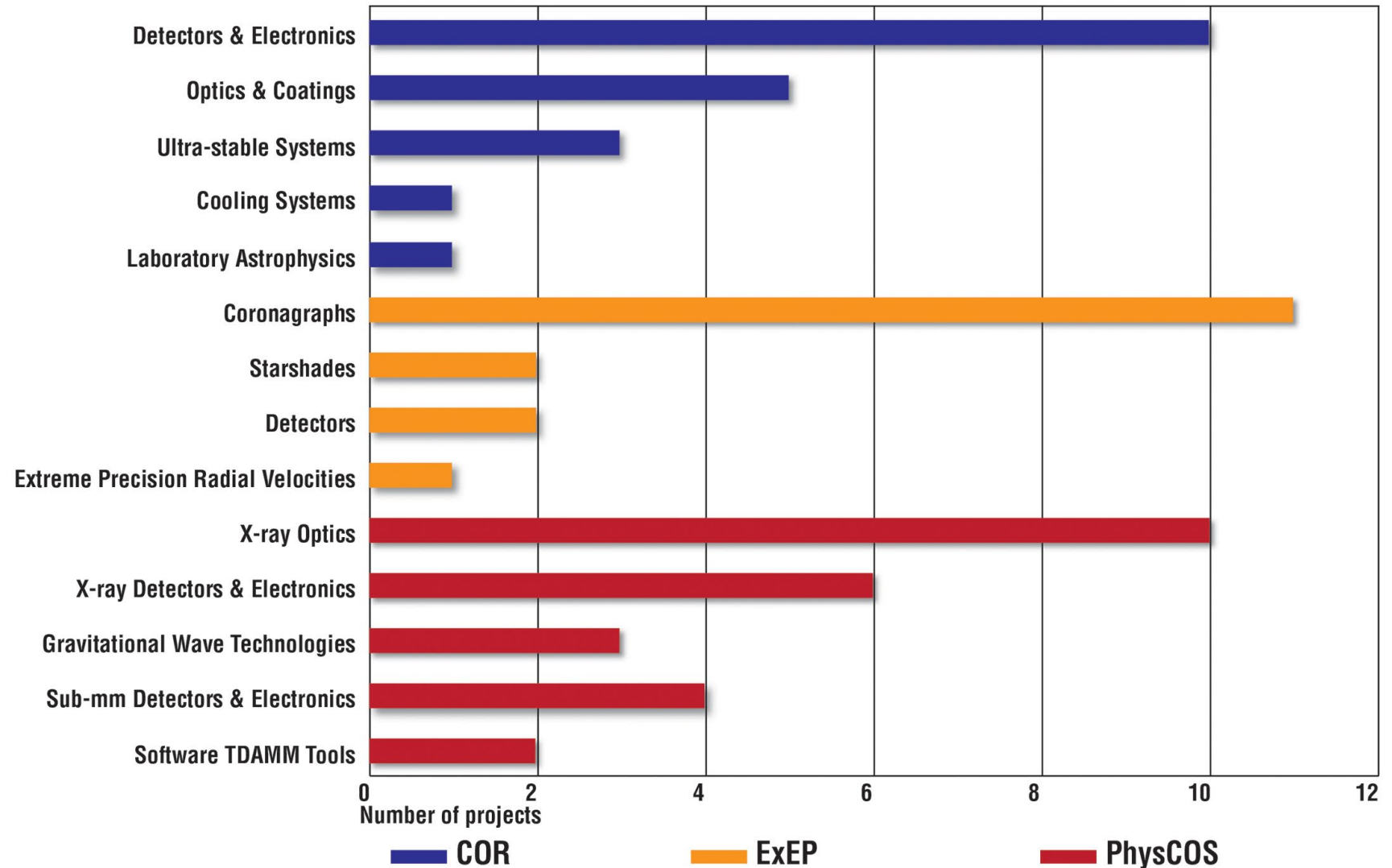
Total: \$5M



Current Strategic Technology Projects

- (SAT + ISFM - building blocks)

For more information see <http://www.astrostrategictech.us/>



Astrophysics Probe

- On August 16, 2022 NASA issued a draft AO for a PI-led Astrophysics Probe for comment.
- The PI cost cap is \$1B; AO requires a General Observer/Guest Investigator (GO/GI) Program during the 5-year prime mission. For a pointed observatory, 70% of observing time is allocated for GO. A survey observatory will make data available as soon as practicable.
- The target date for the final Probe AO remains July 2023
- This is a two-step AO: because the Probes are more complex than previous Explorers, and this is the first one, the competitive Phase A studies will last 12 months
- In response to the recommendation of Astro2020, Astrophysics will accept proposals for:
 - A far-infrared imaging and/or spectroscopy mission
 - An X-ray probe
- Proposing teams should check the Q&As frequently at <https://explorers.larc.nasa.gov/2023APPROBE/>

Release of final AO:	July 2023 (target)
Proposals due:	NET mid-November 2023



Time Domain and Multi-Messenger Astrophysics (TDAMM)

- Astro2020 Decadal Survey recommended Time-Domain and Multi-Messenger Astrophysics (TDAMM) as highest priority sustaining activity for NASA Astrophysics.
 - TDAMM contributions of current NASA fleet highlight the need to maintain and replace the workhorse missions.
 - Recommended strategic approach is to add space-based capabilities based on science priorities and status of complementary facilities.
 - e.g. gravitational-wave, neutrino, international e/m missions
 - Roman Space Telescope is a game changer for TDAMM: Opportunities for TDAM astrophysics in recent Roses call
 - New NASA missions address need for continuous monitoring for transients (X-Ray, Gamma-ray)
 - Smallsat missions (BurstCube, GlowBug, BlackCat, StarBurst)
 - Explorers: COSI (in development)
 - Star-X, UVEX, LEAP and MoonBeam (in Step-2 competitive downselect)
 - NASA partnership with Israel (ULTRASAT) adds sensitive wide-field UV monitoring
 - Planetary Mission NEO-Surveyor adds IR transient monitoring capability

Time Domain and Multi-Messenger Astrophysics (TDAMM)

- Conducting a study of coordinating TDAMM observations among NASA spacecraft using centralized proposal, and ToO initiation to make more efficient use of fleet
- NASA transient alert system
 - Modernizing in preparation for the Rubin era of $\sim 10^6$ alerts per night
 - Funding multi-mission and mission-design software tools for community use
 - Initiating discussions across Agencies e.g. LIGO w/NSF
- PhysCOS/COR hosted TDAMM workshop in Annapolis, MD. on August 22-24, 2022
 - ~300 participants
 - White Paper recently delivered and posted
 - International agency meeting identified areas of collaboration
 - 2nd meeting International working group scheduled for 2023 to discuss standards and coordination
- Through PhysCOS community groups, supporting new and upcoming Science Analysis Groups in the areas of Gamma-ray Transient Networks and Space Communications



TDAMM Report



TDAMM
Workshop

IDEA Initiatives



On-going & Planned IDEA Initiatives in APD

- Inclusion Plans in ROSES22:
 - Piloting continues - APRA, LISA, SAT, TCAN, Roman, Precursor Science – lots of lessons being learned
 - IP assessment criteria are not part of evaluation criteria but if IP is inadequate, funding released only after IPs are judged to be adequate
 - ROSES 23 has new standardized language and various programs across SMD will continue to pilot this effort
 - SMD held a community workshop and a resources page available as of January 2023 under SMD Inclusion webpage
- APD Community Days have begun
 - APD Virtual visit (Clampin, Eric Smith, Cucchiara, Sheth) visited Puerto Rico on March 7th.
 - Stakeholders on the island engaged in planning
 - Faculty and graduate students across island invited
 - Follow up visits planned to further engage on specific areas (i.e. engineering / technology as well as undergraduate research etc.)



On-going & Planned IDEA Initiatives in APD

Continued

- Statement of Principles by APD developed and shared across NASA Astrophysics ecosystem
- Regular attendance at National Society of Black Physicists (NSBP) and Society for Advancement of Chicanos and Native Americans in Science (SACNAS) meetings
- Other previous APD pioneering efforts:
 - Code of Conduct for review panels developed by APD, now adopted SMD-wide!
 - Changes in language to Senior Review (SR) aligned with NASA's core value of Inclusion – our changes to SR adopted SMD-wide!
 - Changes to AO language



Statement of Principles



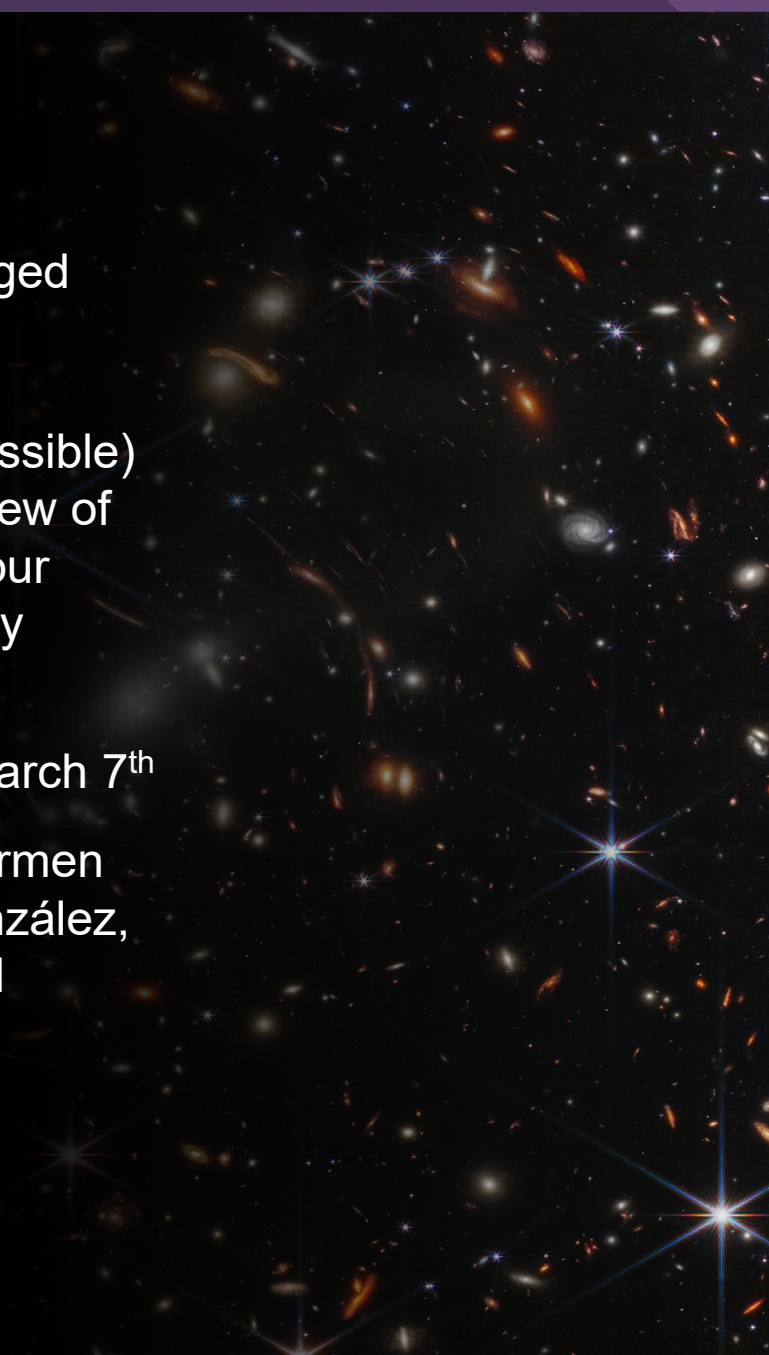
Code of Conduct



SMD Inclusion Plan Resource Page

Community Engagement

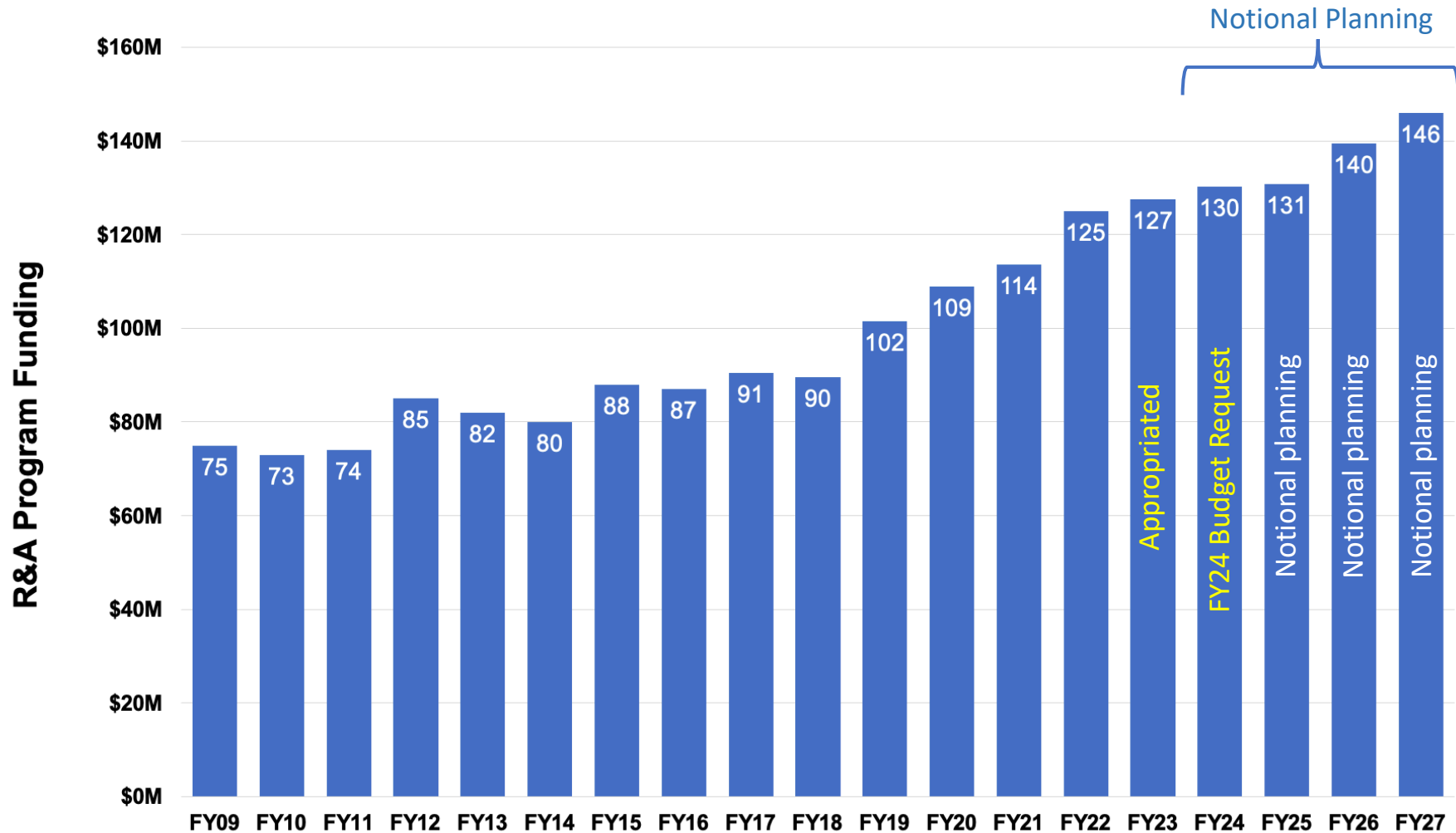
- We must ensure that people from all over our nation are aware and engaged
- NASA Astrophysics (APD) has launched a virtual and in person (when possible) “road tour” to visit with different community members to provide an overview of APD, listen to the community’s questions, concerns and suggestions on our plans, and expand the footprint of our scientific and technology community engaged in work with our division.
 - The first of these events was with the University of Puerto Rico on March 7th
 - APD has been working with Dra. Mayra Lebrón Santos, Dra. Carmen Pantoja, Dra. Desireé Cotto Figueroa, Dr. Héctor J Jiménez González, Dr. Gerardo Morell Marrero, Dr. Rafael Rodríguez and Prof. Abel Méndez, as well as Dr. Héctor Arce on crafting the event and understanding the needs of the Puerto Rican community



R&A



Research & Analysis Funding



The Astrophysics R&A Program has seen a sustained growth.

For the last 12 months, the selection rates were 24% for R&A programs and 28% for mission's General Observer and General Investigator (GO/GI) programs, with a total average selection rate of 27% for all Astrophysics ROSES programs.

2023 Astrophysics Research Solicitations

Supporting Research and Technologies			
Astrophysics Research & Analysis	APRA	IP	
Strategic Astrophysics Technology	SAT	IP	
Astrophysics Theory Program	ATP	IP	DAPR
Nancy Grace Roman Technology Fellowships	RTF		
Astrophysics Decadal Survey Precursor Science	ADSPS		DAPR
Data Analysis			
Astrophysics Data Analysis	ADAP		DAPR
Fermi, Swift, NuSTAR, NICER, TESS, IXPE New	GO/GI		DAPR
Mission Science and Instrumentation			
Astrophysics Pioneers (suborbital science)	Pioneers		DAPR
Suborbital payloads solicited through APRA	APRA	IP	DAPR
Roman Research and Opportunities	Roman	IP	DAPR
Cross Divisional			
Exoplanets Research Program	XRP		DAPR
Topical Workshops, Symposia and Conferences	TWSC		
Citizen Science Seed Funding Program	CSSFP		
Graduate Student Research Awards	FINESST		

Solicited Separately			
JWST, Hubble, Chandra GO/GI/Archive/Theory programs	GO/GI		DAPR
NASA Hubble Fellowship Program	NHFP		
NASA Postdoctoral Program	NPP		
Support for XMM-Newton U.S. PIs (selected by ESA)	XMM GO		
Not Solicited in ROSES-23			
Theoretical and Computational Astrophysics Networks, every other year	TCAN	IP	DAPR

IP: Proposals require an Inclusion Plan for creating and sustaining a positive and inclusive working environment.

Assessment of IP not part of adjectival rating / does not inform selection of proposals. However, funding only released after a satisfactory Inclusion Plan is accepted.

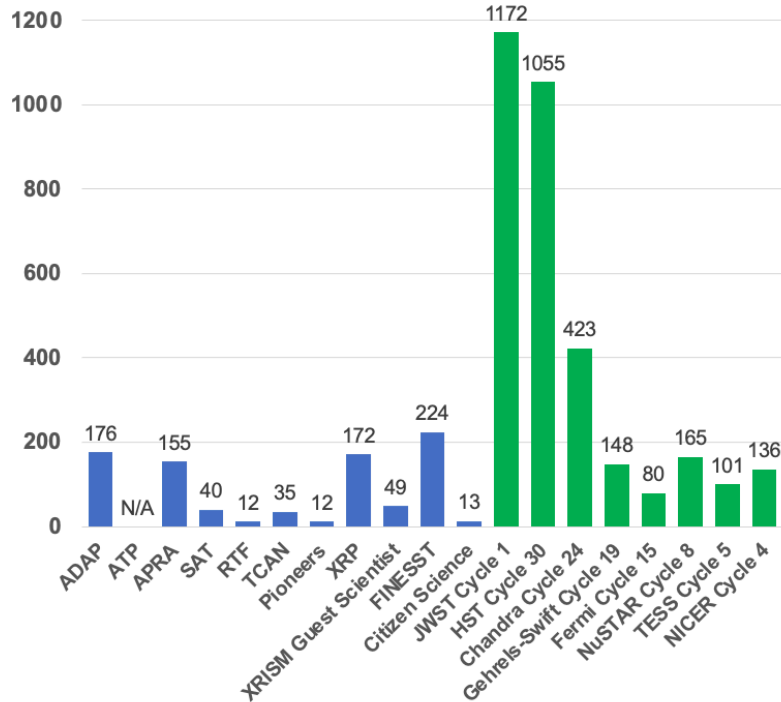
Inclusion Plan pilot program will continue in 2023 but likely not expand until later.

DAPR: Proposals evaluated using dual-anonymous peer reviews where panelists do not know the identities of the proposing teams and institutions.

Astrophysics R&A Selection Rates

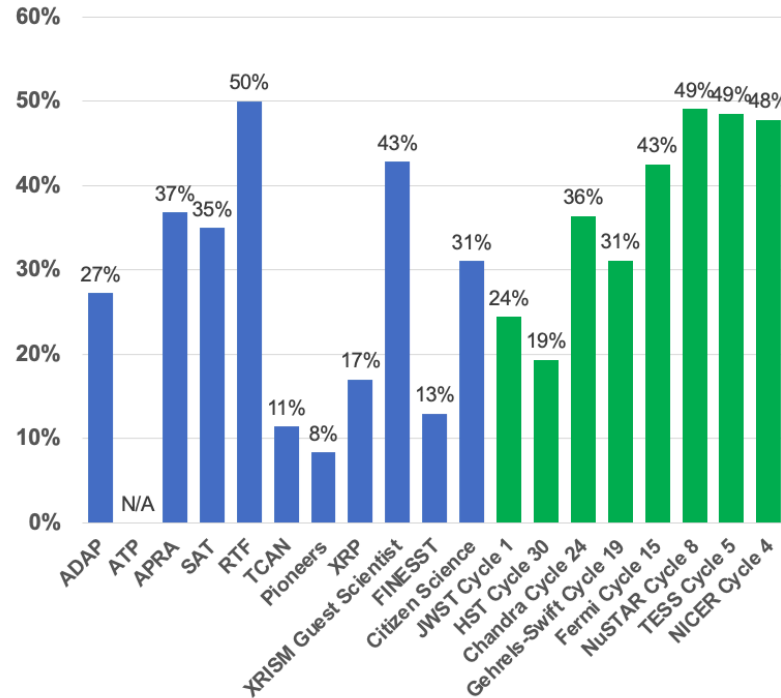
March 2022-2023

Number of Proposals



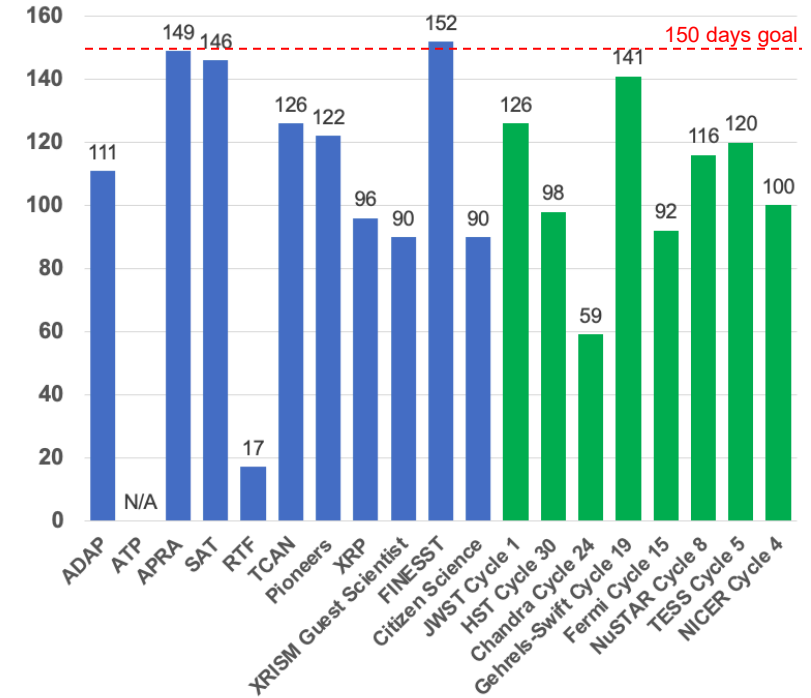
R&A: 888 proposals
 GO/GI: 3,280 proposals
 Total: 4,168 proposals

Selection Rates



R&A: 24% (19% last year)
 GO/GI: 28%
 Average: 27%

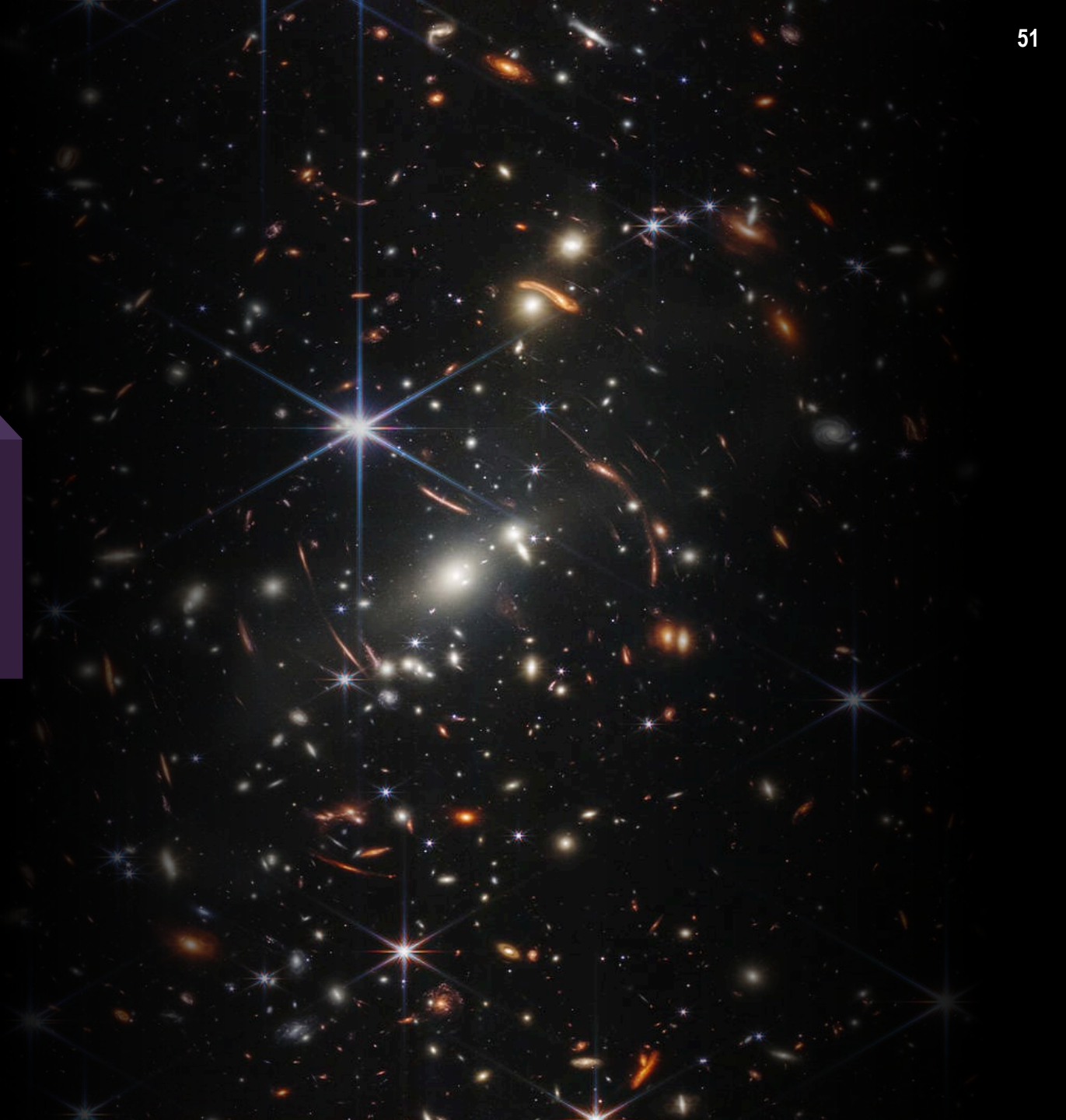
PI Notification (Days)



80% of PI notification:
 R&A: 110 days
 GO/GI: 107 days

* Only programs with selections made and PIs notified

NASA Hubble Fellowship Program



NASA Hubble Fellowship Program (NHFP)

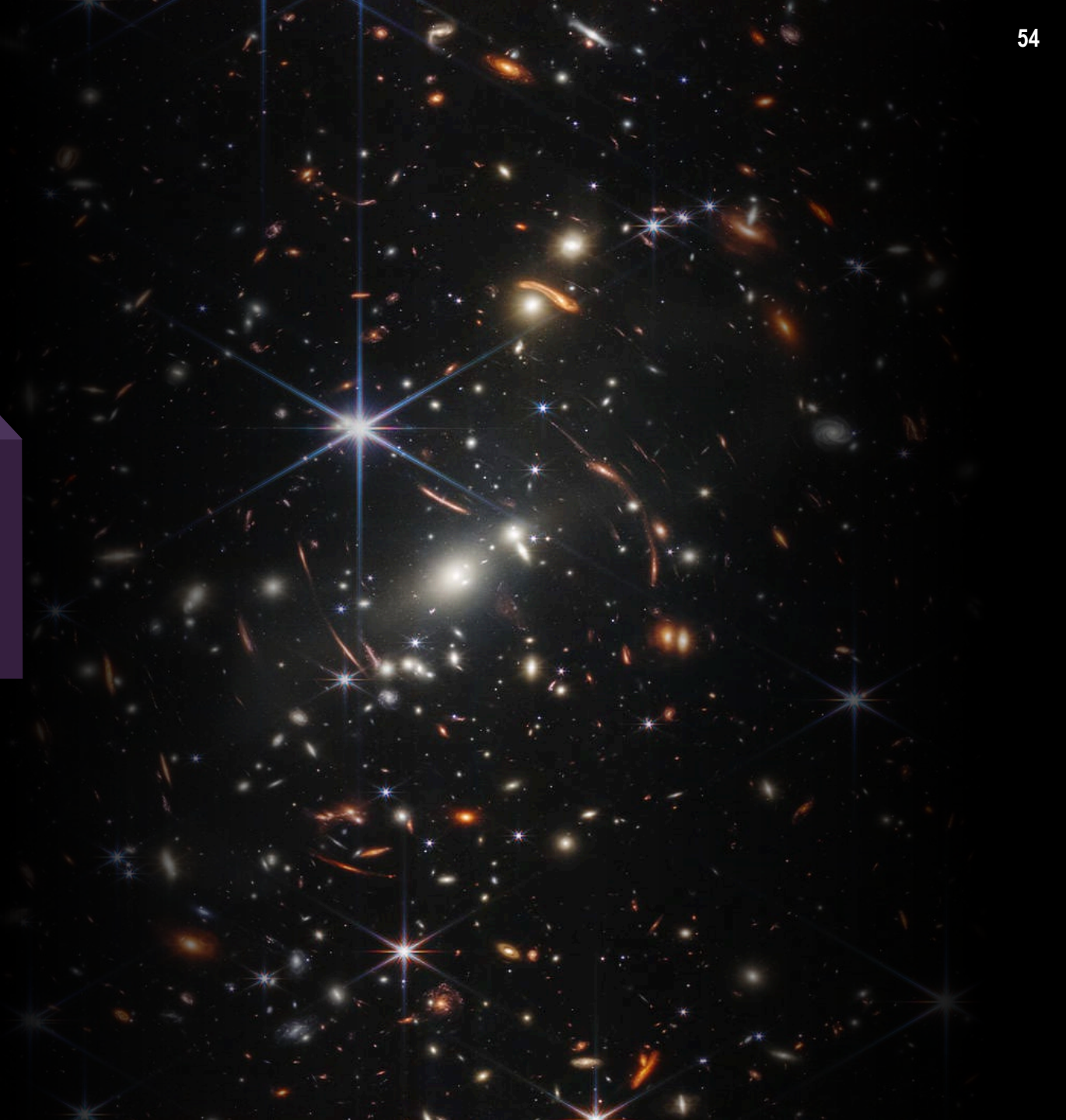
- In 2021 a review of the NASA Hubble Fellowship Program (NHFP) was conducted to assist NASA in increasing the effectiveness of the program and bolstering its excellence.
- January 2022 Report contains 32 recommendations in 5 areas:
 - Mission of the NHFP
 - Management of the Program
 - Application and Review Processes
 - Diversity and Accessibility of the Program
 - Support of the Fellows
- APD sought community input and discussion of the report at 2022 AAS meetings

NHFP Response Progress

- Recommendations 1 and 2 are overarching and will be met through the process NASA is employing to address all the recommendations
- NASA has partially or entirely implemented 15 of the 32 recommendations (#4, 5, 6, 10, 13, 16, 17, 18, 20, 21, 25, 27, 28, 29, 32)
- Recommendations 3, 12 are strongly dependent on APD budgets
- Discussions are underway how to implement recommendations #7, 8, 9, 11, 14, 15, 19, 22, 23, 24, 26, 30
 - Many of these will be implemented over the next few fiscal cycles (FY24-FY27)
 - Five will be implemented by FY30 (#14, 15, 19, 22, 24)
- See Backup charts for details on each recommendation



Independent Balloon Program Review



Independent Balloon Program Review Team

First	Last	Organization
William C	Jones	Princeton University
John	Sample	Montana State University
Carolyn	Kierans	Goddard Space Flight Center
Linnea	Avalone	National Science Foundation
Kenneth	Jucks	NASA HQ Earth Science Division
David	Gregory	Former NASA Wallops Flight Facility
Joaquin	Vieira	University of Illinois Urbana-Champaign
Jessica	Gaskin	Marshall Space Flight Center
Neeharika	Thakur	Prince George Community College
Scott	Nutter	Northern Kentucky University
Jose V	Siles	Jet Propulsion Lab
Aamir	Ali	Templeton Foundation

- Decadal recommended IBPRT
- [Terms of Reference here](#)
- Non-government members being appointed as Special Government Employees (SGEs)
- Tentative timeline:
 - 1st meeting in April / May
 - Interim report to APAC (Oct '23)
 - Final report to APAC ('Mar '24)

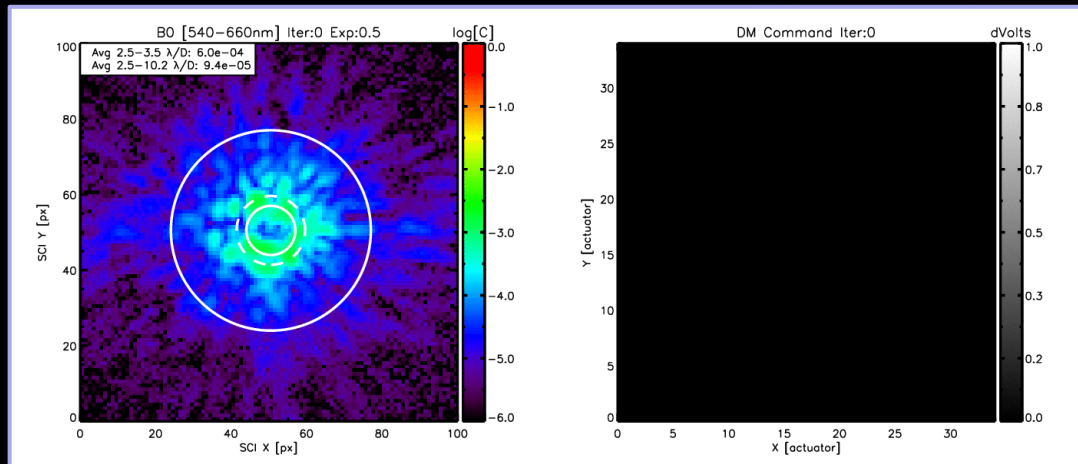


Balloon Program

- During 2022, NASA successfully implemented a scientifically productive Balloon Campaign.

PICTURE-C: Balloon-Borne Coronagraphy

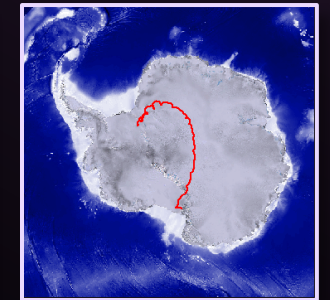
- The first on-sky coronagraph dark hole created in a space-like environment



Chakrabarti et al. - U Mass Lowell

SPIDER: Balloon-borne CMB experiment

- **SPIDER** studies the Cosmic Microwave Background (CMB) and its polarization for indications of gravitational waves associated with the Big Bang.



SPIDER's balloon flight track over Antarctica



Status of Science Data Policy

Year of Open Science



Science Data Policy and a Year of Open Science

- SMD has released [SPD-41a: Scientific Information Policy for the Science Mission Directorate](#) to provide guidance on the open sharing of publications, data, and software created in the pursuit of scientific knowledge.



- SMD has developed Open Science Guidelines that provide further guidance to the community on general implementation of SPD-41a.



- The [Astrophysics Scientific Information Management Policy](#) provides further clarification on the application of SPD-41a to the Astrophysics Division.





Science Data Policy and a Year of Open Science

- 2023 Year of Open Science is a multi-agency initiative to spark change and inspire open science engagement through events and activities that will advance adoption of open science. NASA is a participating agency.



- NASA's participation in the Year of Open Science is part of SMD's Transform to Open Science (TOPS), a \$40 million 5-year mission to accelerate adoption of open science.





THANK YOU



Backup





NHFP Backup slides



NHFP Review recommendations	
<p>1) The NHFP program should articulate a clear and specific mission statement that is aligned with SMD Core Values. This should be accompanied by revised processes for the selection of Fellows, and an evaluation plan for the Program, that are in turn aligned with the SMD vision. This will require reimagining the nuts-and-bolts processes (application, review, selection, support) through which the Program’s mission is put into practice.</p>	<p>9) Do not require host institution specification on application and do the pairing after selection of Fellows. Establish a more structured and accessible mechanism for matching applicants with host institutions and host advisors. For example, discuss with the selected Fellows the appropriate institution after the award, which empowers the Fellows from underrepresented communities to hold a valuable card for negotiating with the host institution.</p>
<p>2) Review the existing policies and rules of the NHFP within the lens of the mission of the Fellowship, aligning them with the six SMD core values discussed above.</p>	<p>10) Ask the candidates to explicitly address scientific leadership in the application.</p>
<p>3) Provide GRA the needed resources to manage the expanded Program.</p>	<p>11) Re-envision the necessity or form of reference letters to, for example, remove or anonymize them; provide guidance (e.g., a rubric) to letter writers to avoid bias; or train the reviewers in recognizing bias in the letters.</p>
<p>4) Implement a clear process for review and approval of Program policies and policy changes that minimizes surprises and considers implementation issues up-front.</p>	<p>12) The NHFP should strongly consider increasing the number of Fellowships awarded to reach an oversubscription rate (i.e., submission numbers vs. selection numbers) more consistent with those of NASA’s other competitive programs and similar Fellowships.</p>
<p>5) The NHFP needs to establish a more centralized management of the program with simplified lines of communication, ensure consistency with regard to benefits and employment status, and needs to establish a sole point of contact (POC) within the NHFP to communicate the necessary (or requested) changes to a POC at NASA.</p>	<p>13) In considering revisions to the NHFP review and selection process, NASA should not be overly concerned with the impact of revised, and potentially more involved, procedures on reviewer acceptance rates.</p>
<p>6) Better communication of policies and paths to change them needs to be provided to the Fellows in a clear and consistent way. At the beginning of their tenure, for example, in an orientation session focused on the “need to know” aspects of the Program management and Fellowship tenure, the Fellows should be informed as to who the POCs are and the process for requesting changes.</p>	<p>14) Before returning to a fully in-person review process, the Leads should carefully consider the benefits of virtual review panels and the impact that returning to in-person panels may have on the diversity (both demographic and institutional) of the reviewers.</p>
<p>7) On a case-by-case basis, grant extensions of tenure to the Fellows whose tenure duration is negatively impacted by personal circumstances.</p>	<p>15) Ensure that revised review criteria are clearly aligned with the Program mission, and SMD and NASA priorities and vision statements.</p>
<p>8) Remove the three-year criterion. Instead, ask applicants to explain in their applications why they should be considered early career scientists.</p>	<p>16) Specific, transparent review criteria will help to ensure that a greater number of qualified applicants, particularly those from underrepresented groups, are able to see the alignment of their experience and expertise with review criteria. Greater transparency will also help individuals who do not have inside knowledge about what makes a good proposal produce more effective applications.</p>

NHFP Review recommendations (cont.)	
<p>17) Enable reviewers to meet before triage to establish a shared set of evaluation criteria and to discuss how to interpret these criteria in light of the NHFP mission and SMD Core Values. Additional discussions about reviewer biases or concerns about applicant proposals, and how to mitigate them, should also occur.</p>	<p>22) The Program should revise the entire structure of the NHFP (application material, evaluation process, selection criteria) through the lens of inclusive leadership and in alignment with the similar SMD core values. This most likely will require external expert help from specialists in the field who can identify needed processes.</p>
<p>18) After creating a vetted rubric, require reviewers to evaluate a combination of successful and unsuccessful anonymized applications from previous cycles before the triage stage to allow for calibration and discussions of expectations and review scores. The shared expectations should then carry over to the review panel discussions.</p>	<p>23) NASA should reconsider allowing affiliated institutions to host four total Fellows per year, every year, and instead hold the combined total to the same cap as it does for other institutions.</p>
<p>19) NASA should re-envision the NHFP review process to incorporate best practices in unbiased, holistic evaluation. This exercise should include experts from the social scientists and may result in, e.g., implementing a dual-anonymous selection review; moving to a two-stage application process; anonymizing or removing entirely letters of recommendation; removing the statement of past work and/or CV components of the application; requiring applicants to not report numbers (e.g., citation rates or h-index); incorporating interviews for finalists; and enabling multimedia submissions; or a combination thereof. The re-envisioned review process would necessarily have to implement and build-in clear mechanisms to reduce bias, including explicit rubric criteria and protocols that explain how the interview process should be conducted (e.g., cameras off during video interviews).</p>	<p>24) NASA should develop centralized avenues to provide resources (e.g., telescope access, computational resources) to Fellows at institutions that lack them. NASA should also provide incentives to Fellows attending smaller institutions and better communicate the advantages those institutions can provide. Additionally, consider joint appointments with institutions that are geographically close to one another.</p>
<p>20) Consistent with a definition of excellence that features collaborative, inclusive leadership in addition to science, an explanation of previous and planned DEIA efforts should be a required component of the Fellowship application and review. The task assigned to the DEIA component should be broadly defined to allow applicants to describe, for example, personal experiences that demonstrated perseverance to stay in the field or individual efforts that resulted in enhanced access for members of underrepresented groups to scientific knowledge, activities, or facilities.</p>	<p>25) To reach a wider applicant pool, the NHFP Leads should establish proactive outreach activities (e.g., workshops at meetings of the AAS, the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), and the National Society of Black Physicists (NSBP); virtual workshops) for applicants and other stakeholders (e.g., reviewers, letter writers) in advance of the deadline to provide information about the application process. This information could include how to address rubric criteria in the application materials, as well as information about the review process.</p>
<p>21) Collect demographic information to evaluate the efficacy of any revised application structures and probe bias. Additional information could be collected during exit interviews.</p>	<p>26) Allow applicants to express interest in both research and additional activities (e.g., outreach, mentoring, service) as part of the application. This may provide opportunities for the Fellowship tenure at smaller host institutions or NASA Centers that actually may be a better fit for those elements. Great science can be and is done at smaller institutions.</p>

NHFP Review recommendations (cont.)	
<p>27) Remove references to academic environments from the AO text and the policy and guideline documents, and make the language inclusive of other non-academic hosts.</p>	<p>32) Create a policy that allows NASA Centers to host NHFP Fellows directly. NASA Centers may not be able to host Fellows of all nationalities. Non-US citizens considering one of these as a host institution should contact the institution to make sure that they can indeed be hosted there. Even if foreign Fellows may not be allowed to choose a Center as a host, they can choose other institutions, which is already the practice at JPL and STScI, for instance.</p>
<p>28) The NHFP should institute a formalized program of professional development support and mentorship of Fellows. This could include conferences and workshops, online or in-person workshops, and individual mentoring from former and current Fellows.</p>	
<p>29) The NHFP should make outreach, teaching, mentoring, and other aspects of career development an integral part of the program and encourage/require host institutions to make these available to Fellows.</p>	
<p>30) Remove the restriction that prevents Fellows from taking a leave from the program, allowing them to attempt other career pursuits or address sudden family situations.</p>	
<p>31) Leveraging its status as a federal funding Agency, NASA should require that Fellows be offered employment status and be given full fringe benefits by the host institution. Current efforts to initiate this by NASA represent a step in the right direction. Consider also providing strong encouragement to host institutions to offer healthcare to significant others and paid parental leave or disclose their policy for benefits etc. so the Fellows can make an informed decision.</p>	

NHFP Review Recommendations and Timeline

Implemented Recommendations (FY22-FY24)

4. Implement a clear process for review and approval of Program policies and policy changes that minimizes surprises and considers implementation issues up-front.
5. The NHFP needs to establish a more centralized management of the program with simplified lines of communication [...]
6. Better communication of policies and paths to change them needs to be provided to the Fellows in a clear and consistent way. [...]
10. Ask the candidates to explicitly address scientific leadership in the application
13. In considering revisions to the NHFP review and selection process, NASA should not be overly concerned with the impact of revised, and potentially more involved, procedures on reviewer acceptance rates.
- 16 Specific, transparent review criteria will help to ensure that a greater number of qualified applicants [...]
17. Enable reviewers to meet before triage to establish a shared set of evaluation criteria [...]
18. After creating a vetted rubric, require reviewers to evaluate a combination of successful and unsuccessful anonymized applications
20. Consistent with a definition of excellence that features collaborative, inclusive leadership in addition to science, an explanation of previous and planned DEIA efforts should be a required component of the Fellowship application and review.
21. Collect demographic information to evaluate the efficacy of any revised application structures and probe bias [...]
25. To reach a wider applicant pool, the NHFP Leads should establish proactive outreach activities [...]
27. Remove references to academic environments from the AO text [...]
28. The NHFP should institute a formalized program of professional development support and mentorship of Fellows [...]
31. Leveraging its status as a federal funding Agency, NASA should require that Fellows be offered employment status and be given full fringe benefits by the host institution [...]

NHFP Review Recommendations and Timeline

Area 1 (Mission of the NHFP)

1. The NHFP program should articulate a clear and specific mission statement that is aligned with SMD Core Values. This should be accompanied by revised processes for the selection of Fellows, and an evaluation plan for the Program, that are in turn aligned with the SMD vision. This will require reimagining the nuts-and-bolts processes (application, review, selection, support) through which the Program's mission is put into practice.
2. Review the existing policies and rules of the NHFP within the lens of the mission of the Fellowship, aligning them with the six SMD core values discussed above.

Target date for possible implementation FY24

NHFP Review recommendations and timeline

Area 2 (Management of the NHFP)

3. Provide GRA the needed resources to manage the expanded Program.
7. On a case-by-case basis, grant extensions of tenure to the Fellows whose tenure duration is negatively impacted by personal circumstances.
8. Remove the three-year criterion. Instead, ask applicants to explain in their applications why they should be considered early career scientists.
9. Do not require host institution specification on application and do the pairing after selection of Fellows. Establish a more structured and accessible mechanism for matching applicants with host institutions and host advisors. For example, discuss with the selected Fellows the appropriate institution after the award, which empowers the Fellows from underrepresented communities to hold a valuable card for negotiating with the host institution.

Target date for possible implementation FY25-FY28

NHFP Review Recommendations and Timeline

Area 3 (Application and Review Process)

11. Re-envision the necessity or form of reference letters to, for example, remove or anonymize them; provide guidance (e.g., a rubric) to letter writers to avoid bias; or train the reviewers in recognizing bias in the letters.
12. The NHFP should strongly consider increasing the number of Fellowships awarded to reach an oversubscription rate (i.e., submission numbers vs. selection numbers) more consistent with those of NASA's other competitive programs and similar Fellowships.
14. Before returning to a fully in-person review process, the Leads should carefully consider the benefits of virtual review panels and the impact that returning to in-person panels may have on the diversity (both demographic and institutional) of the reviewers.
15. Ensure that revised review criteria are clearly aligned with the Program mission, and SMD and NASA priorities and vision statements.
19. NASA should re-envision the NHFP review process to incorporate best practices in unbiased, holistic evaluation. [...]

Target date for possible implementation no earlier than FY26

NHFP Review Recommendations and Timeline

Area 4 (Centering Diversity, Equity, Inclusion, and Accessibility in the NHFP)

22. The Program should revise the entire structure of the NHFP (application material, evaluation process, selection criteria) through the lens of inclusive leadership and in alignment with the similar SMD core values. This most likely will require external expert help from specialists in the field who can identify needed processes.

23. NASA should reconsider allowing affiliated institutions to host four total Fellows per year, every year, and instead hold the combined total to the same cap as it does for other institutions.

24. NASA should develop centralized avenues to provide resources (e.g., telescope access, computational resources) to Fellows at institutions that lack them. NASA should also provide incentives to Fellows attending smaller institutions and better communicate the advantages those institutions can provide. Additionally, consider joint appointments with institutions that are geographically close to one another.

26. Allow applicants to express interest in both research and additional activities (e.g., outreach, mentoring, service) as part of the application. This may provide opportunities for the Fellowship tenure at smaller host institutions or NASA Centers that actually may be a better fit for those elements. Great science can be and is done at smaller institutions.

Target date for possible implementation no earlier than FY25

NHFP Review Recommendations and Timeline

Area 5 (Support of the Fellows)

28. The NHFP should institute a formalized program of professional development support and mentorship of Fellows. This could include conferences and workshops, online or in-person workshops, and individual mentoring from former and current Fellows.

29. The NHFP should make outreach, teaching, mentoring, and other aspects of career development an integral part of the program and encourage/require host institutions to make these available to Fellows.

30. Remove the restriction that prevents Fellows from taking a leave from the program, allowing them to attempt other career pursuits or address sudden family situations.

32. Create a policy that allows NASA Centers to host NHFP Fellows directly. NASA Centers may not be able to host Fellows of all nationalities. Non-US citizens considering one of these as a host institution should contact the institution to make sure that they can indeed be hosted there. [...]

Target date for possible implementation FY26