National Aeronautics and Space Administration

NASA

EXPLORE SOLAR SYSTEM & BEYOND

NASA Town Hall

AAS 240th Meeting | June 13, 2022

Paul Hertz
Director, Astrophysics Division
Science Mission Directorate

@NASAUniverse @NASAExoplanets @NASAWebb

Charts posted at http://science.nasa.gov/astrophysics/documents

NASA Headquarters Staff in Attendance

Thomas Zurbuchen	Paul Hertz	
Manuel Bautista	Dominic Benford	Terri Brandt
Sandra Cauffman	Valerie Connaughton	Doris Daou
Kristen Erickson	Alise Fischer	Galen Fowler
Michael Garcia	Hashima Hasan	Denise Hill
Douglas Hudgins	Hannah Jang-Condell	Patricia Knezek
Elizabeth Landeau	William Latter	Joshua Pepper
Mario Perez	Natasha Pinol	Haley Reed
Gregory Robinson	Kartik Sheth	Eric Smith
Sanaz Vahidinia	Nicolle Zellner	

The NASA Team

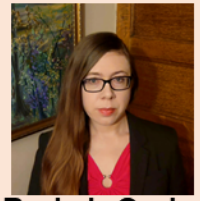
NASA Astrophysics Division

Division Director

Paul Hertz
Astrophysics Division Director

Sandra Cauffman
Astrophysics Division Deputy Director

Program Executives



Rachele Cocks
Dep COSI, Dep Ariel/CASE CubeSats

E. Lucien Cox
SOFIA, GUSTO, XRISM, ExEP

Julie Crooke
GOMAP

Ed Griego
Roman, CGI

Shahid Habib
PCOS/COR, ARIEL, Athena, Euclid, LISA, UltraSat

Janet Letchworth
Operating Missions, Decadal

Mark Sistilli
Explorers Program SPHEREx, COSI Balloons

Cross Cutting

Eric Smith
Chief Scientist Webb Precursor Sci

Vacant

Vacant
Assoc Dir for Flight ASM Program Manager

Mario Perez
Chief Technologist SAT, RTF, ISFM, Swift

Omid Noroozian
Deputy Chief Technologist

Not Pictured

Lisa Wainio
Information Manager, Public Affairs Liaison

Administrative Support

Jennifer Baker
Administrative Assistant

Ingrid Farrell
Program Support Specialist

Kelly Johnson
Administrative Assistant

Sara Schwartzman
Program Support Specialist

Program Scientists

Manuel Bautista

Dominic Benford
Roman, CGI, APRA Lead

Terri Brandt
COSI Dep APRA Dep Pioneers Dep Precursor Sci

Valerie Connaughton
APRA (High Energy) XRISM, UltraSat,XMM, TDAMM, PCOS Program

Antonino Cucchiara

Michael Garcia
APRA (UV/Visible), SmallSats/Pioneers Hubble

Thomas Hams
APRA (CR, Fund. Phys.) Rockets/Balloons GUSTO, LISA

Hashima Hasan
Education/Comms, Citizen Science, Archives, Advisory Committees, NuSTAR, Keck

Douglas Hudgins
ExEP Program ADAP Lead TESS Dep, ARIEL

Stefan Immler
Astrophysics Research Program Mgr, Chandra, ART-XC

Hannah Jang-Condell
XRP, TESS ExEP, Explorers

Patricia Knezek
Explorers Program Astrophysics Probe SOFIA, Hubble Fellows

William Latter
APRA (Lab Astro) SPHEREx, Fermi

Sangeeta Malhotra
Roman/CGI Dep ATP/TCAN Dep

Roopesh Ojha
Data Lead, NICER, HEC, AI/ML

Joshua Pepper
Deputy TESS, Deputy ADAP, Deputy ExEP

Kartik Sheth
Inclusion Plans Technical assessments

Linda Sparke
2021 MIDEX/MO, Archives, COSI

Eric Tollestrup
APRA (IR/Submm) Euclid, IXPE, COR Program

Sanaz Vahidinia
ATP/TCAN Lead

Astrophysics Program Abbreviations: ASM – Astrophysics Strategic Missions; COR – Cosmic Origins; ExEP – Exoplanet Exploration Program; PCOS - Physics of the Cosmos

Join the NASA Team at Headquarters

NASA is seeking permanent and visiting Ph.D.-level scientists to serve as Program Scientists in the Astrophysics Division at NASA Headquarters in Washington, DC. With a budget of $1.6 billion annually, the Division is responsible for the nation's space-based astrophysics program.

Talk to any of the NASA HQ staff to learn more.

NASA Program Scientists

- manage scientific research grants programs and the proposal review process;
- serve as the Headquarters science lead for missions;
- implement NASA's response to the 2020 Decadal Survey;
- gain insight into Federal astrophysics policy and programs;
- run scientific programs with multimillion-dollar budgets, and
- contribute to a culture of diversity, equity, and inclusion.

This summer (date TBD), NASA will advertise for program scientists across SMD.

- The ad will be open on USAJobs.gov for <5 days
- Subscribe to USAJobs.gov for an alert
- NASA will advertise through mailing lists (next page) and AAS Job Register

This summer (date TBD), NASA will advertise for astrophysics visiting scientists

- Visiting scientists spend 2-6 years at NASA before returning to their permanent job
- NASA will advertise through mailing lists (next page) and AAS Job Register

Keep Connected with NASA

NSPIRES mailing list – information about NASA solicitations

https://nspires.nasaprs.com/

Cosmic Origins mailing list, Exoplanet Exploration mailing list, Physics of the Cosmos mailing list – information about NASA missions and science

https://cor.gsfc.nasa.gov/cornews-mailing-list.php

https://exoplanets.nasa.gov/exep/exopag/announcementList/

https://pcos.gsfc.nasa.gov/pcosnews-mailing-list.php

NASA Astrophysics Federal Advisory Committees

Astrophysics Advisory Committee (APAC)
https://science.nasa.gov/researchers/nac/science-advisory-committees/apac

NASEM Committee on Astronomy and Astrophysics (CAA)
http://sites.nationalacademies.org/bpa/bpa_048755

Astronomy and Astrophysics Advisory Committee (AAAC)
https://www.nsf.gov/mps/ast/aaac.jsp

Sign up to be a panel reviewer:

https://science.nasa.gov/researchers/volunteer-review-panels

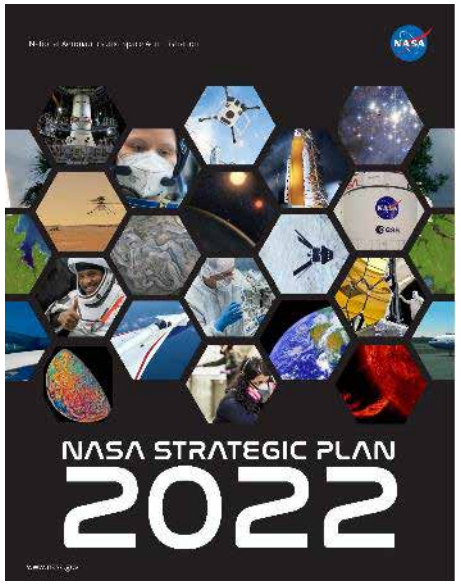
Importance of Inclusion, Diversity, Equity, Accessibility (IDEA)

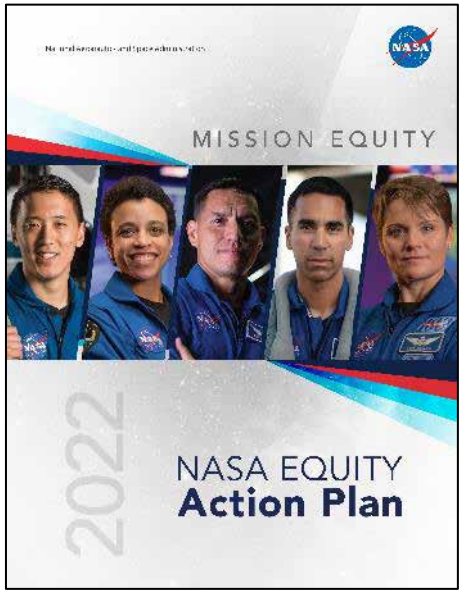
"The panel [on the State of the Profession and Societal Impacts] asserts that fundamentally, the pursuit of science, and scientific excellence, is inseparable from the humans who animate it."

- *Pathways to Discovery in Astronomy and Astrophysics for the 2020s*

NASA is committed to integrating inclusion, diversity, equity, and accessibility (IDEA) into all activities (missions, programs, reviews, internal matters, etc.)

Inclusion & Diversity of Thought





Strategic Objective 4.1: Attract and develop a talented and diverse workforce. Cultivate a diverse, motivated, and highly qualified workforce through modernizing our Human Capital processes and systems, increasing our workforce agility and flexibilities, and implementing a robust Inclusion, Diversity, Equity, and Accessibility (IDEA) approach to ensure systematic and sustainable fairness, impartiality, and equity in our business practices.

NASA is continuing its journey towards equity. To this end, NASA has established four foundational focus areas:

- Increase Integration and Utilization of Contractors and Businesses from Underserved Communities to Expand Equity in NASA's Procurement Process
- Enhance Grants and Cooperative Agreements to Advance Opportunities, Access, and Representation for Underserved Communities
- Leverage Earth Science and Socioeconomic Data to Help Mitigate Environmental Challenges in Underserved Communities
- Advance External Civil Rights Compliance and Expand Access to Limited English Proficient (LEP) Populations within Underserved Communities

Building Excellent NASA Teams Requires Inclusion & Diversity

- IDEA is infused throughout everything we do. It is not a standalone or separate activity.
- Astrophysics has pioneered and piloted IDEA activities that are now adopted across SMD:
  1. Inclusion Plans adopted in ROSES elements across all SMD
  2. Code of Conduct now adopted for panel reviews a
  3. Dual Anonymous Peer Reviews adopted
  4. Inclusion Criteria in Senior Re across all SMD divisions *
  5. Increasing diversity expected across all SMD divisions
- Other SMD
  7. and publication of demographics of ROSES proposers and awardees *
  8. port data on proposal submissions and success rates *
  9. Bridge Program funded for better engagement with MSIs *
  10. National Academies study of barriers to inclusion in mission leadership
  11. National Academies study of demographic data required to assess the health of the community *
  12. Regular participation at meetings such as SACNAS and NSBP
  13. PI Launchpad to incubate next generation of diverse leaders for missions *
  14. IDEA criteria being added to Announcements of Opportunity *

Additional initiatives are being considered for inclusion in the FY24 NASA budget request *

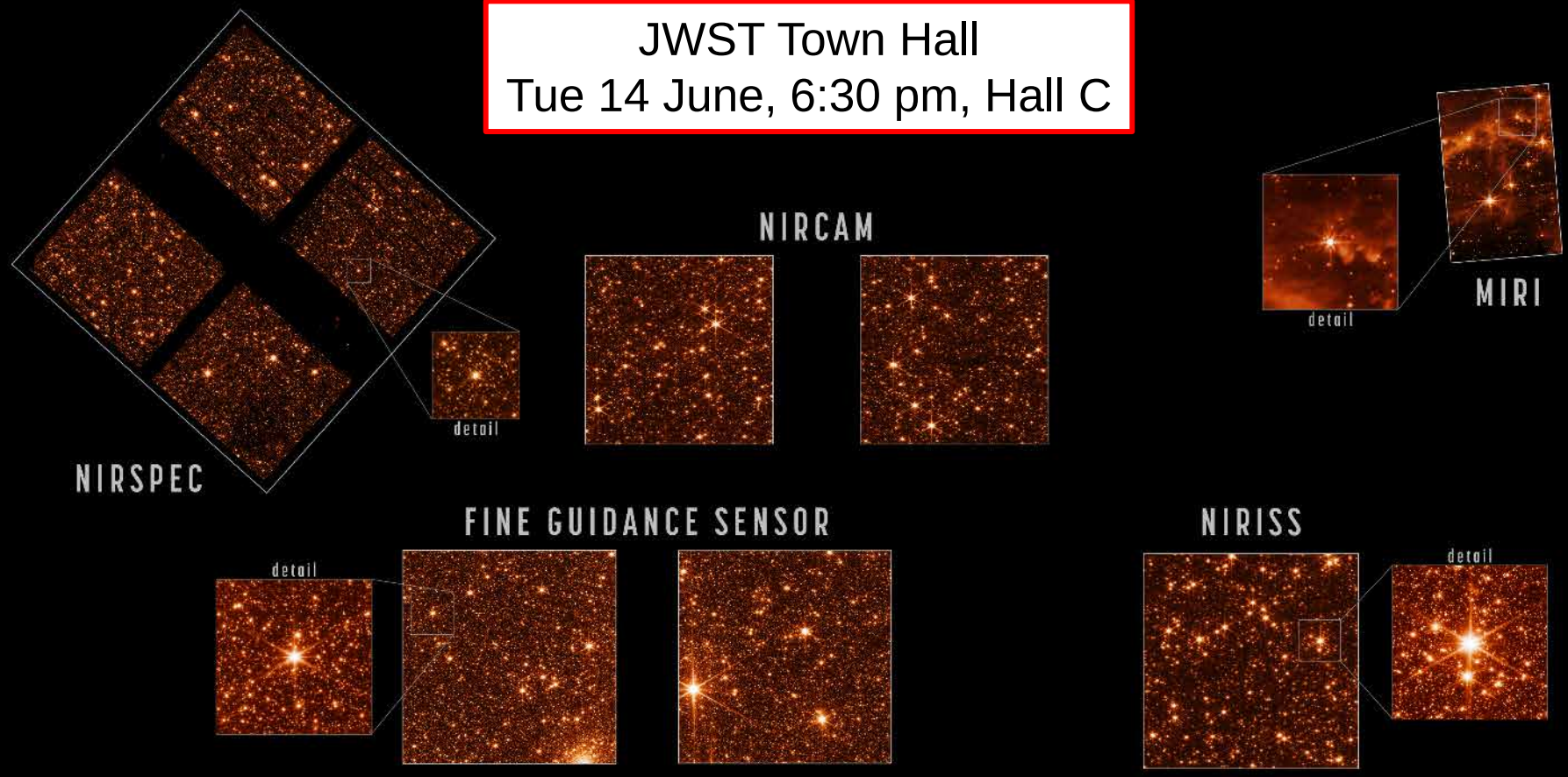
* Responsive to an Astro2020 Decadal Survey recommendation

James Webb Space Telescope Update

JWST Town Hall
Tue 14 June, 6:30 pm, Hall C

JWST Optical Performance Better than Requirements!

JWST Town Hall
Tue 14 June, 6:30 pm, Hall C



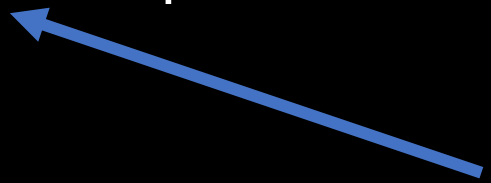
NIRCam (2 micron), NIRSpec (1.1 micron), NIRISS (1.5 micron), and MIRI (7.7 micron)

Commissioning Timeline

The CAST lays out each step of JWST commissioning.
(CAST = Commissioning Activity Sequence Timeline)
There are 730 high-level steps in the timeline.

These are broken down into:

- ~2800 steps for deployments and spacecraft ✓
- ~5400 steps for the telescope ✓
- ~1500 steps for the science instruments



~20 steps left (99% complete)

JWST Town Hall
Tue 14 June, 6:30 pm, Hall C

Webb Cycle 1 Long Range Plan

The Cycle 1 Long Range Plans (LRP) was released to the public the week of 18-April-2022.
It is a dynamic plan that will change with execution times as run, spacecraft anomalies, ToO's, etc.

LRP Cycle 1 Dates: 27-June-2023 to 2-July-2023

Category	Total Time [hrs]	Total Planned Time [hrs] (%)
GO	6090.1[1]	5749.7 (94%
GTO	3774.0[2]	3667 (98%
ERS[3]	529.5	529.5 (100%
Cal	659.6	659.6 (100%
Total	11023.2	10491.0 (95%)

[1]Includes 200.5 hrs of ToO's which do not get planned until activation
[2]Includes 5.2 hrs of ToO's which do not get planned until activation
[3]Bulk of ERS programs are schedule in the first 5 months of Cycle 1

https://www.stsci.edu/contents/news/jwst/2022/schedule-for-cycle-1-science-operations-released

Data courtesy N. Reid, STScI

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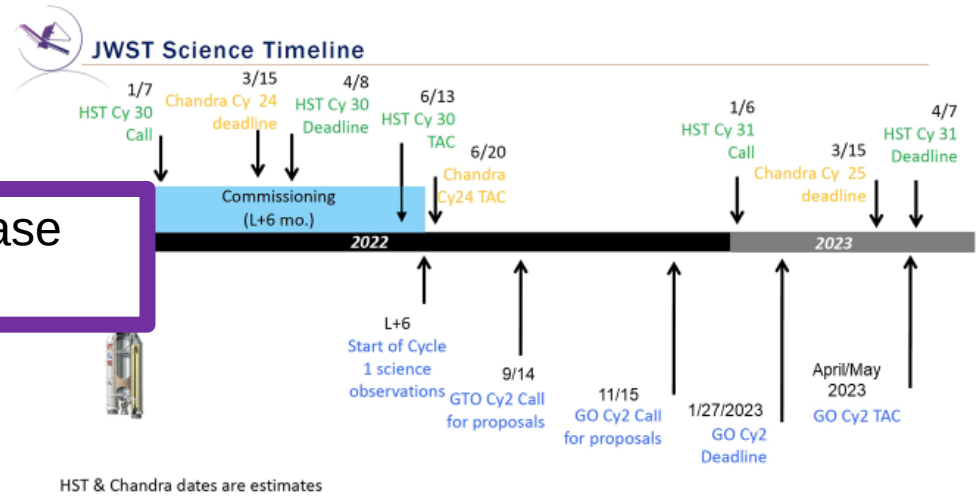
First Image Release
July 12, 2022

Science Timeline



HST & Chandra dates are estimates

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Keep up with JWST online
JWST homepage — nasa.gov/webb
JWST Blog — blogs.nasa.gov/webb
Where is JWST — jwst.nasa.gov/content/webbLaunch/whereIsWebb.html

Twitter: @NASAWebb, @JWSTObserver
Facebook: nasawebb
YouTube: NASAWebbTelescope
Flickr: nasawebbtelescope
Instagram: nasawebb

Program Updates – Research

2022 Astrophysics Research Program Elements

ROSES-22

Supporting Research and Technology

- Astrophysics Research & Analysis (APRA) *
- Strategic Astrophysics Technology (SAT) *
- Theoretical and Computational Astrophysics Networks (TCAN) *
- Roman Technology Fellowships (RTF)
- Precursor Science Investigations for Astro2020 DS */** New

Data Analysis

- Astrophysics Data Analysis (ADAP) **
- GO/GI programs for Fermi, Swift, NuSTAR, TESS, NICER **

Mission Science and Instrumentation

- Astrophysics Pioneers (suborbital science investigations) *
- Suborbital payloads solicited through APRA *
- LISA Preparatory Science *
- Roman Research and Support Opportunities New
- XRISM Guest Scientist ** New
- UltraSat Participating Scientist ** New

Cross Divisional

- Exoplanets Research Program (XRP) **
- Topical Workshops, Symposia and Conferences (TWSC)
- Citizen Science Seed Funding Program
- Graduate Student Research Awards (FINESST)

Solicited Separately

- GO/GI/Archive/Theory programs for Hubble, Chandra, SOFIA, Webb **
- NASA Hubble Fellowship Program (NHFP)
- NASA Postdoctoral Program (NPP)
- Support for XMM-Newton U.S. PIs selected by ESA

Not solicited in ROSES-22

- Astrophysics Theory Program (ATP), every other year
- Astrophysics Explorers U.S. PIs (APEX USPI) is no longer solicited separately, now part of Astrophysics Research & Analysis (APRA)

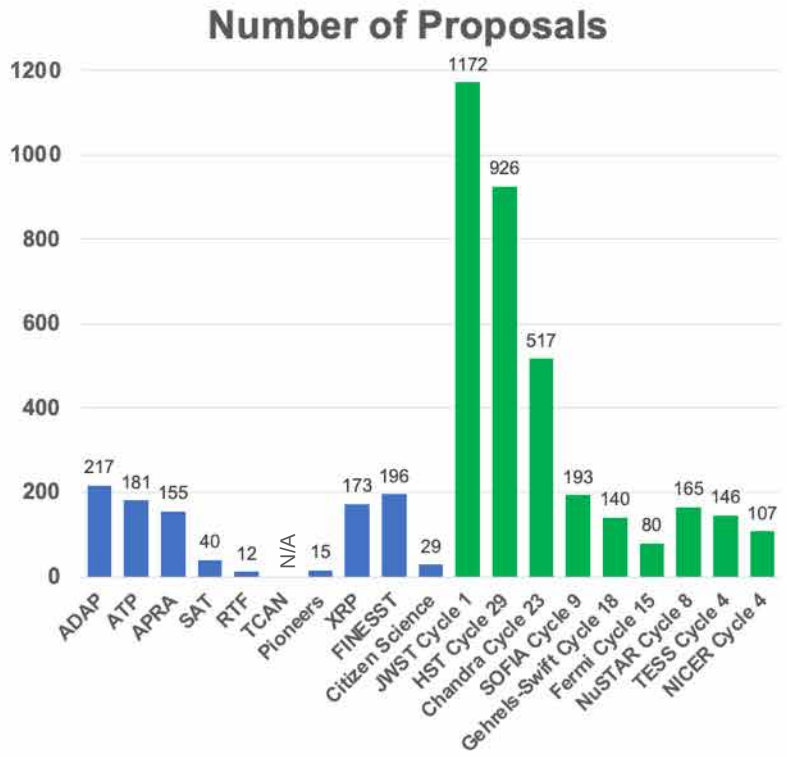
Notice:

* Proposals will require an inclusion plan for creating and sustaining a positive and inclusive working environment. Stay tuned for future announcement

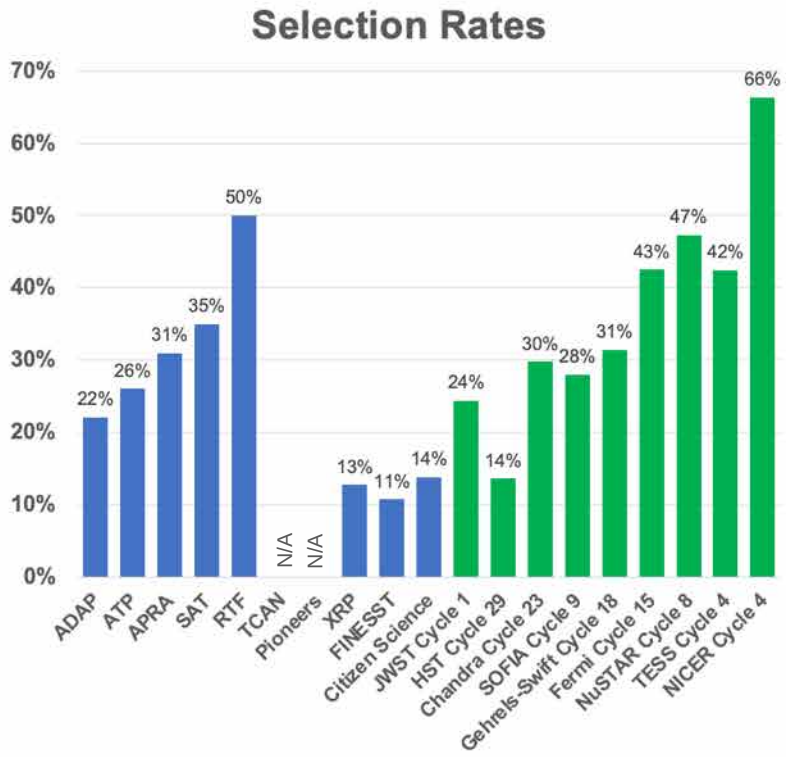
** Proposals evaluated using dual-anonymous peer reviews

Astrophysics R&A Selection Rates

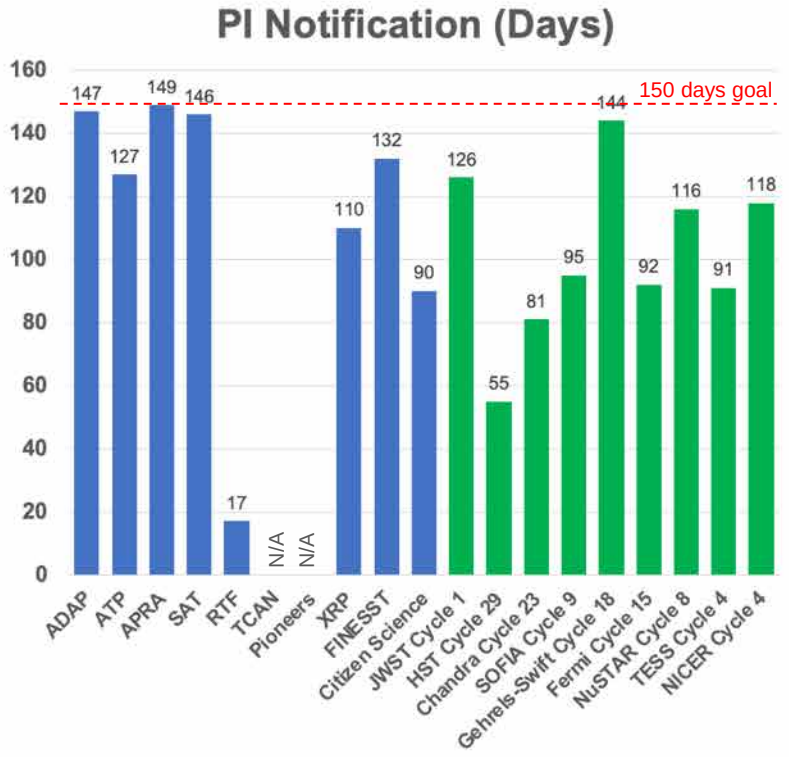
June 2021-2022



R&A: 1,018 proposals
GO/GI: 3,446 proposals
Total: 4,464 proposals



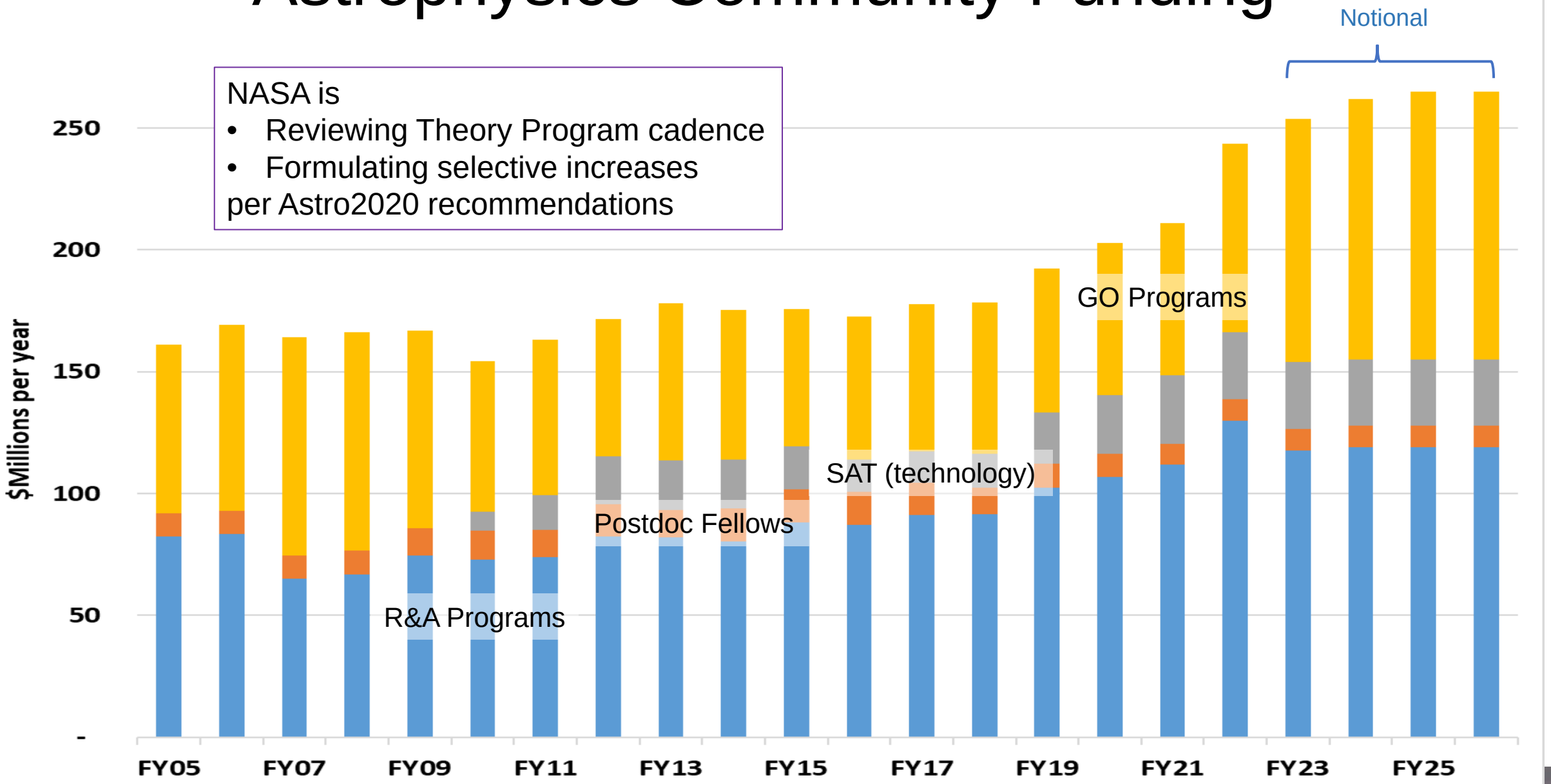
R&A: 20%
GO/GI: 27%
Average: 25%



80% of PI notification:
R&A: 147 days
GO/GI: 122 days

* Only programs with selections made and PIs notified

Astrophysics Community Funding



Nancy Grace Roman Technology Fellows Class of 2021

Brandon Chalifoux – U. Arizona – *X-ray telescope mirrors*

Jake Connors – NIST – *TES for far-IR astronomy*

Sona Hosseini – JPL – *Miniature UV spatial spectrometer*

Christopher Mendillo – U. Mass Lowell – *Exoplanet balloons*

Jonathan Pober – Brown U. – *Neutral hydrogen cosmology*

Paul Szypryt – U. Colorado – *TES for near-IR astronomy*

2022 NHFP Fellows

How does the universe work?
Einstein Fellows

How did we get here?
Hubble Fellows

Are we alone?
Sagan Fellows

NASA Hubble Fellowship Program

NASA Hubble Fellowship Program Review

The NASA Hubble Fellowship Program (NHFP) supports outstanding postdoctoral scientists pursuing independent research that contributes to NASA Astrophysics

- Merged the previously separate Einstein, Hubble, and Sagan Fellows programs in 2017

In the summer of 2021, NASA conducted the first programmatic review of its Hubble Fellowship Program since the original Hubble Fellowship Program was created over 30 years ago

Review focused on two main areas:

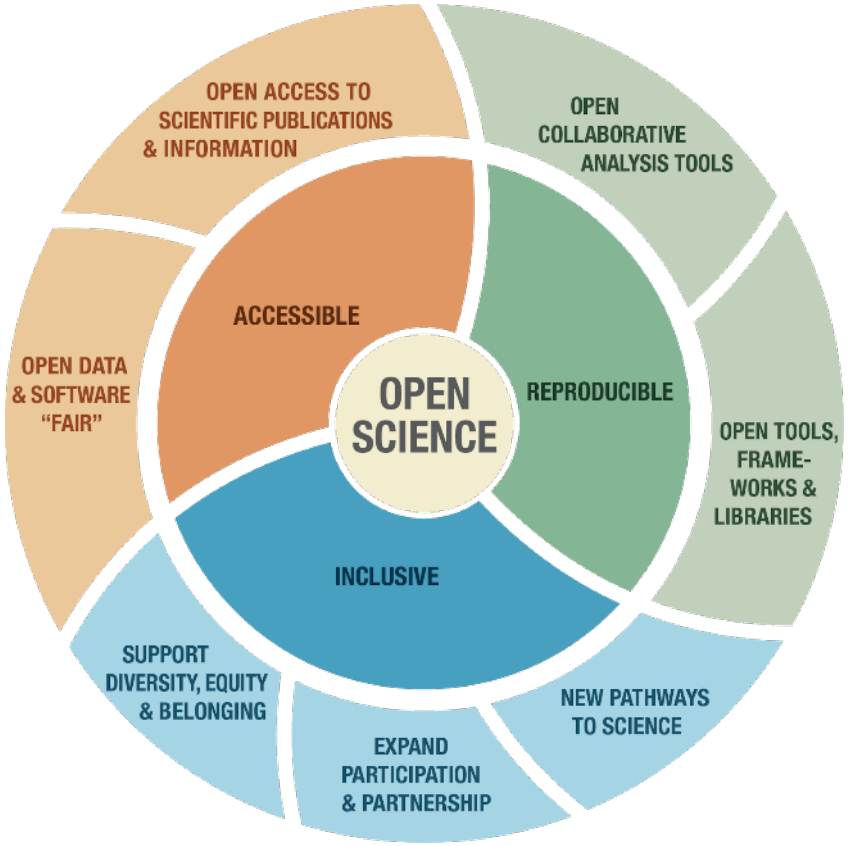
1. Success of the NHFP under its current structure
2. Diversity, equity, and inclusion of the program

Panel convened comprised of a diverse group of astrophysicists and experts in diversity, equity, inclusion, and accessibility

- Co-chaired by Rita Sambruna, Deputy Director of the Astrophysics Division at GSFC, and Nicolle Zellner, Program Scientist in NASA HQ's Planetary Science Division
- The panel's report is available at https://science.nasa.gov/astrophysics/documents

Towards an Improved Hubble Fellowship Program
Splinter Session
Wed 15 Jun, 10:00 am, Conf Rm 204

Open-Source Science Accomplishments



- CHORUS agreement signed by NASA STI providing automatic compliance with open access to all publications by NASA authors accepted by CHORUS partner journals. CHORUS will also provide metrics for compliance.
- SMD Policy Directive-41 is the first SMD-wide policy on data, software and information**.** RFI for SPD-41 update closed on March 4, informing revision of SPD-41a and language for ROSES-23.
- Astrophysics data policy, clarifying and providing specific guidance on data policy implementation specific to the division, is now in development with community input.
- Transform to Open Science Training (TOPST) element will solicit ROSES proposals to advance Open Science literacy in NASA's SMD enterprise through development of Open Science curriculum materials, capacity building with the implementation of summer schools, and virtual cohorts. release.

Science Information Policy Town Hall
Thu Jun 16, 1:00 pm, Sheraton Magnolia Rm

Questions to: https://arc.cnf.io/sessions/r8zx/#!/dashboard

Why Volunteer to Serve on a NASA Peer Review Panel?

Personal professional development:

- See how the whole review process works
- Learn what constitutes excellent proposals
- Network with your professional colleagues and NASA scientific staff

Institutional achievement:

- Improve at competing for NASA money
- Increase knowledge of NASA's research and technology programs

Investment in the future:

- Help select the most transformative science
- Ensure that all proposals receive a fair and competent review

All reviewers receive an honorarium from NASA

All reviews are virtual (with only a few case-by-case exceptions)

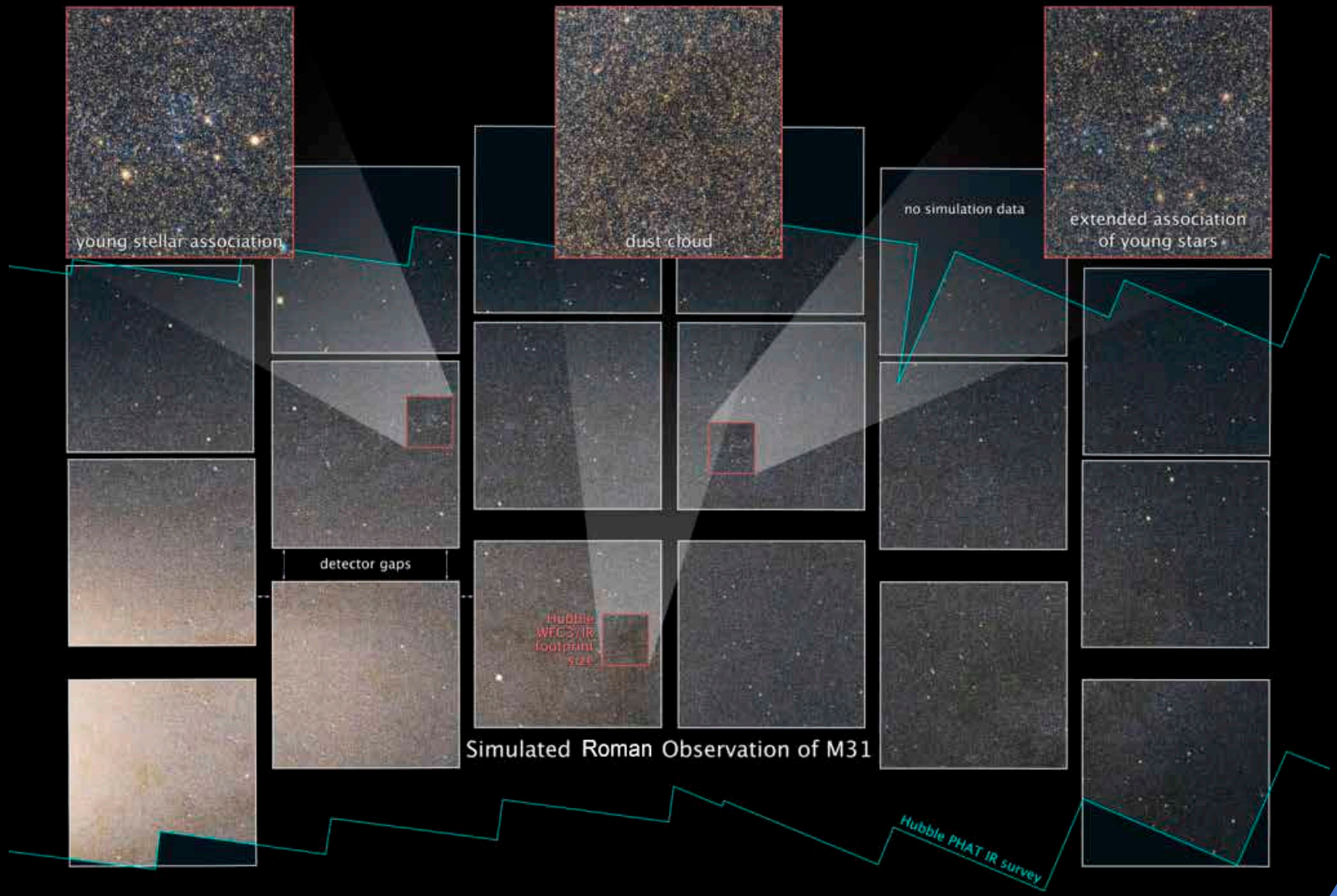
Sign up to be a panel reviewer:

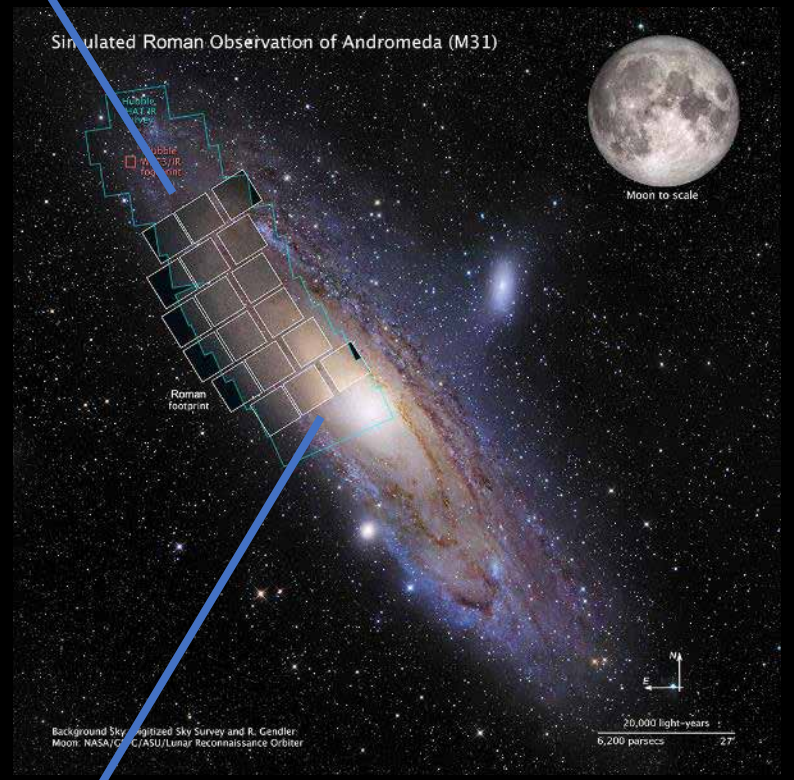
https://science.nasa.gov/researchers/volunteer-review-panels

or contact a NASA program officer (for contact info, see https://science.nasa.gov/researchers/sara/program-officers-list)

Program Update -- Missions

NANCY GRACE ROMAN SPACE TELESCOPE





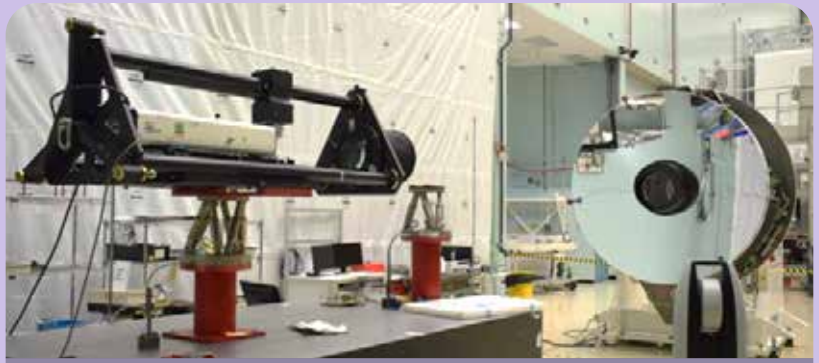
The Wide Field Instrument with its 300 Mpix infrared camera provides Hubble's resolution and sensitivity over 200× larger FOV – *flagship-level survey capability*

https://roman.gsfc.nasa.gov/

Optical Telescope Assembly Hardware

Tertiary Optical Mirror Assembly

Secondary Mirror Support Tube

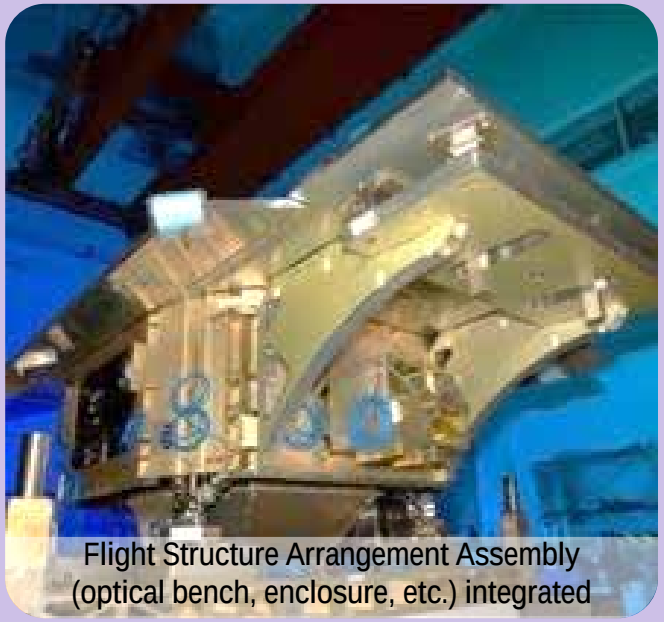


Primary Mirror horizontal optical test

Forward Metering Shell w/thermal control hardware installed

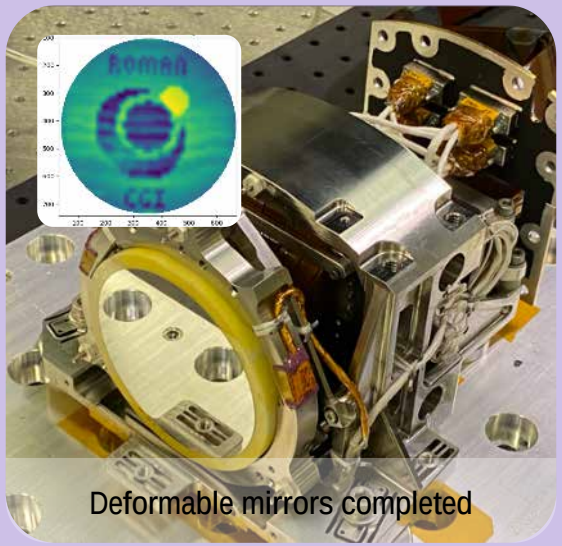
Wide Field Instrument Hardware

Flight Element Wheel Assembly completed; done thermal vac test

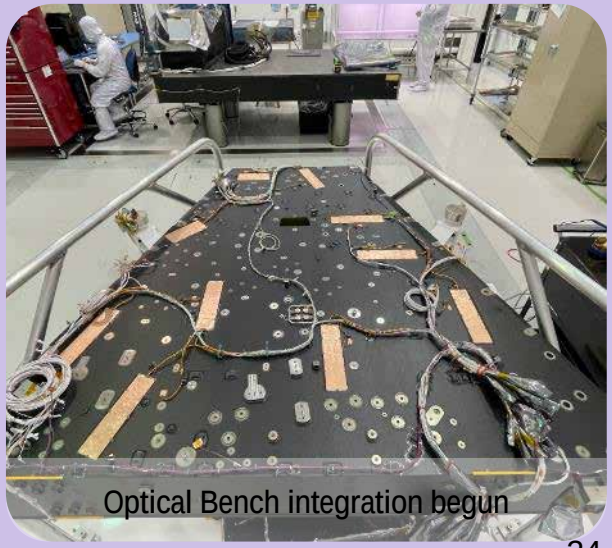


Flight Structure Arrangement Assembly (optical bench, enclosure, etc.) integrated

Coronagraph Instrument Technology Demonstration Hardware



Deformable mirrors completed



Optical Bench integration begun

Visit the NASA booth to play the console version of our new Roman video game!

Or go to:
https://roman.gsfc.nasa.gov/game

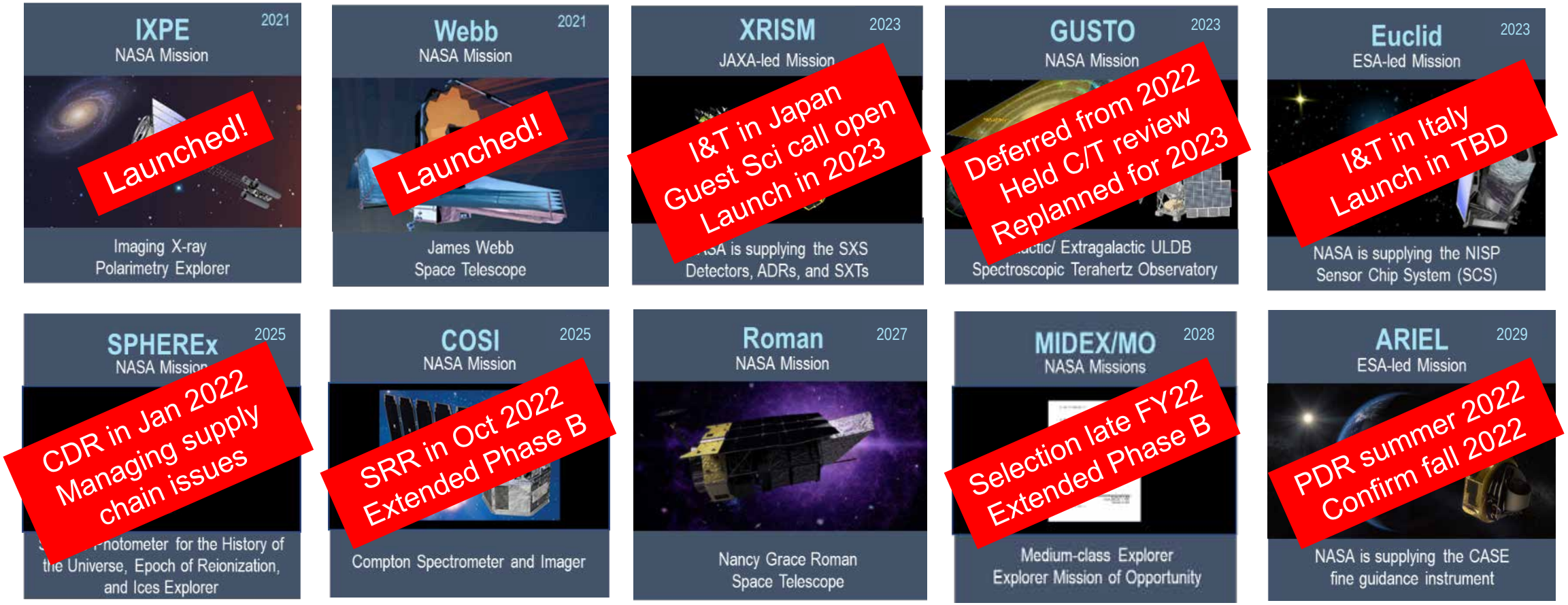
Roman Proposal Opportunities

- Roman will support Core Community Surveys and a variety of General Astrophysics surveys.
  - This is not a call for either kind of observing proposals.
  - Core community surveys will be defined by an open community process run by STScI and IPAC
- Nancy Grace Roman Space Telescope Research and Support Opportunities is being solicited as part of ROSES-2022. Draft posted; final call in ~month, proposals due ~90 days after.
- Open to small teams, large teams, or individuals. Seeking early career researchers; theorists, observers, data analysts. Opportunity for researchers at smaller institutions to participate on a major NASA mission.
- Proposal categories are:
  - Wide Field Instrument (WFI) Science – Science Teams to prepare for all types of WFI surveys
  - WFI Project Infrastructure Teams – Teams work with science centers to develop infrastructure in support of mission science goals
  - Coronagraph Community Participation Program – Investigators work with Coronagraph instrument team to plan and execute tech demo observations

Roman Solicitation Hyperwall
Wednesday 5:40pm NASA booth

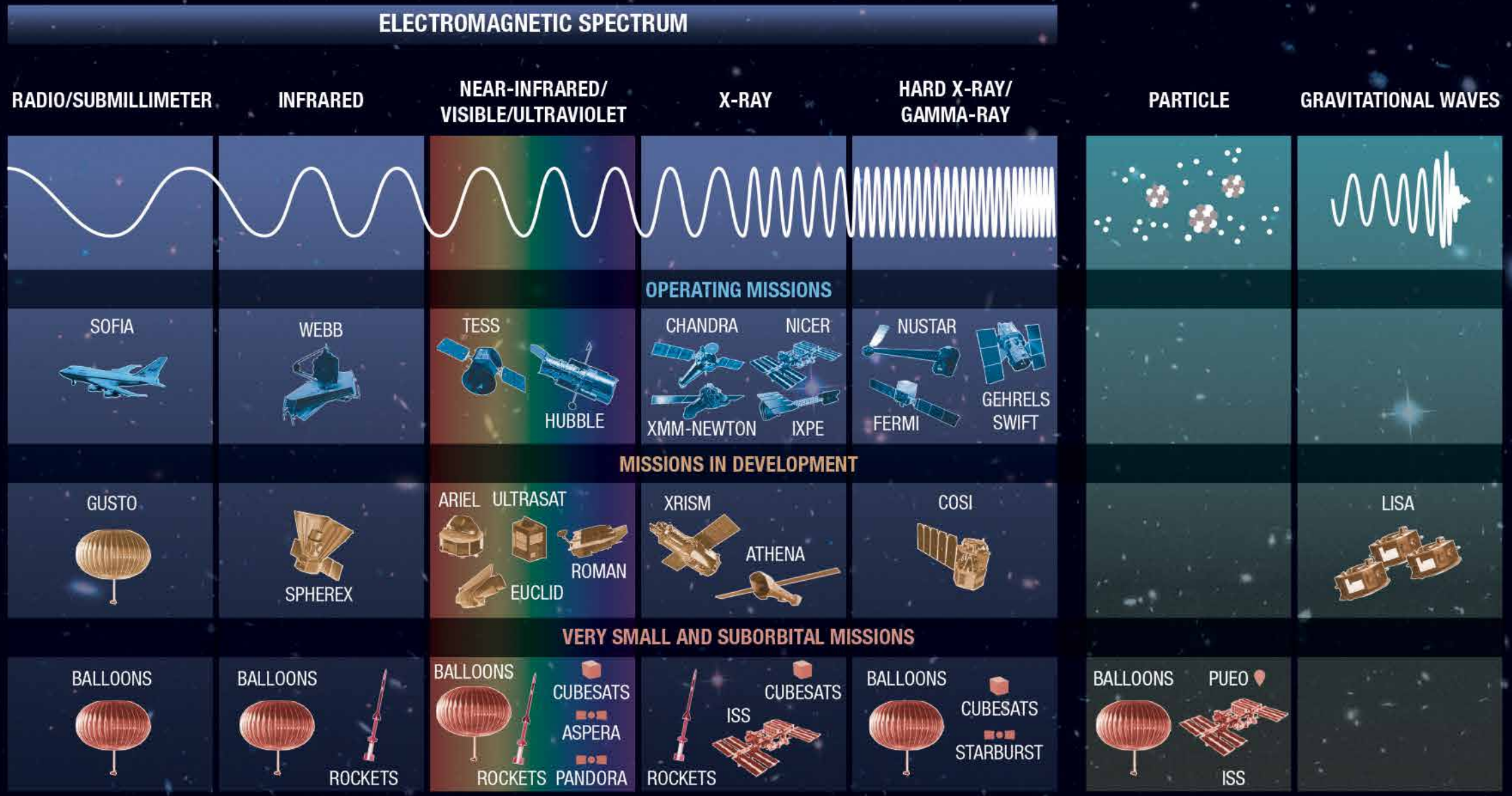
Roman Space Telescope Town Hall
Thursday 12:45pm Ballroom D

Astrophysics Missions in Development



Launch dates are current project working dates through XRISM; Agency Baseline Commitment launch date could be later

Does not include Pioneers or CubeSats



5 balloon payloads
2 sounding rocket payloads

2 Pioneers smallsats
6 balloon payloads
2 rocket payloads
3 cubesats

1 Pioneers smallsat
4 balloon payloads
4 sounding rocket payloads
2 cubesats 1 ISS experiment

1 Pioneers balloon
4 balloon payloads
1 ISS experiment

March 2022

Partner-led mission

Balloon Program


HPD Sunrise payload


Pointing tests of APD XL-Calibur payload

Campaigns cancelled due to COVID-19: Spring 2020 (New Zealand), Summer 2020 (Palestine TX), Fall 2020 (Ft Sumner NM), Winter 2020 (Antarctica), Spring 2021 (New Zealand), and Winter 2021 (Antarctica).

Successfully demonstrated Return to Flight using COVID-safe procedures with Spring and Fall **Ft Sumner NM** campaigns in 2021 launching 10 missions with 4 piggy-backs.

Wanaka, New Zealand super-pressure balloon campaign (Mar-May) launch attempt resulted in an abort due to an anomaly in non-NASA ground support equipment. For Spring 2023 two science missions planned for Wanaka.

Sweden Campaign is ongoing with two science payloads: Sunrise (heliophysics) and XL-Calibur (astrophysics) plus a 60 MCF qualification test flight. First Launch expected for Mid June.

The Fall **Fort Sumner, NM Campaign**, with launch window opening in Aug, has 9 missions plus 7 piggy-backs on the manifest.

The **Antarctica 2022/2023** long-duration balloon campaign has two science missions: SPIDER (astrophysics) and AESOP-lite (heliophysics) on the manifest. Due to delays in meeting payload milestones, the GUSTO mission slipped to the Antarctica 2023/2024 manifest.

Australia Sounding Rocket Campaign

XQC (X-ray Quantum Calorimeter Experiment)

PI – D McCammon / Univ. Wisconsin (ELA) **2022-06-26**

The purpose of this mission is to measure the spectrum of the diffuse X-ray emission from the interstellar medium over the energy range 0.07 to 1 keV.

SISTINE (Sub-orbital Imaging Spectrograph for Transition Region Irradiance from Nearby Exoplanet Host Stars)

PI - K. France / Univ. Colorado (ELA) **2022-07-04**

Measurements UV spectra of M and K type dwarf stars. Goals assist in identification and characterization of nearby habitable exoplanets and advance TRL for future missions, such as LUVOIR.

DEUCE (Dual-channel Extreme Ultraviolet Continuum Experiment)

PI – I. Fleming / Univ. of Colorado (ELA) **2022-07-12**

Technology development for future UV missions, physics of re-ionization from B stars at extreme UV.

Equatorial Launch Australia (ELA) is a commercial launch site near Arnhem, Northern Territory Launches planned for Jun/Jul 2022.

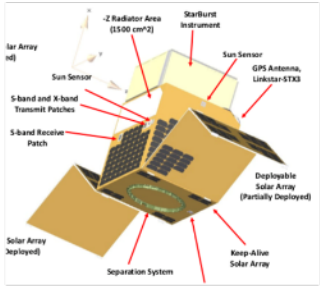
Images from the RSPO Site set-up travel in Oct 2021.

Astrophysics Pioneers

- A new class of small missions solicited annually in ROSES. Includes SmallSats, CubeSats >6U, major balloon payloads, modest ISS attached payloads, and cis-lunar payloads (via CLPS); $20M maximum PI cost cap
- Fills in the gap between existing ROSES investigations (<$10M for APRA) and existing Explorers MO investigations (~$35M for SmallSats)

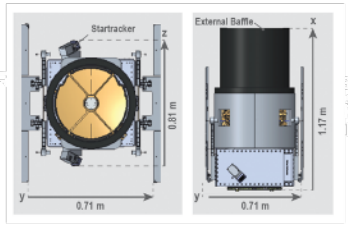
Astrophysics Pioneers – Cycle 1 Selections

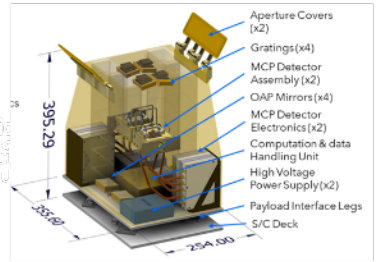
PUEO: A Long-duration Balloon-borne Instrument for Particle Astrophysics at the Highest Energies (PI Abigail Vieregg, U. Chicago)
APPROVED for DEVELOPMENT



StarBurst: Gamma-ray ASM, Simultaneous detection of NS/NS mergers with LIGO (PI Daniel Kocevski, NASA MSFC)
APPROVED for DEVELOPMENT

Pandora: Multiwavelength Characterization of Exoplanets and their Host Stars (PI Elisa Quintana, NASA GSFC)
APPROVED for DEVELOPMENT





Aspera: IGM Inflow/outflow from galaxies via OVI 10^5K emission line imaging (PI Carlos Vargas, U. Arizona)
APPROVED for DEVELOPMENT

- ROSES-2020, 24 Proposals, 4 selected, all 4 passed gate review!
- ROSES-2021, 18 proposals received, review completed, selections soon
- ROSES-2022 proposals due March 16, 2023

Astrophysics Missions in Operations

Hubble 4/90
NASA Strategic Mission

Hubble Space Telescope

Chandra 7/99
NASA Strategic Mission

Chandra X-ray Observatory

XMM-Newton 12/99
ESA-led Mission

X-ray Multi Mirror - Newton

Gehrels Swift 11/04
NASA MIDEX Mission

Neil Gehrels Swift Gamma-ray Burst Explorer

Fermi 6/08
NASA Strategic Mission

Fermi Gamma-ray Space Telescope

NuSTAR 6/12
NASA SMEX Mission

Nuclear Spectroscopic Telescope Array

SOFIA 5/14
NASA Strategic Mission

Stratospheric Observatory for Infrared Astronomy

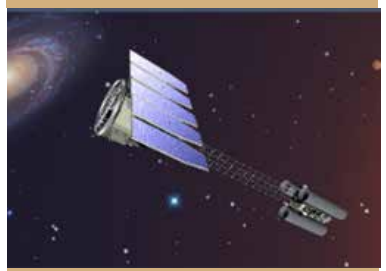
ISS-NICER 6/17
NASA Explorers Miss. of Oppty

Neutron Star Interior Composition Explorer

TESS 4/18
NASA MIDEX Mission

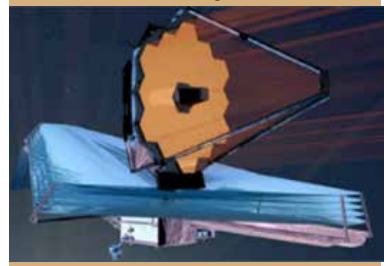
Transiting Exoplanet Survey Satellite

IXPE 12/21
NASA SMEX Mission



Imaging X-ray Polarimetry Explorer

Webb 12/21
NASA Strategic Mission



James Webb Space Telescope

Balloon Program
Four Campaigns per Year

Managed by the Astrophysics Division

Imaging X-ray Polarimetry Explorer (IXPE)

Launched Dec 9

Boom deployed Dec 15

Science started Jan 10

Special Session on IXPE Initial Results
Tuesday 14 June, 8:30 am in Con Rm 101

Positive, statistically significant detections of polarization!

- CAS-A, 4U 0142, Mrk 501, Crab and Vela pulsar wind nebulae, Her X-1
- Discovery papers to Nature, Science, and the Astrophysical Journal are in progress and/or have been submitted

SOFIA

SOFIA Town Hall
June 15 at 6:30pm in Ballroom C

The Decadal Survey recommended NASA end the SOFIA mission after its current mission extension.

On April 28, NASA and DLR (the German Space Agency) jointly announced that they will conclude the SOFIA mission, after a successful eight years of science.

SOFIA will finish out its scheduled operations for the 2022 fiscal year, followed by an orderly shutdown.

During FY 2022, SOFIA will carry out a full program of science operations including multiple deployments to the southern hemisphere.

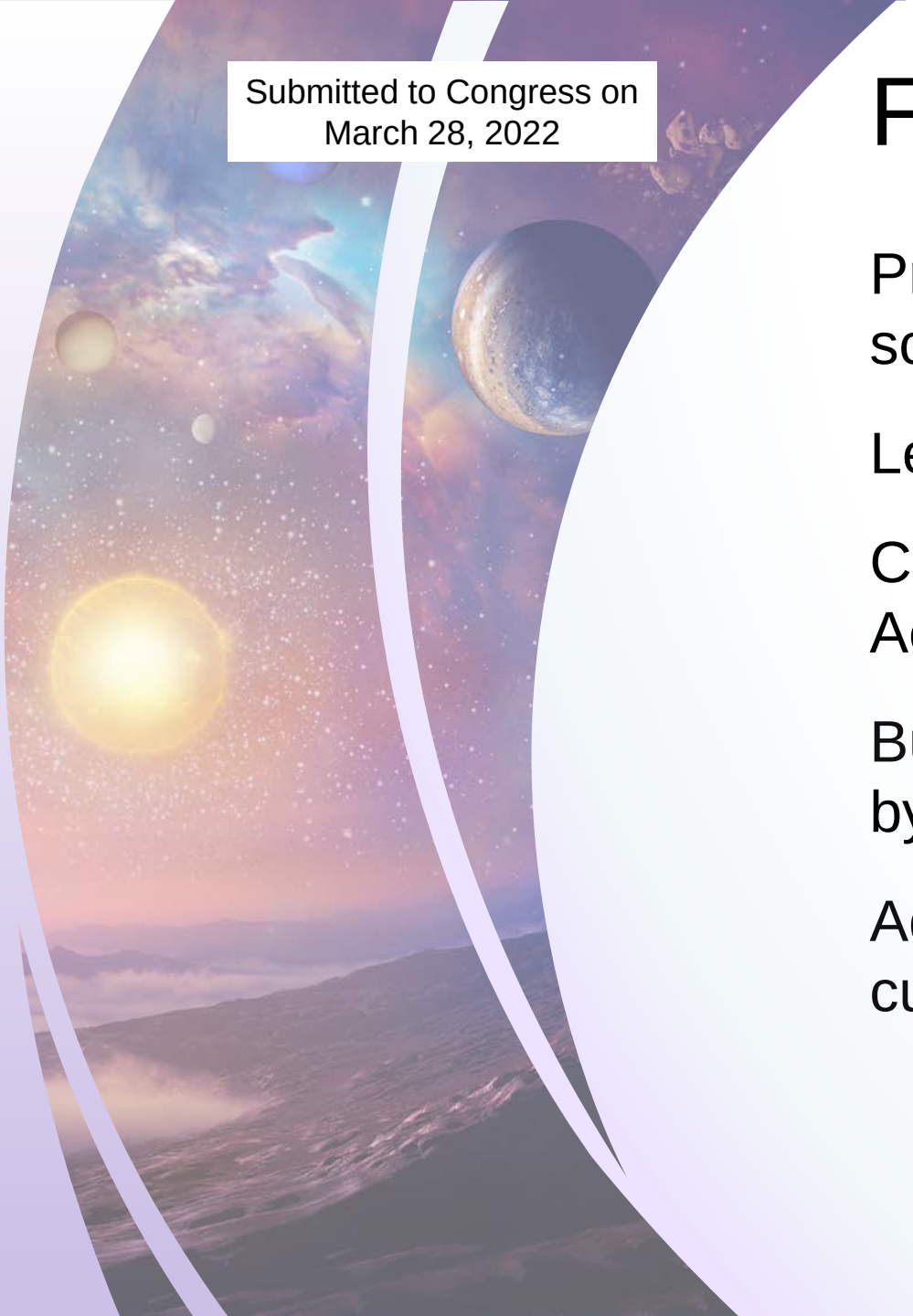
During FY 2022, SOFIA will prioritize completing legacy surveys to establish an enduring archive of data for community use. Over 80% of Cycle 9 selected investigations will be completed; some selected proposals will not get conducted due to scheduling conflicts.

Airborne Astronomy Ambassadors (AAA), the SOFIA teachers-in-flight program, will continue to operate during FY 2022.

Proposals for Cycle 10 (FY 2023) were received earlier this year; no selections will be made from the Cycle 10 proposals.

The SOFIA project has been directed to develop a project closeout plan for FY 2023.

FY23 President's Budget Request



Submitted to Congress on March 28, 2022

FY23 SMD Budget Priorities

Promote US leadership in Earth system science and addressing the climate crisis

Lead Artemis Science

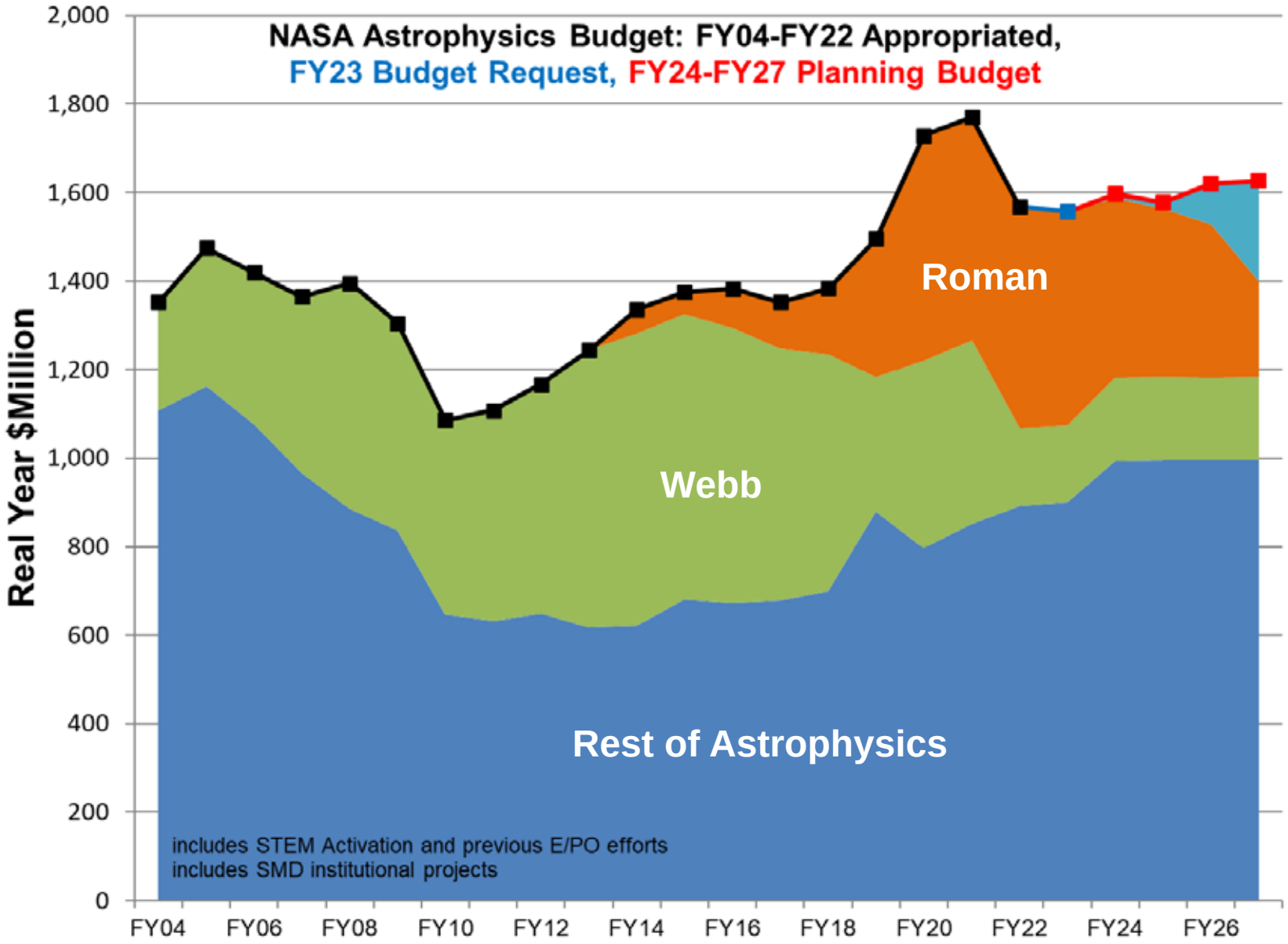
Champion Inclusion, Diversity, Equity and Accessibility

Build a balanced and innovative program driven by the highest national priorities

Advance open science for all by leveraging cutting edge data science techniques

This Year

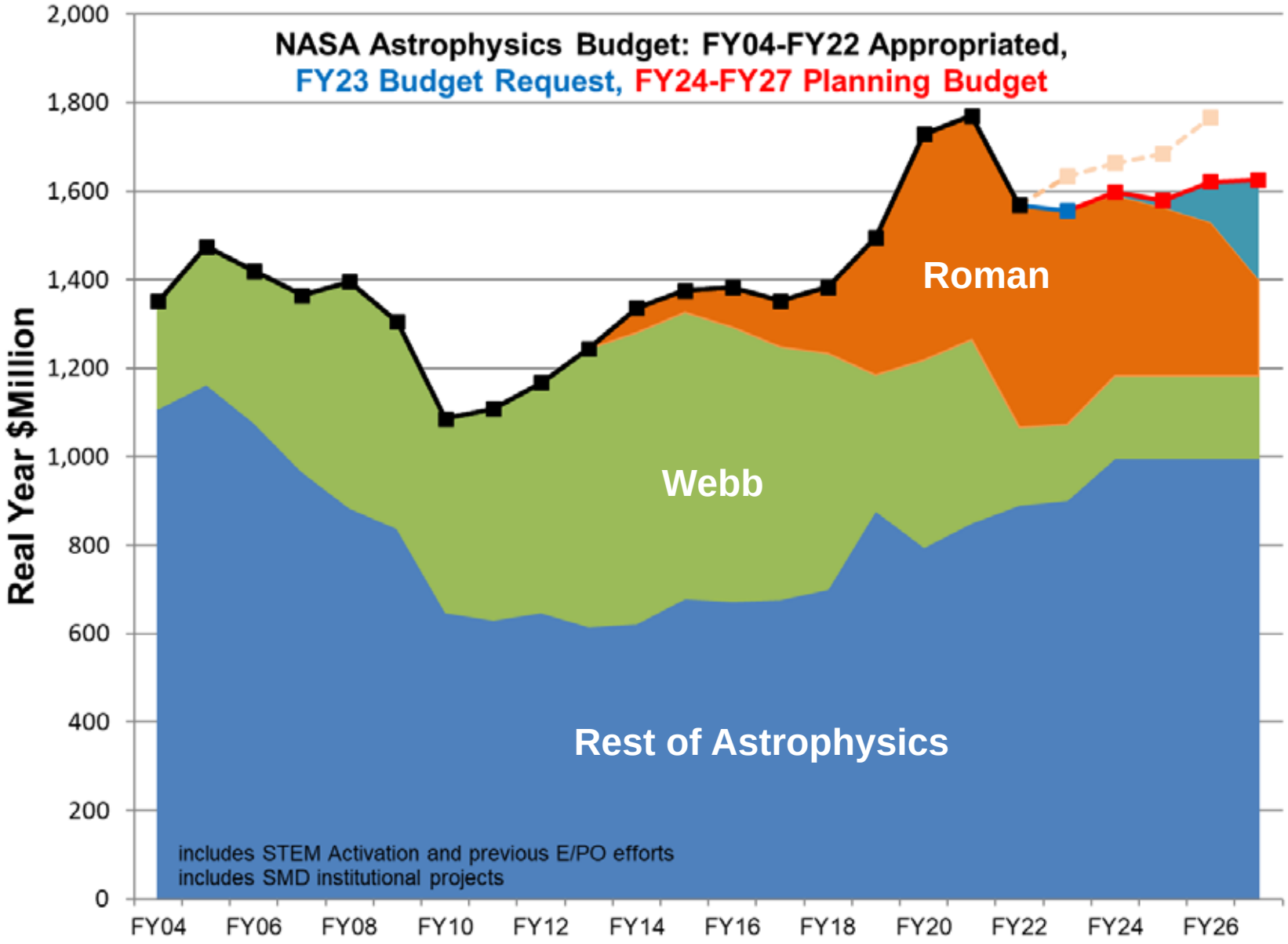
FY23 President's Budget Request



Decadal Survey Wedge

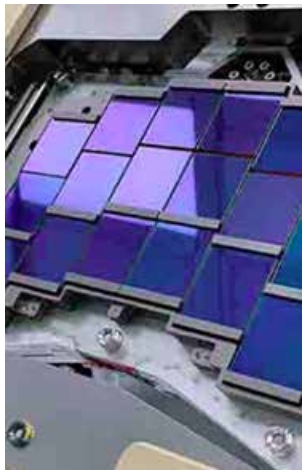
This Year

FY23 President's Budget Request



Decadal Survey Wedge

Astrophysics Budget Features



Increased funding planned compared to a year ago

- Additional Webb General Observer funding
- Roman adjusted for COVID impacts
- Additional Pioneer selections & increased Pioneers cadence
- Support Great Observatory Precursor Science and Time Domain Astrophysics infrastructure systems for Decadal Survey
- Includes bridge partnerships focused on minority serving institutions and Decadal Survey recommendations for increased inclusion
- SOFIA close out in FY23 per Decadal Survey recommendation

Same funding planned compared to a year ago

- Healthy R&A program
- Development of Astrophysics Explorers GUSTO and SPHEREx
- Development of contributions for JAXA-, ISA-, and ESA-led missions XRISM, ULTRASAT, Euclid, Ariel, Athena, and LISA
- Funded operating missions per Senior Review

Decreased funding planned compared to a year ago

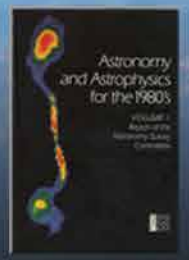
- Extended Phase B for COSI, delayed development for next MIDEX
- Compared to the FY 2022 Budget request, delays a future Astrophysics Probe mission; AO release delayed from January 2023
- Delayed implementation of Decadal Survey recommendations

Implementing the 2020 Decadal Survey

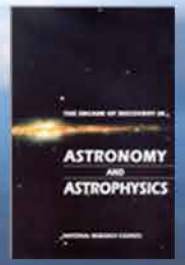
Astrophysics

Decadal Survey Missions

1972 Decadal Survey *Hubble*



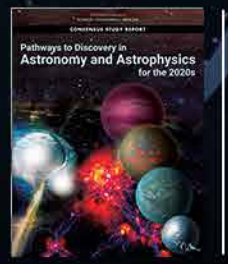
1982 Decadal Survey *Chandra*



1991 Decadal Survey *Spitzer*

2001 Decadal Survey *Webb*

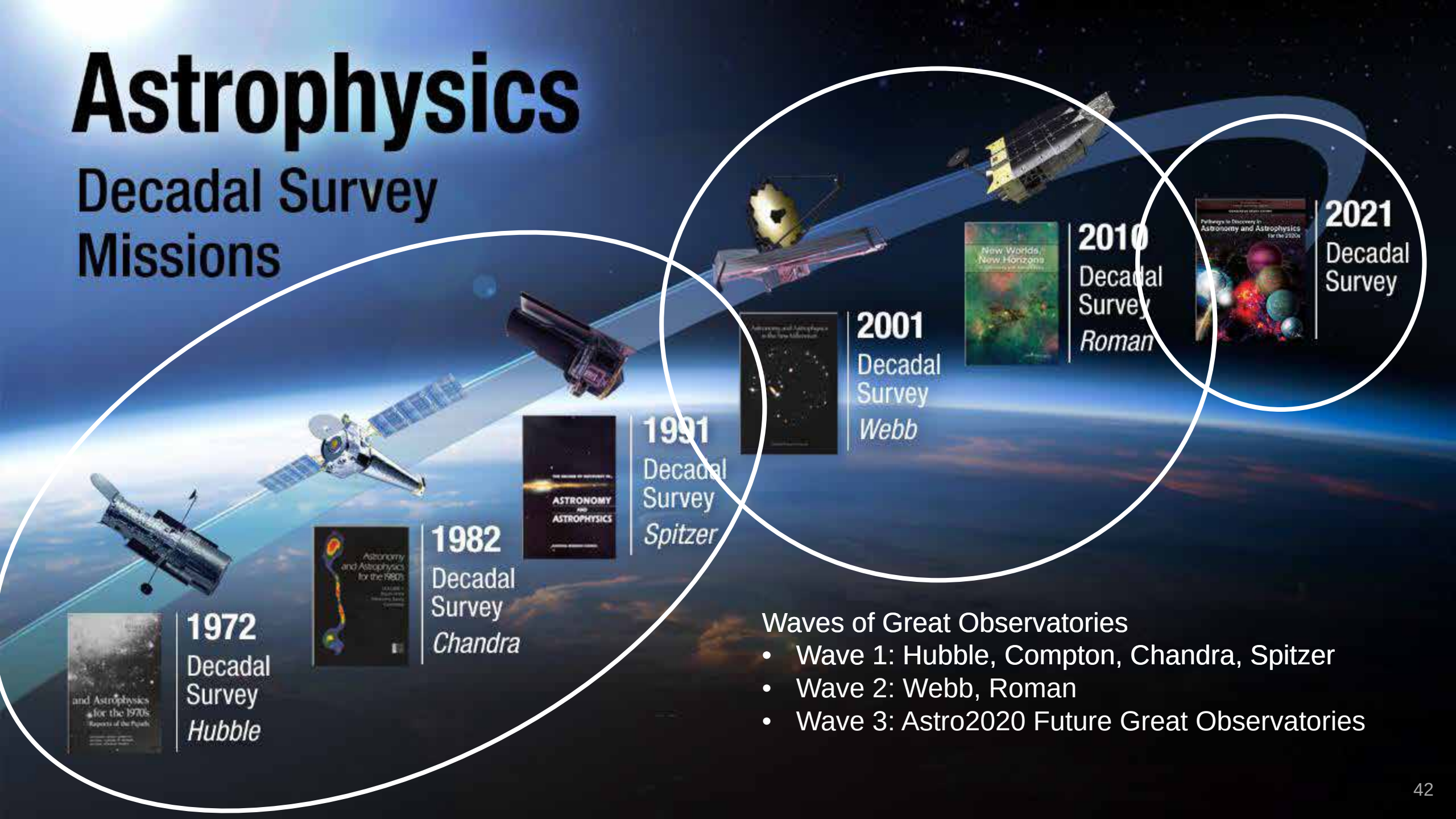
2010 Decadal Survey *Roman*



2021 Decadal Survey

We are bound by the budgets that we have

- First budget that is fully informed by the Decadal Survey will be the FY24 budget proposal, which will be formulated by NASA Astrophysics in Spring 2022 and submitted to Congress in February 2023



Waves of Great Observatories

- Wave 1: Hubble, Compton, Chandra, Spitzer
- Wave 2: Webb, Roman
- Wave 3: Astro2020 Future Great Observatories

Decadal Survey Implementation Update

Page	Recommendation	NASA Actions
3-22	IDEA workforce	SMD bridge program appropriated for FY22
3-23	Postdoc fellowships	Independent review conducted of N… Hubble Fellowship Program to improve inclusi…
3-29	Proposal demographics	National Academi… …uation for Assessing the Health… …SA Science Mission Di… …ommunities" underway
3-30	IDEA evaluation criteria	…required in 8 astrophysics ROSES elements
5-12	SOFIA	…IA will conclude its mission by September 30, 2022
6-8	R…	APAC task force approved at March APAC meeting
7-11	G… …tories program	Precursor science workshops in April and August 2022
7-19	Tim… domain program	Time domain workshop planned for August 2022
7-20	Astrophysics probes	AO announced for mid 2023
7-35	Roman science program review	CAA working group is conducting a non-advocate review

Additional initiatives are being considered for inclusion in the FY24 NASA budget request

Time Domain & Multi-Messenger Initiative

Operating Missions

- Hubble
- Chandra
- Gehrels Swift
- Fermi
- CALET (w/ JAXA)
- AMS (DOE mission)
- NICER
- TESS

Missions in Development

- BurstCube (cubesat)
- BlackCat (cubesat)
- PUEO (balloon payload)
- StarBurst (Pioneer)
- UltraSat (w/ ISA)
- COSI (SMEX)
- Roman

Future Missions under study or being proposed

- THESEUS (w/ ESA)
- Proposed CubeSat
- Proposed Pioneer
- Proposed Mission of Opportunity
- Proposed MIDEX
- Future Probe

Time Domain & Multi-Messenger Initiative

Actions are being developed to address Time Domain Astrophysics and Multi Messenger (TDAMM) recommendations of the 2020 Decadal Survey

- Operating NASA missions continue to make significant contributions to TDAMM and NASA expects future missions to pursue this science:
  - NASA is making investments in infrastructure – transient alerts, data archives, communications, software – which are essential to maximize scientific return; funding for these investments is included in the FY23 budget request.
  - Responding to transient astrophysical phenomena involves multiple ground- and space-based assets and NASA is studying efficiencies in how to deploy its fleet
  - Astro 2020 urges TDAMM be addressed across agencies and NASA is standing up interagency and international working groups to address this coordination
- TDAMM will be an initiative with extensive interagency and international cooperation, shaped using broad community input
  - Prioritizing the science NASA should address. Community workshop this 22-24 August 2022: https://pcos.gsfc.nasa.gov/TDAMM/
  - Partner-led TDAMM missions with NASA contributions
  - NASA missions with international partner contributions

Future Great Observatories

Large observatories are a critical component of NASA's astrophysics portfolio

- The Decadal Survey recommends a compelling, feasible, timely portfolio of future great observatories that is part of a balanced Astrophysics program

Today NASA's priority is ensuring mission success for Webb and Roman

- Webb completed telescope commissioning; science instrument commissioning is progressing well; preparations are underway for science to commence in July 2022.
- Roman is progressing well in Mission Phase C "Final Design and Fabrication" and is on track for a mid-2027 launch

Now is not the time to start a Future Great Observatory; now is the time to prepare

NASA will take a deliberate, multi-stage planning and strategy approach to the next large observatory mission

- Stage 1 – Begin the Decadal Survey recommended "Great Observatories Maturation Program". Focus on enabling science and technology; begin Stage 1 now
- Stage 2 – Conduct Analysis of Alternatives (AoA) and science / technology / architecture trades; begin Stage 2 in a few years (driven by planning and budget availability)
- Stage 3 – Pre-formulation and decision to start the next Great Observatory; begin after Stage 2 AoA complete (Decadal Survey estimates 6 years for Stages 2 and 3)

STAGE 1 ACTIVITIES

Science	Workshops - compile metrics and science gaps	Update ROSES Call	Determine efforts beyond ROSES	ROSES Selected	Science Gaps Identified for 3 Great Observatories	Begin Precursor Science Funded activities
				SCIENTIFIC ASSESSMENT →		
Science Evaluation	Stand up Team	Develop initial Metrics	Develop input parameters	Sensitivity study of key parameters	Iterate with SST and TST	Update sensitivity study with new parameters
				TECHNOLOGY DEVELOPMENT →		
Technology	Stand up Team	ID Tech Gaps	Develop high level Tech Dev plans	ID tech studies. Trades & study groups	ID long lead tech investments	Begin tech studies

Note: This is not a timeline; some activities within each lane occur in parallel
There is cross-communication and cross-participation between activities in different rows
ROSES call for presursor science investigations anticipated for January 2023

Next Steps for Stage 1

Community Participation via

Technology

- Update Gap lists: present at **June** AAS PAG meetings
- SAT proposals due **Dec 15**
- A TST will begin technology activities in CY22; numerous community Task Groups are expected to be stood up to help in CY23.
- Community technology workshop(s) in **CY 2023**

Great Observatories Mission and Technology Maturation Program (GOMAP)

Objectives

- GOMAP will co-develop and mature the science, mission architecture, and technologies for Astro2020's NASA flagships
- Engage stakeholders and leverage the entire multi-sector community: industry, academia, NASA centers, other agencies, and international partners
    - Support trade studies, technology development, integrated modelling, and other feedback via openly competed procurements
    - Host open, hybrid workshops with published outcomes
    - Majority (>80%) of funding will be competed
- Intentionally seek out, build upon, and leverage the IDEA community to enable an inclusive culture and broad participation by all as the missions evolve
    - Adopt affirmative codes of conduct
- Engage community groups in all mission phases for developing science requirements and priorities; thereafter, prevent science-scope creep
    - Continually engage new science community members as the activities evolve
- Communicate broadly to community for transparency and confidence in the process

Big Finish

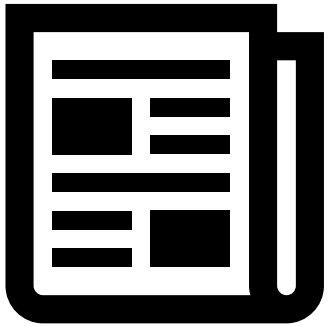
What's next for Astrophysics?

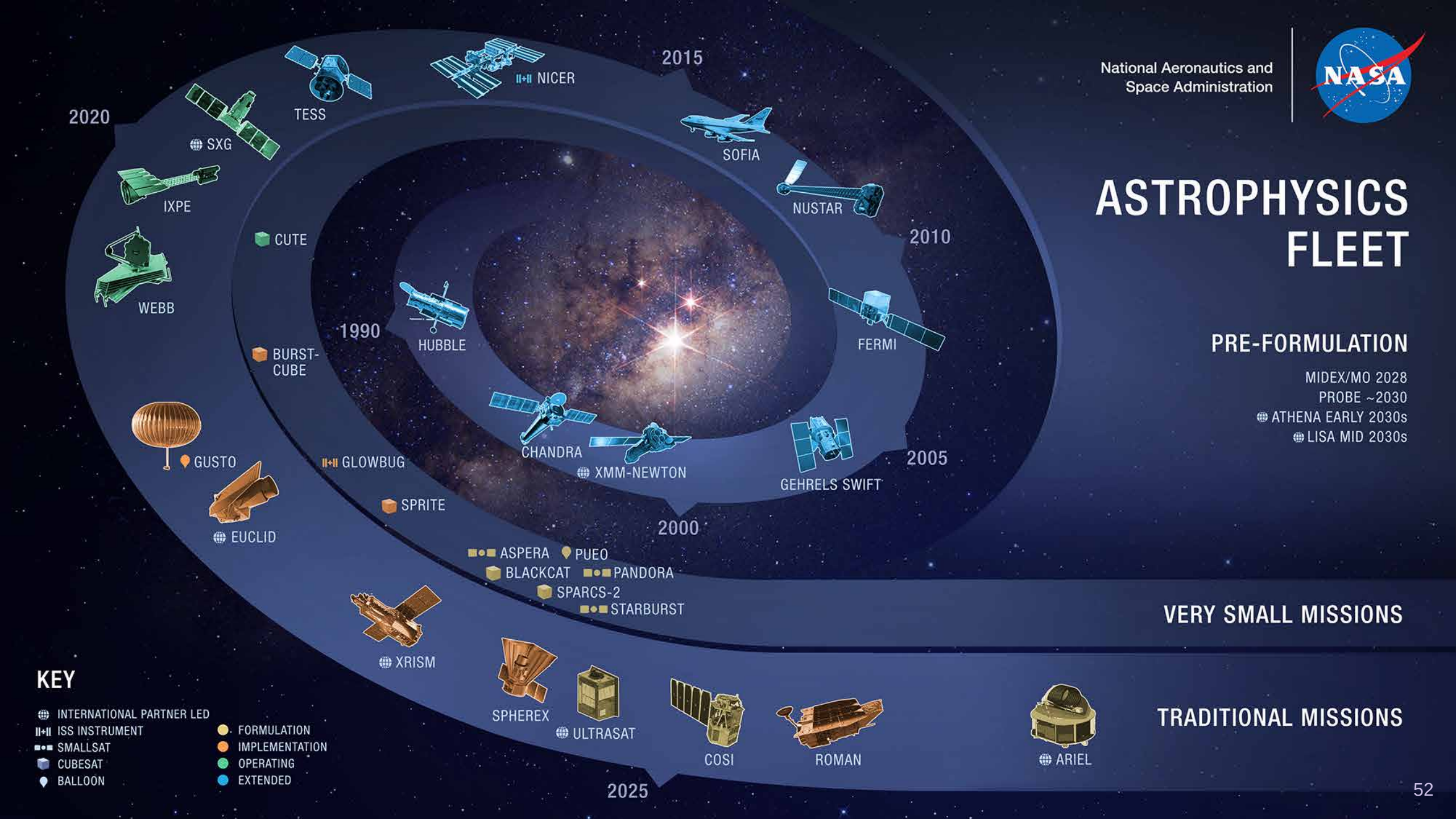
I will be stepping down this summer after more than 10 years as Director of Astrophysics (the best job at NASA)

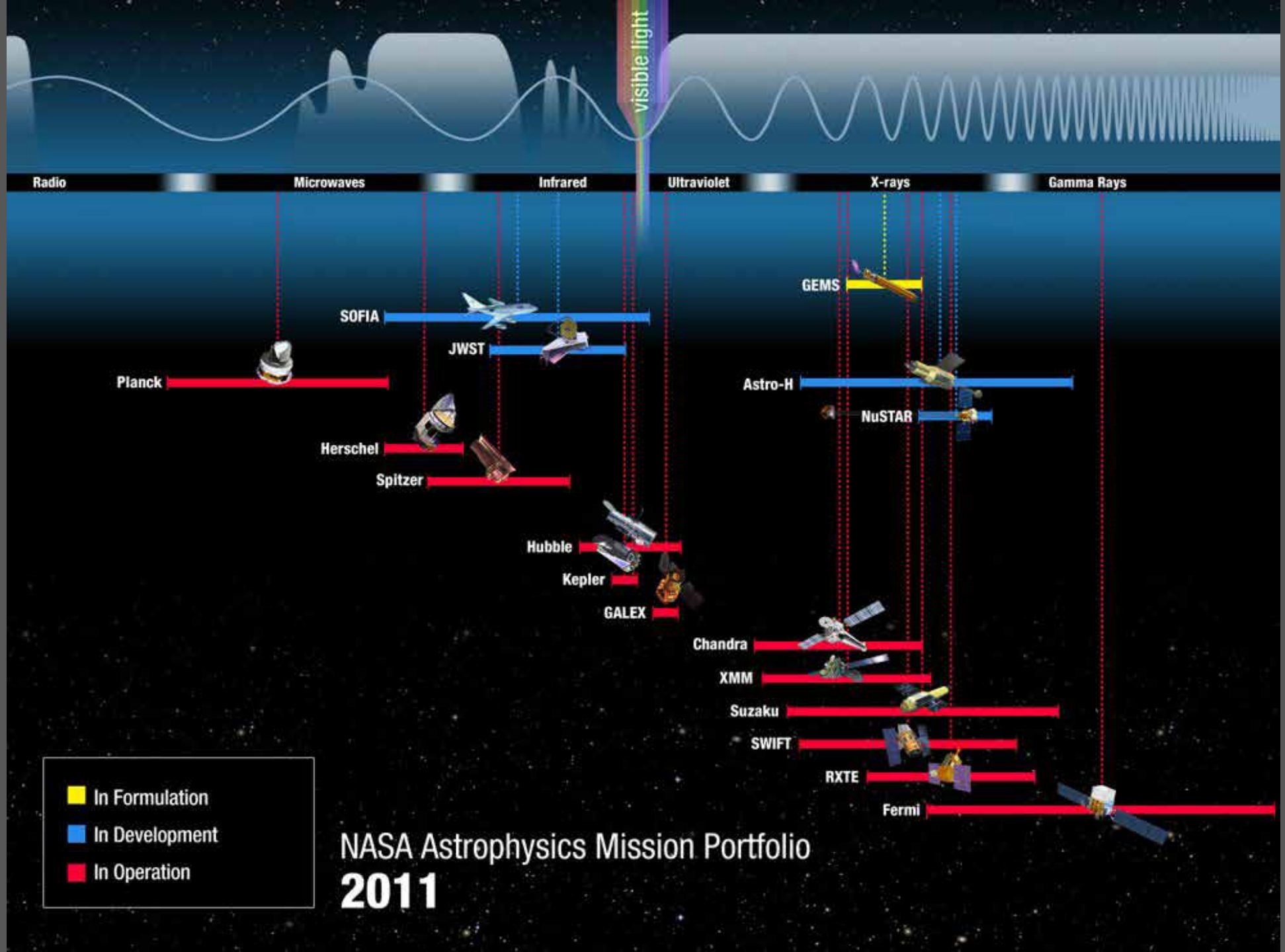
- This is my last Joint PAG plenary address
- Ten years makes me the longest serving Director of Astrophysics in the history of NASA
- Once the new Director of Astrophysics is in place, I will move to the SMD Front Office as Senior Advisor to the SMD Associate Administrator

Applications are in and the review is underway to select the person who will lead NASA astrophysics in the upcoming era of

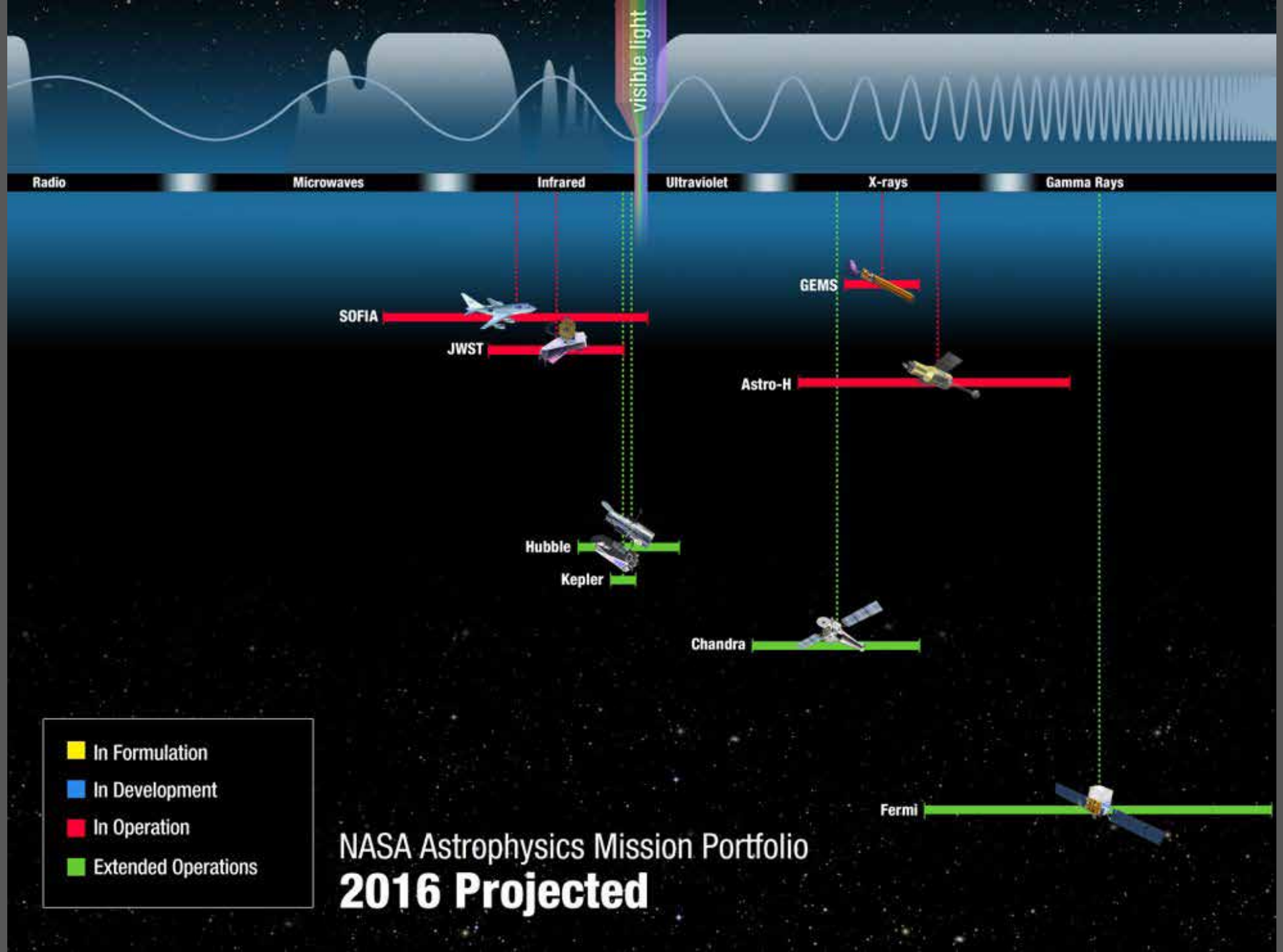
increasing inclusion and diversity,
growing R&A,
Webb science,
Roman development,
exoplanet characterization,
time domain and multi-messenger astrophysics,
dark energy and dark matter,
first Astrophysics Probe,
more Explorers / Pioneers / cubesats,
future great observatories,
and realizing Decadal Survey priorities

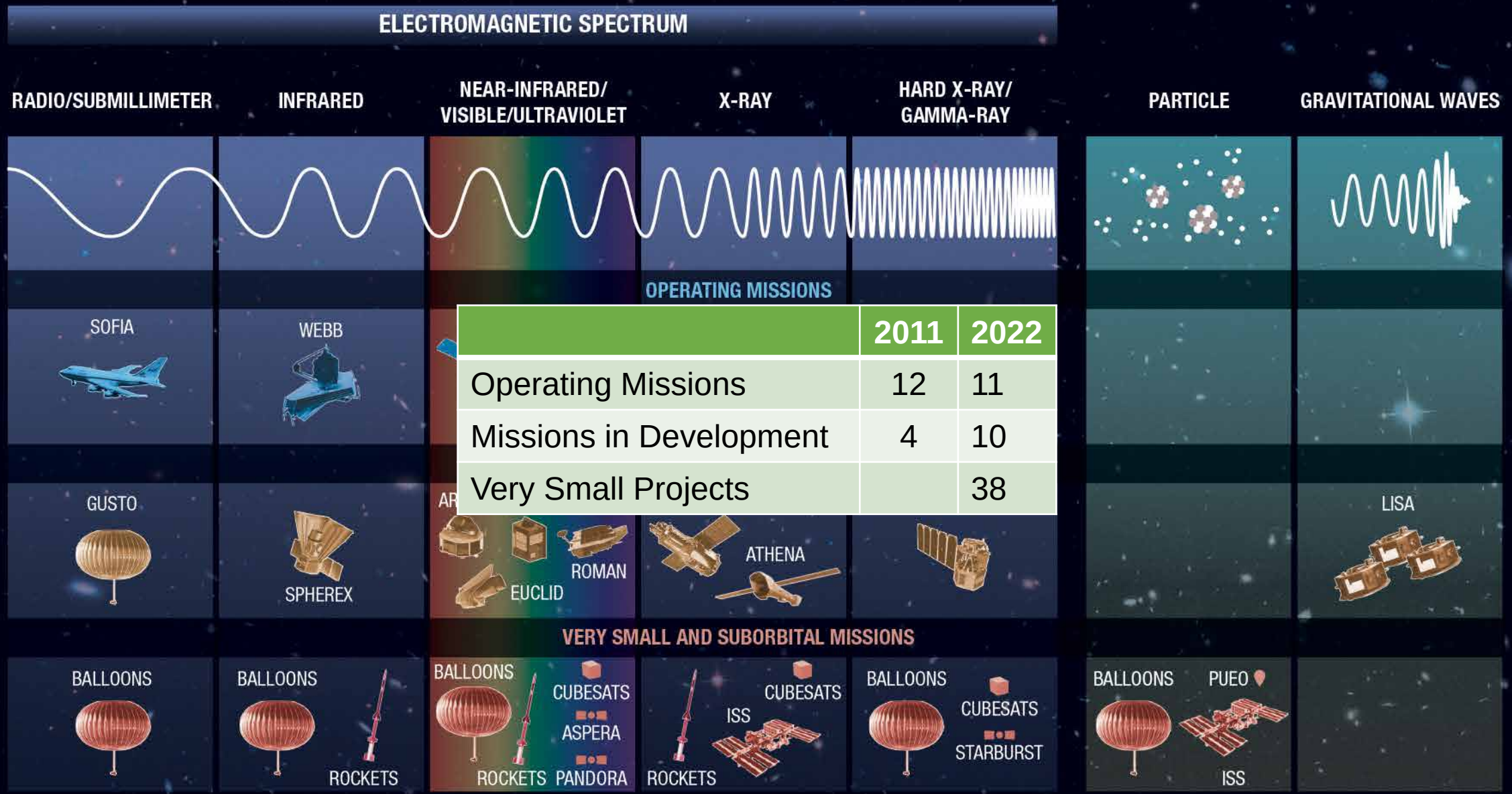



National Aeronautics and Space Administration
NASA
ASTROPHYSICS FLEET
2015
2020
2010
1990
2005
2000
2025
NICER
TESS
SXG
SOFIA
IXPE
NUSTAR
CUTE
WEBB
HUBBLE
FERMI
BURST-CUBE
CHANDRA
XMM-NEWTON
GEHRELS SWIFT
GUSTO
GLOWBUG
EUCLID
SPRITE
ASPERA
PUEO
BLACKCAT
PANDORA
SPARCS-2
STARBURST
XRISM
SPHEREX
ULTRASAT
COSI
ROMAN
ARIEL
PRE-FORMULATION
MIDEX/MO 2028
PROBE ~2030
ATHENA EARLY 2030s
LISA MID 2030s
VERY SMALL MISSIONS
TRADITIONAL MISSIONS
KEY
INTERNATIONAL PARTNER LED
ISS INSTRUMENT
SMALLSAT
CUBESAT
BALLOON
FORMULATION
IMPLEMENTATION
OPERATING
EXTENDED



November 2011


visible light
Radio
Microwaves
Infrared
Ultraviolet
X-rays
Gamma Rays
SOFIA
JWST
GEMS
Astro-H
Hubble
Kepler
Chandra
Fermi
In Formulation
In Development
In Operation
Extended Operations
NASA Astrophysics Mission Portfolio
2016 Projected



	2011	2022
Operating Missions	12	11
Missions in Development	4	10
Very Small Projects		38

5 balloon payloads
2 sounding rocket payloads

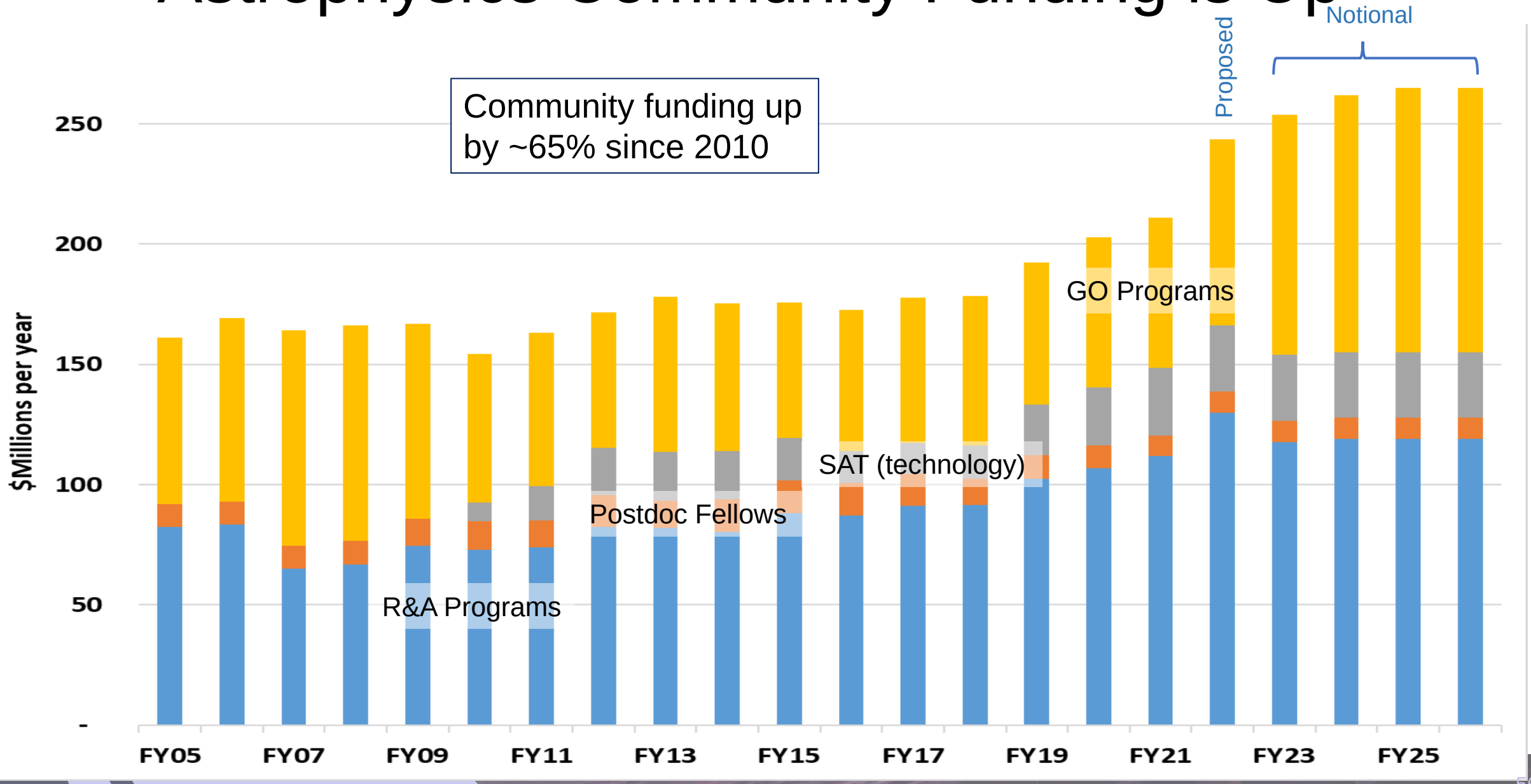
2 Pioneers smallsats
6 balloon payloads
2 rocket payloads
3 cubesats

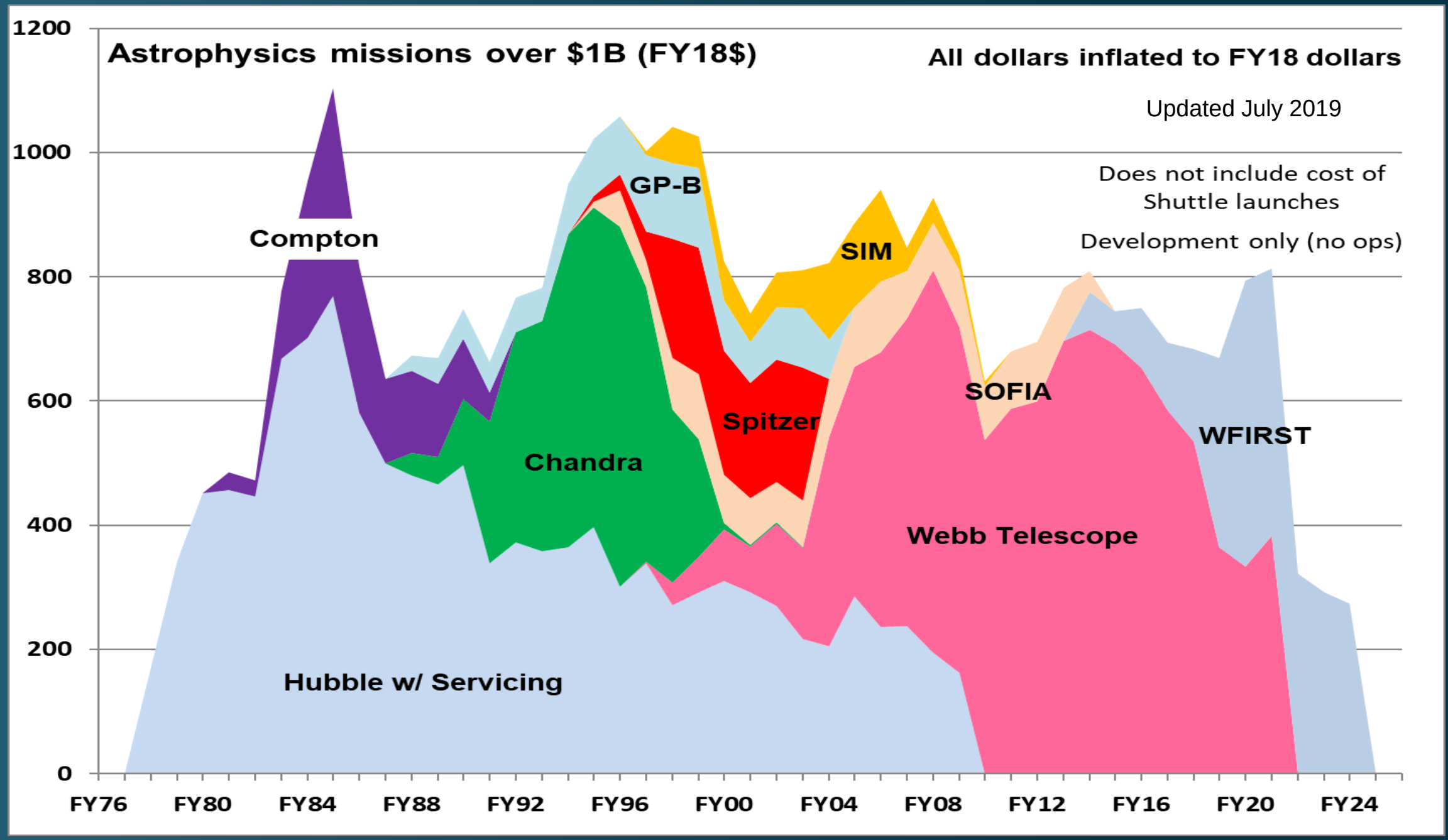
1 Pioneers smallsat
4 balloon payloads
4 sounding rocket payloads
2 cubesats 1 ISS experiment

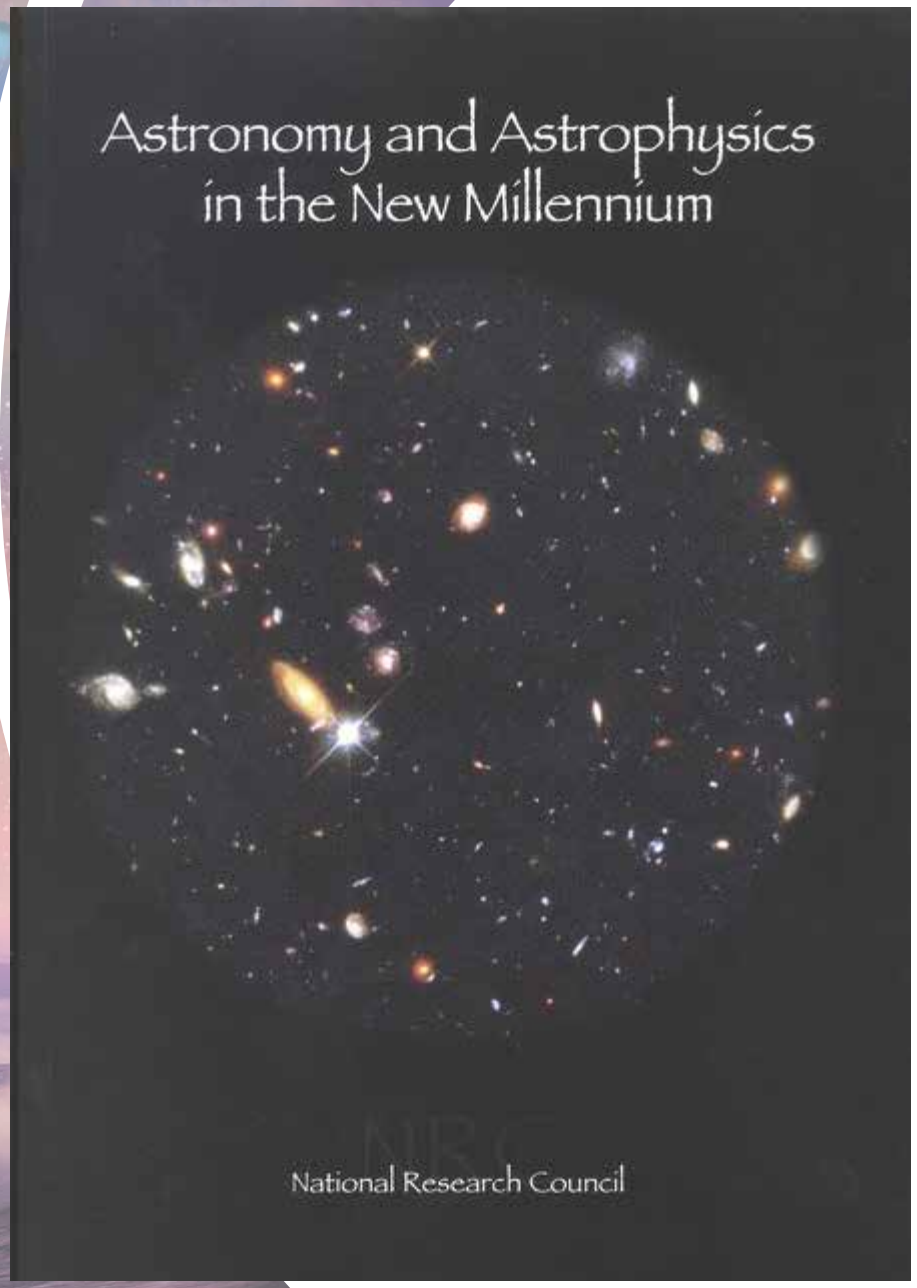
1 Pioneers balloon
4 balloon payloads
1 ISS experiment

March 2022

Astrophysics Community Funding is Up



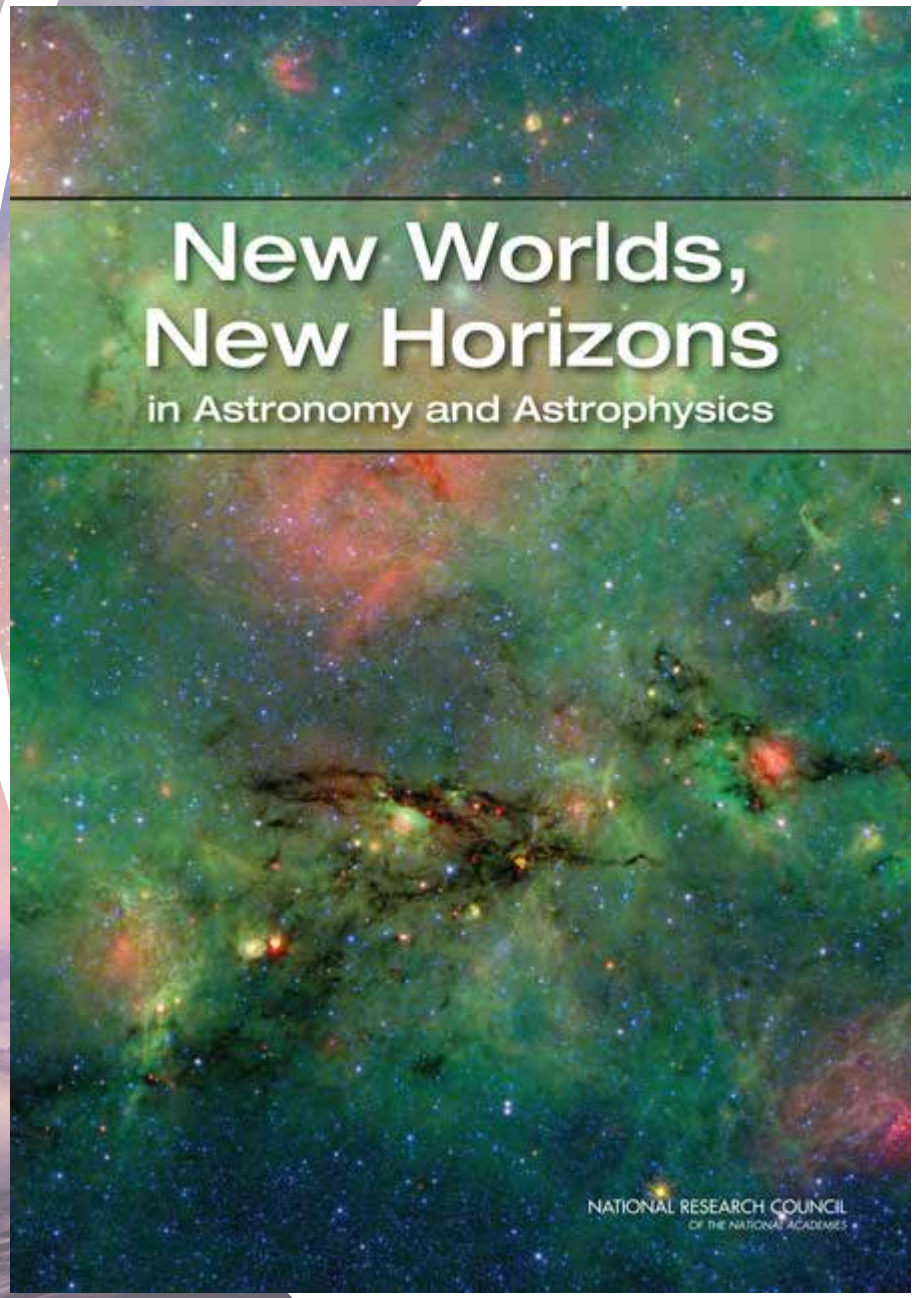

Astrophysics missions over $1B (FY18$)
All dollars inflated to FY18 dollars
Updated July 2019
Does not include cost of Shuttle launches
Development only (no ops)
Compton
GP-B
SIM
Chandra
Spitzer
SOFIA
WFIRST
Webb Telescope
Hubble w/ Servicing
1200
1000
800
600
400
200
0
FY76
FY80
FY84
FY88
FY92
FY96
FY00
FY04
FY08
FY12
FY16
FY20
FY24



Astro2000 realized

Finish the Program of Record
SIRTF (Spitzer), SOFIA, SIM (Gaia), MAP (WMAP), Planck
Large Initiatives
NGST (Webb) , Con-X (Athena), ~~TPF~~
Medium Initiatives
GLAST (Fermi), LISA, EXIST (MAXI), ~~ARISE~~

Legend:
In the current program
Subset of capabilities in the (international) current program
~~Not in the current program~~

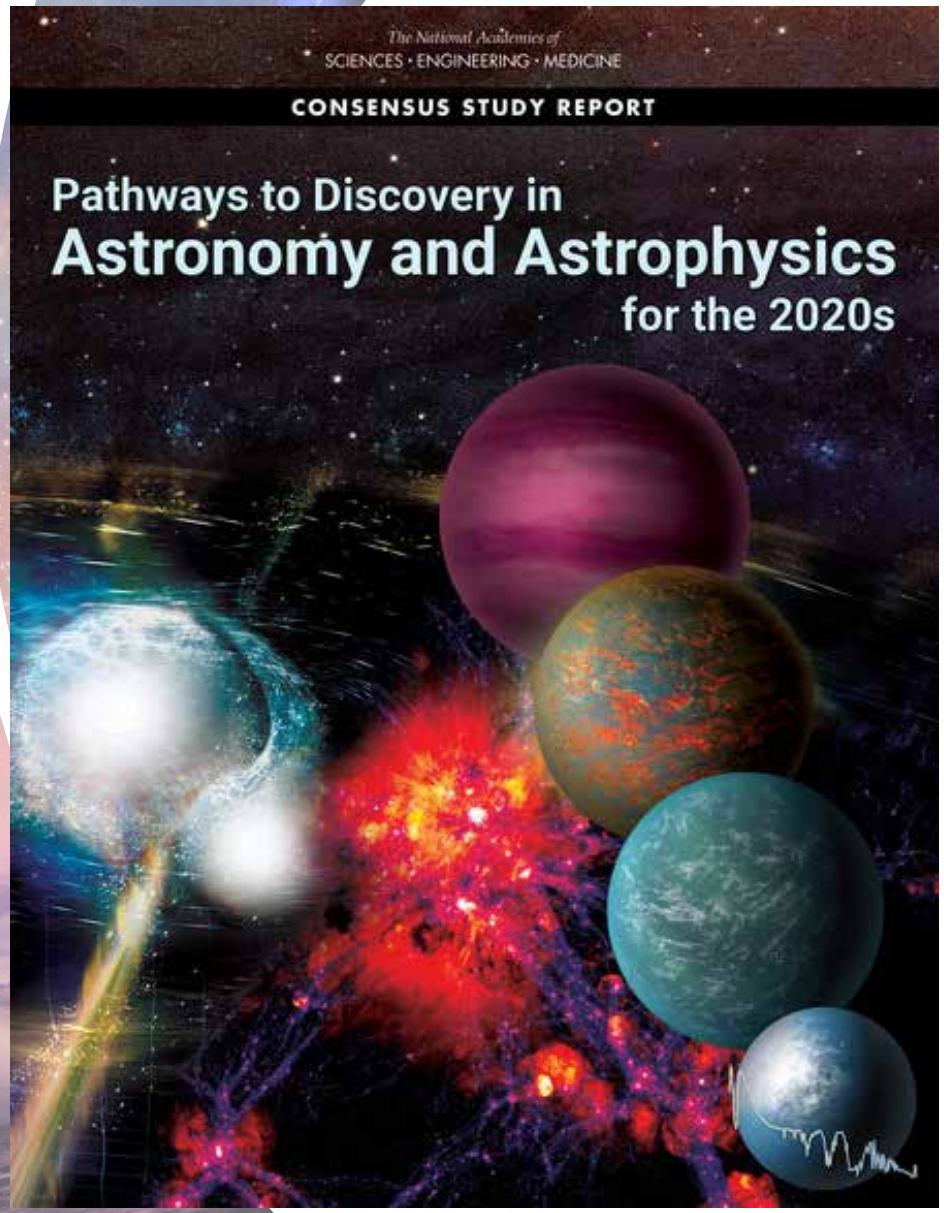


Astro2010

Program of Record [Figure 6.3]
Webb, Small Explorers (NuSTAR, GEMS (IXPE))
Large Initiatives
WFIRST (Roman), Explorers, LISA, IXO (Athena)
Medium Initiatives
Exoplanet Technology, CMB Technology

Legend:
In the current program
Subset of capabilities in the (international) current program
~~Not in the current program~~

Astro2020



Program of Record [Table 7.1]
End SOFIA, Explorers, Webb, Roman, Euclid, Athena, LISA
Enabling & Frontiers (Large) Initiatives
GOMAP, IR/O/UV Observatory, FIR & X-ray Observatories
Sustaining (Medium) Initiatives
TDAMM Follow-Up Program, Astrophysics Probe

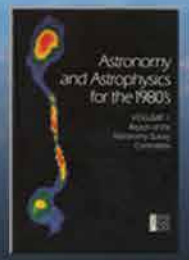
Decadal Survey Goal

- NASA's highest aspiration for the 2020 Decadal Survey is that it be ambitious
  - The important science questions require new and ambitious capabilities
  - Ambitious missions prioritized by previous Decadal Surveys have always led to paradigm shifting discoveries about the universe
- If you plan to a diminishing budget, you get a diminishing program.
  - Great visions inspire great budgets.

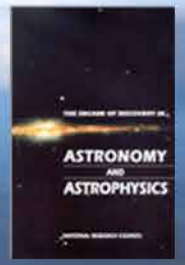
Astrophysics

Decadal Survey Missions

1972
Decadal Survey
Hubble



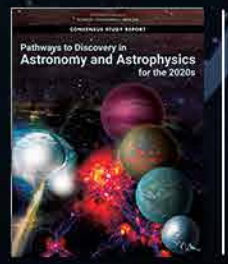
1982
Decadal Survey
Chandra



1991
Decadal Survey
Spitzer

2001
Decadal Survey
Webb

2010
Decadal Survey
Roman



2021
Decadal Survey

PH to Astrophysics Division (2012) – Create the Future

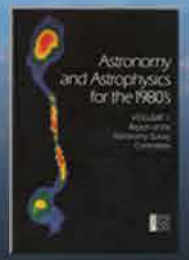
PH to Astro2020 (2019) – Carpe Posterum

PH to everyone (2022) – We got what we asked for!

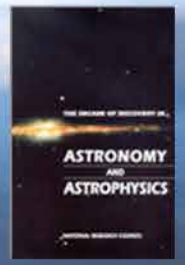
Astrophysics

Decadal Survey Missions

1972
Decadal Survey
Hubble

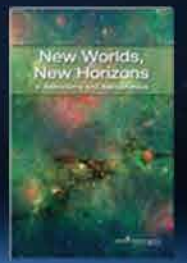


1982
Decadal Survey
Chandra

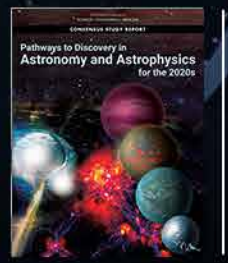


1991
Decadal Survey
Spitzer

2001
Decadal Survey
Webb



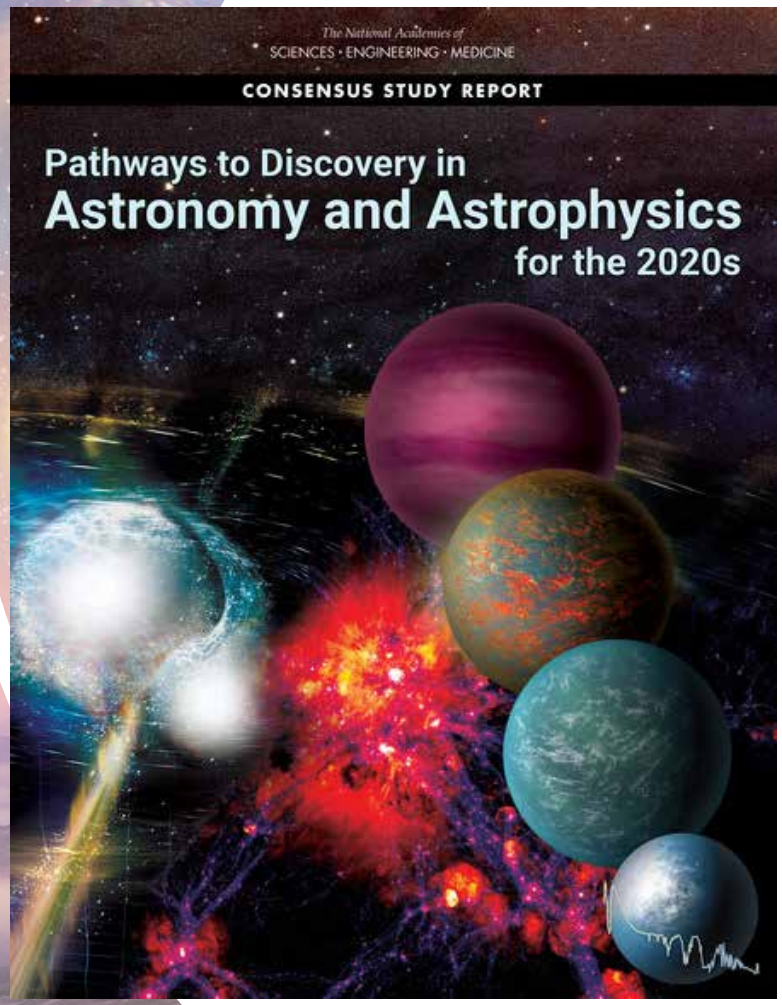
2010
Decadal Survey
Roman



2021
Decadal Survey

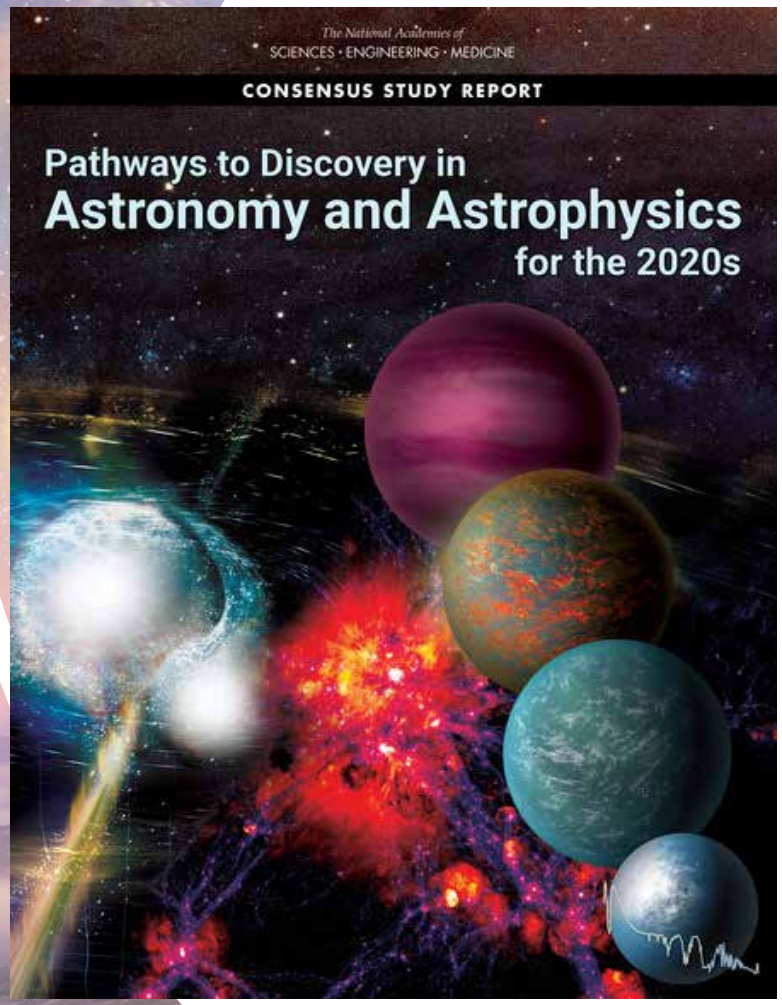
Thomas Zurbuchen, Associate Administrator for Science
"Astro2020 and Beyond: Carpe Posterum"
Tue 14 Jun @ 11:40 am in Hall C

Carpe Posterum: a How-To Guide



- Every decade has its challenges
  - The 2000s were a time of unbridled optimism and underrealized dreams. Yes, we did finally get JWST. But we don't have SIM or Con-X or TPF.
  - The 2010s began as a decade of austerity. But we're well on the way to building Roman. By the end of the year, we will have selected 5 Explorers and 4 Missions of Opportunity in 10 years. We have partnerships in LISA and Athena and XRISM (and Euclid and ARIEL). We made hard choices to defer a CMB mission and decline to participate in SPICA.
- It's time to begin the work of the 2020s!
  - We have an ambitious and inspiring Decadal Survey recommending investments to study the time domain universe, produce the first Astrophysics Probe, and characterize Earth 2.0.
  - We also have a reduced and flattened planning budget.
  - This feels like déjà vu all over again.

Carpe Posterum: a How-To Guide



- Astrophysics holds a key position in our culture. It is one of the most accessible sciences, is generally apolitical, and inspires people the world over.
  - The U.S. is the world leader in space astrophysics
- The goals of the 2020s will take the same hard work that it took to realize the dreams of previous decades and prior Decadal Surveys:
  - Unity of purpose for Decadal Survey priorities
  - Leverage all the diverse talent of the Nation
  - Focus on consistent messages to stakeholders
  - Diligence in controlling scope creep
  - Innovation in science, technology, and architecture
  - An “All of Humankind” approach


Carpe Posterum