



National Aeronautics and
Space Administration

NASA Astrophysics Update

Committee on Astronomy and Astrophysics | November 2024

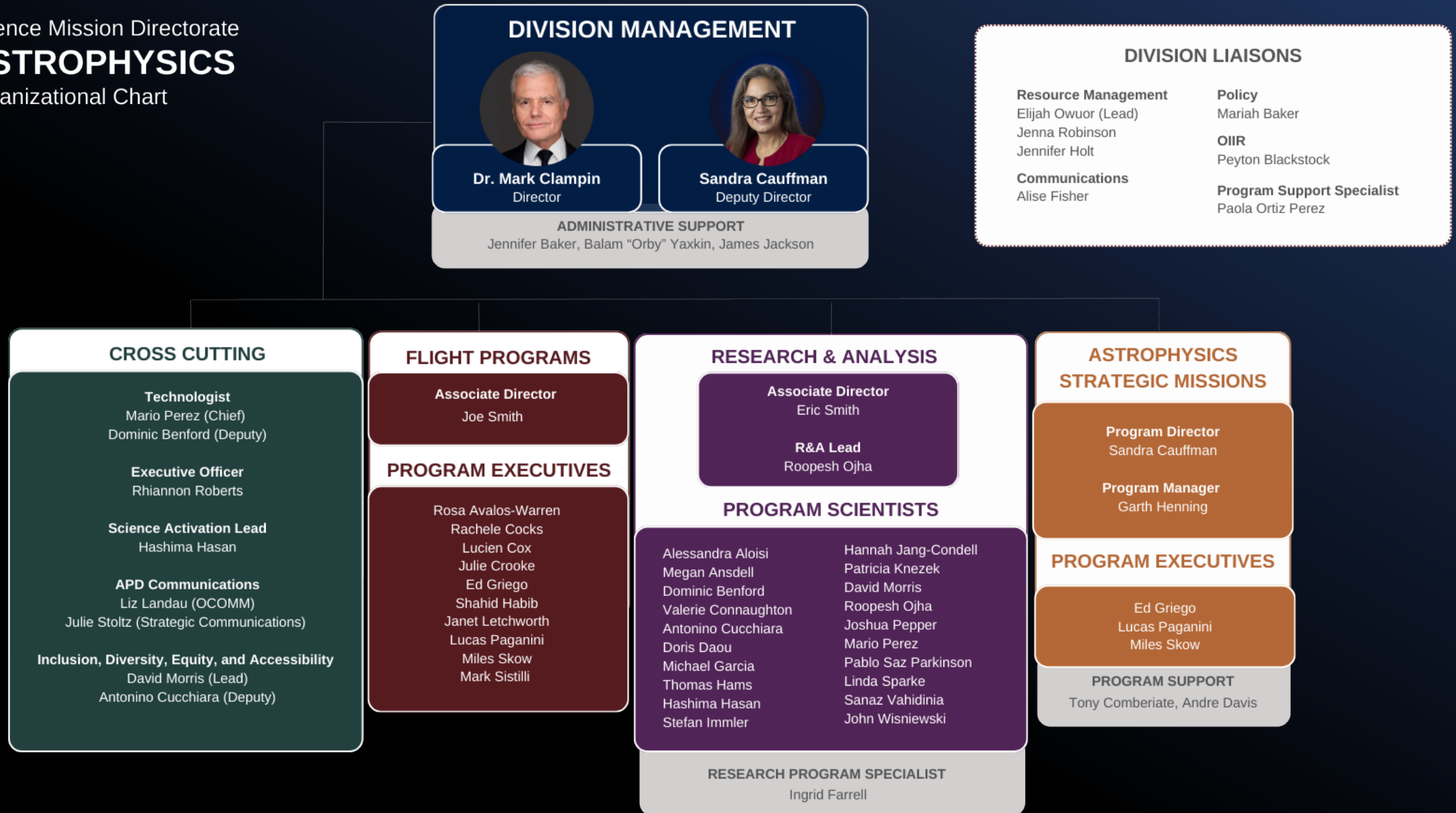
Dr. Mark Clampin

Director, NASA's Astrophysics Division

Science Mission Directorate



Science Mission Directorate
ASTROPHYSICS
 Organizational Chart



RESEARCH
 ~**365** U.S. Science PIs Funded currently
 ~**130** Individual Institutions Selected
 ~**\$145M** Awarded Annually

SMALLSATS/CUBESATS

4 Science Missions Launched
4 Missions Complete
10 Science Missions in Development
 8 Free-flying CubeSats
 1 Supporting Technology Development Project
2 ISS-attached Science Missions

SOUNDING ROCKETS

19 Science Missions Launched (Suborbital)
7 In Development

BALLOONS

32** Suborbital Balloons Launched
 **Includes APD, HPD, PSD, ESD, educational, & engineering missions
21 Missions in Development

TECHNOLOGY DEVELOPMENT

~**\$160M** Invested Annually

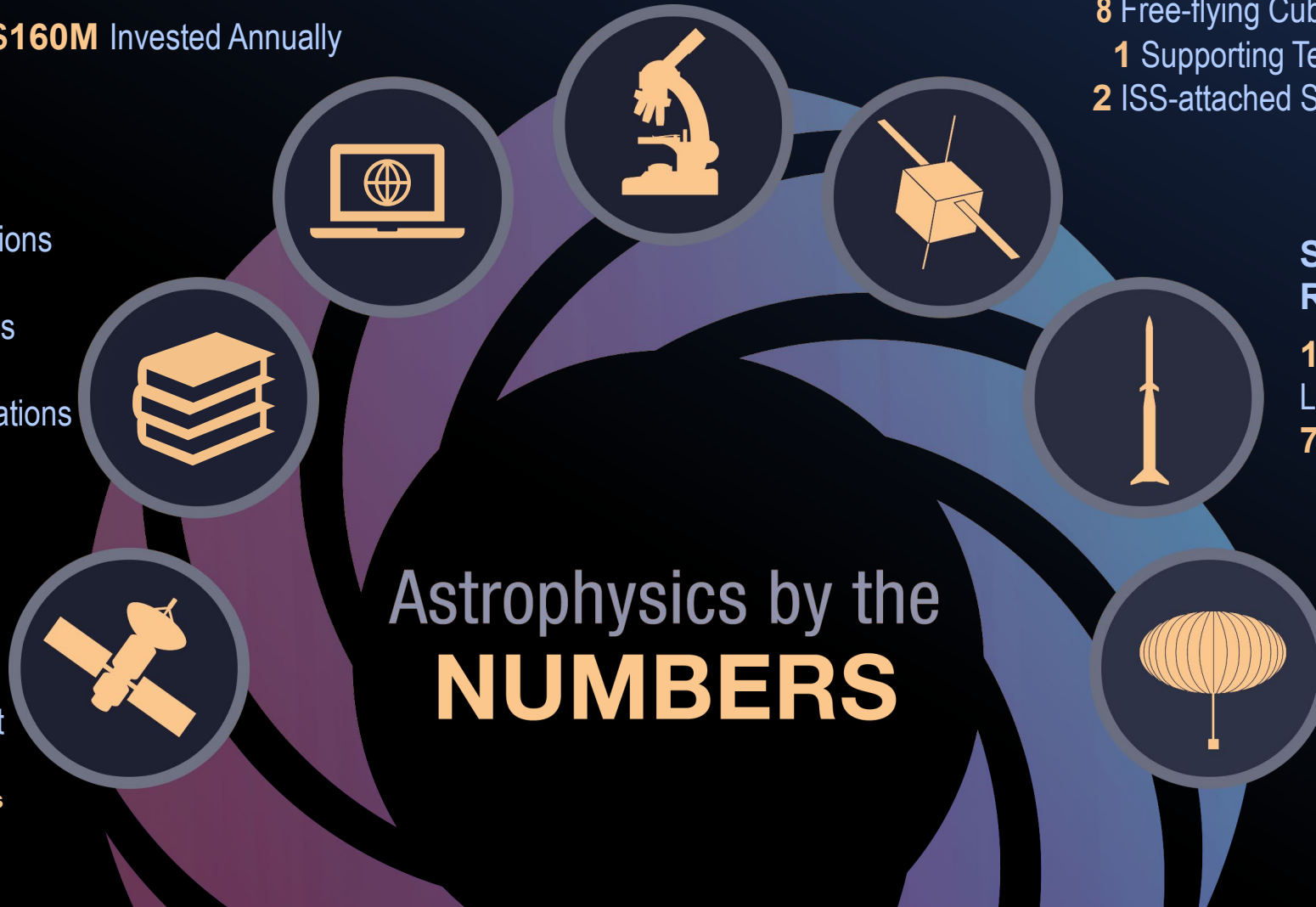
REFEREED PUBLICATIONS

>21,361 Hubble Publications (1991-Current)
>1,745 Webb Publications (July 2022-Current)
>10,091 Chandra Publications (1999-Current)

MISSION SUMMARY

15* Missions Operating
17* Missions in Development
2 Tech. Demos
 *Including international partnerships

Astrophysics by the
NUMBERS

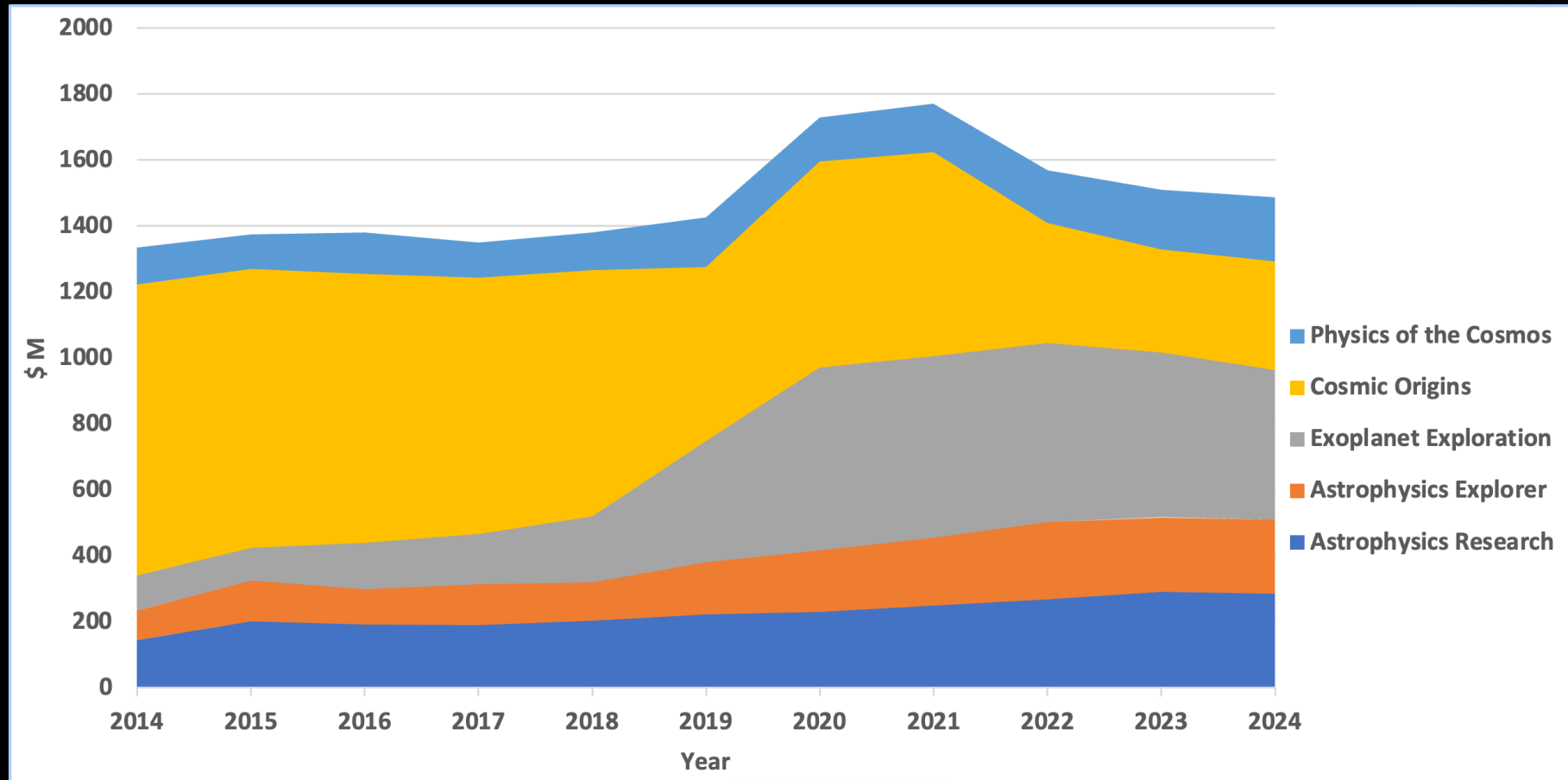


Astrophysics Priorities

Explore/Innovate/Partner/Inspire

- Maintain a **balanced portfolio** during this decade and the next, by balancing investments in missions under development and future missions, against funding for large missions in extended science operations.
- Investment to advance the Astro2020 Decadal Priorities, including technology maturation for the **Habitable Worlds Observatory**, and the selection of an **Astrophysics Probe** mission.
- Ensure successful completion of the **Roman Space Telescope**, within the Agency commitment
- Protect international **partnerships** such as the Laser Interferometer Space Antenna (LISA)

APD Budget: FY14 – FY24



- Roman Space Telescope FY24: \$407 M
- Webb Space Telescope Operations FY24: \$187 M

FY25 Senior Review of Operating Missions

The 2025 Senior Review includes the following missions:

Chandra	Hubble
Fermi	NuStar
IXPE	TESS
Swift	XMM Newton

**NICER is excluded,
and will be reviewed
after a planned
upcoming repair*

Timeline

- August 5, 2024: FY25 Astrophysics Senior Review Final Call for Proposals
- December 12, 2024: Senior Review final proposals due

Strategy

- Schedule designed to provide recommendations for input to FY27 Budget process
- Proposals are being prepared using FY25 President's Budget Request
- A single panel will review all the proposals together
- OPCR findings will be provided to the review committee

Astrophysics Probe Explorers (APEX)

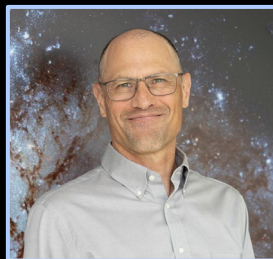
- Astrophysics Probe Announcement of Opportunity (AO)
 - Selections of Phase A studies was made October 2024
- Concept study reports due: Q4 CY 2025
- Down-selection: Q2 CY 2026
- AO-Required Launch Readiness Date: NLT July 2032



PRIMA



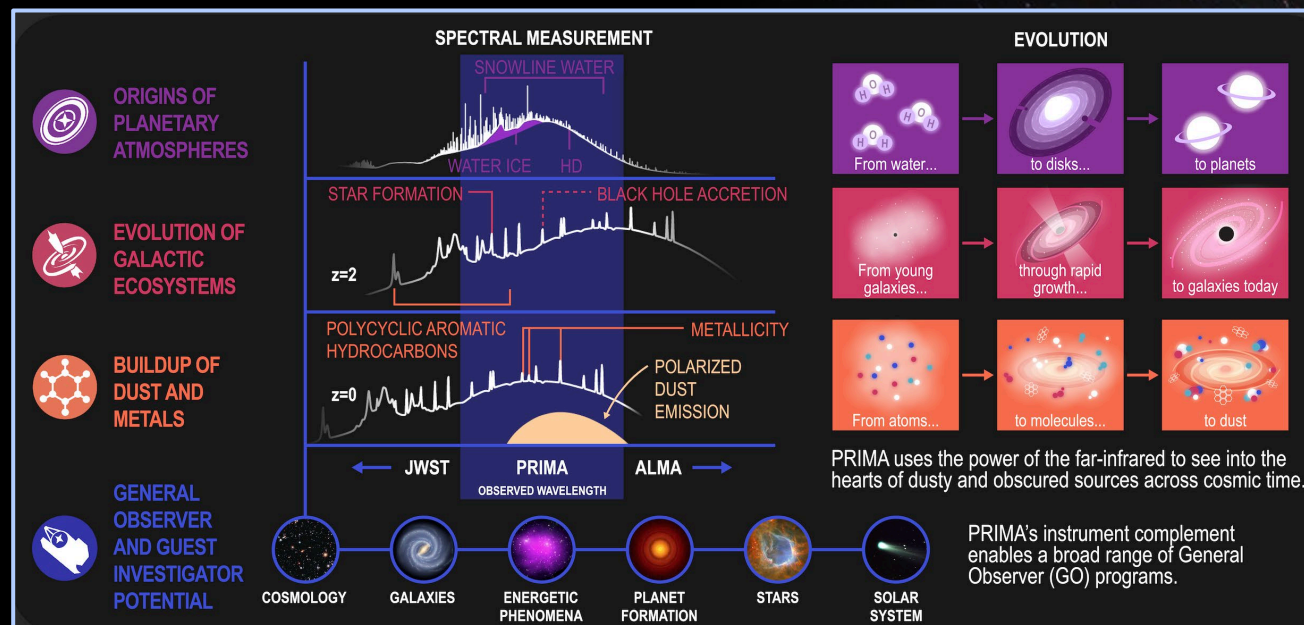
P.I. Jason Glenn (GSFC)



PRIMA offers far-infrared observations at a sensitivity several orders of magnitude better than prior state-of-the-art.

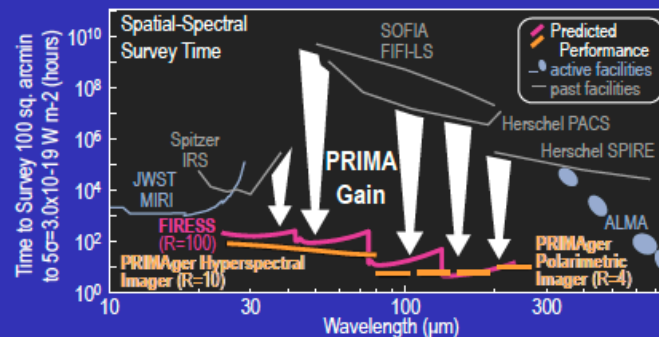
PRIMA has two instruments.

- FIRESS* is a multimode spectrometer with a bandpass of 24-235 μm at $R > 85$ & a high resolution mode of $R > 2000$ over the whole band and 4400 at 112 μm .
- PRIMAger* is a hyperspectral imager from 28-84 μm with $R=10$ & polarimetric imaging in 4 bands from 80-261 μm .

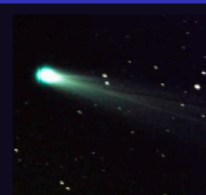


GENERAL OBSERVER SCIENCE

PRIMA's 3-5 orders of magnitude gain in spectral mapping speed unlocks science discovery space between JWST and ALMA. With 75% of observing time dedicated to GO science, PRIMA can obtain spectra of hundreds more protoplanetary disks, young stars, and distant galaxies than Herschel.



In 1200 hours: PRIMA can measure the D/H isotopic ratio of water in a statistically-significant sample of solar system comets - a key constraint to the origin of water on Earth



In 100 hours: PRIMA can map magnetic fields in the diffuse gas of local galaxies, revealing their role in how star forming clouds are born.

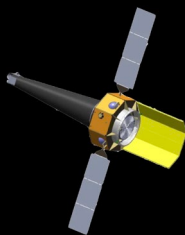


In 5000 hours: PRIMA can survey the entire sky to a sensitivity 100x deeper than IRAS and Akari that would engender a legacy of discovery.



AXIS

P.I. Chris Reynolds



AXIS offers state-of-the-art X-ray spatial resolution with much greater field of view and sensitivity. AXIS is a high spatial resolution ($<1.5''$ Half Power Diameter) X-ray imaging observatory with a 0.3-10 keV bandpass and 24 arcmin diameter field of view. It has an effective area FOV-average of 3600 cm^2 (1keV) and 570 cm^2 (6keV).

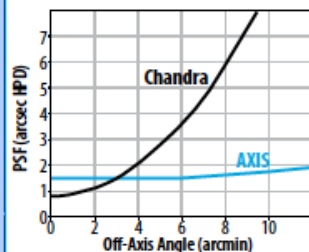
AXIS is a huge leap forward

AXIS vs Chandra

- 5-10x larger effective area
- 6x better FoV-ave PSF

AXIS vs XMM-Newton

- 4x larger area below 2 keV
- 10x better PSF



AXIS has 70x the survey grasp (FoV x area) at $1.6''$ than Chandra

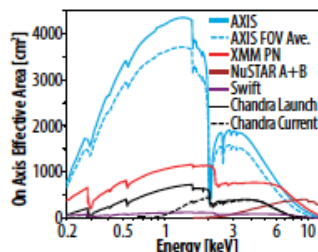
enabling surveys that probe further, wider, and faster

AXIS vs Swift

- Same fast ToO Response Time
- 60x better sensitivity

AXIS vs NuSTAR

- Superior area below 8 keV
- 40x better PSF



AXIS answers the big questions posed by the Astro2020 Decadal Survey

AXIS Deep
Extragalactic
Survey

The AXIS Science Pillars

Astro 2020 asks...

Why X-rays?

...AXIS answers

Why AXIS?

Pillar 1: "What seeds supermassive black holes and how do they grow?"

AXIS determines the origin of massive black holes
X-rays identify clean census of black holes in distant JWST galaxies
AXIS' PSF and large area enable imaging of distant, faint sources

Pillar 2: "How do gas, metals, and dust flow into, through, and out of galaxies?"

AXIS shows how supernovae and AGN transform galaxies
X-rays uniquely probe the million-degree gas that drives gas flows
High contrast imaging separates diffuse gas and bright sources

Pillar 3: "What powers the diversity of explosive phenomena across the electromagnetic spectrum?"

AXIS discovers explosive transients both near and distant
X-rays uniquely encode information on transient progenitors
AXIS enables transient alerts, TDAMM surveys and fast followup

The Extragalactic Surveys will find $>20,000$ AGN over cosmic time, $>50x$ more than the Chandra Deep Field.

The Galactic Plane Survey will discover $>1M$ new sources in crowded fields, $10x$ deeper and $5x$ wider than current best X-ray surveys.

AXIS is the Probe for the entire astronomical community

AXIS offers >68 Ms over 5 years to General Observers for investigations beyond what we can even imagine in 2023

AXIS sensitivity and spatial & spectral resolution impacts broad range of astrophysics, from photoevaporation of exoplanet atmospheres to X-ray reionization of the high- z Universe

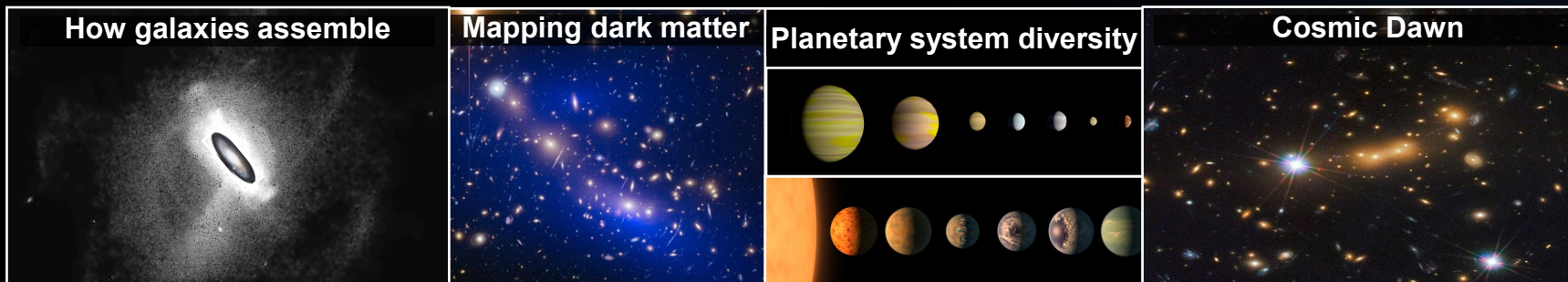
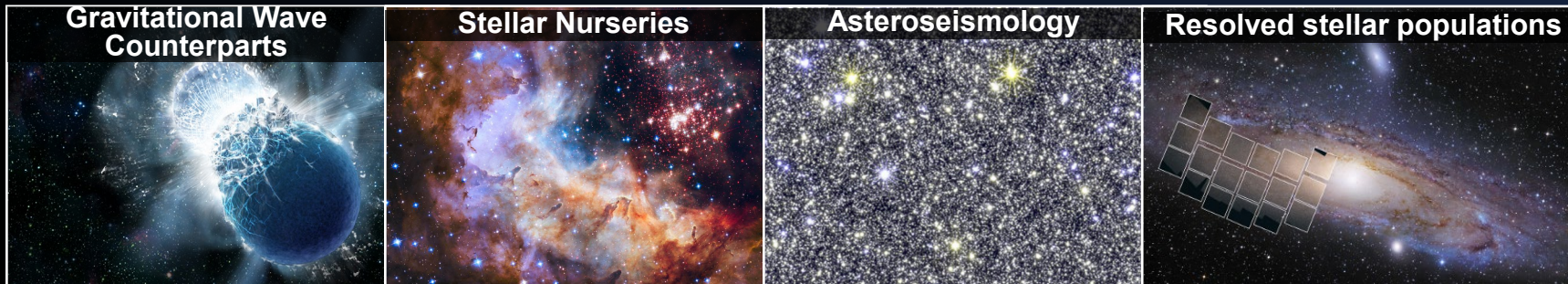


AXIS' Transient Alert Monitor alerts the community in 10 minutes, and rapid response allows for a powerful GO Target of Opportunity program that addresses TDAMM charge by Astro2020

Nancy Grace Roman Space Telescope

Science

- Using a wide field instrument, Roman will conduct a survey to study the nature of dark energy and dark matter.



Nancy Grace Roman Space Telescope

Status

- The telescope's thermal vacuum (TVAC) testing completed.
- Successful Systems Integration Review in Sept. 2024.
- Amended solicitation for Roman preparatory forthcoming.
- The project remains on cost and schedule.
- Positive OIG report

Near-Term Milestones

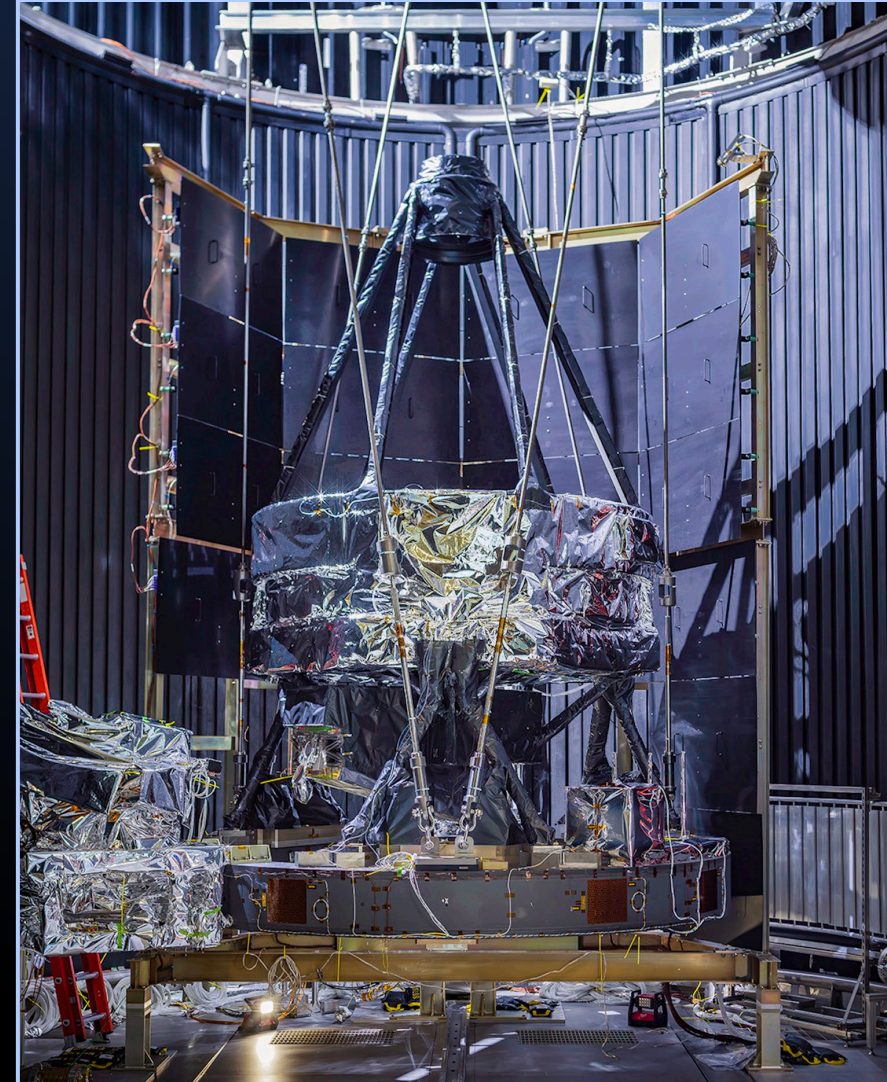
- January 2025: Key Decision Point KDP-D
- September 2026: KDP-E & Launch Readiness Review (LRR)



Roman's spacecraft bus in GSFC's clean room. Credit: NASA/Chris Gunn



IOA arriving at GSFC



Imaging Optical Assembly (IOA) in Chamber A
Copyright © 2024 L3Harris Technologies Inc.

Roman Instruments

- WFI, delivered on August 7th, has completed final closeouts and is ready for integration into the Integrated Payload Assembly (IPA).
- CGI was delivered to GSFC on May 19th, meeting performance requirements in both the Hybrid-Lyot and Shaped Pupil modes. CGI has been integrated into the Instrument Carrier.



The Wide Field Instrument upon delivery to the clean room at NASA's GSFC.



The Coronagraph Instrument, Roman's Technology Demonstration.

Roman Community Support

- APD has implemented a change in policy to align with SMD practice and consider science community funding outside the mission life cycle cost cap, as is already done in other divisions and for non-strategic APD missions.
- Paradigm for Roman is different from 'pointed observatory' approach; most science will be done with data entirely or substantially from its major surveys: need to support data analysis with this dataset.
 - Sky coverage, number of galaxies + stars + everything else to study will be orders of magnitude larger than with Webb or Hubble, so every observation will have many users;
 - Productivity limited by people, not data!
- *Primarily*, this science funding will provide grants for scientists via Roman General Investigator calls.
 - Calls annually beginning FY26
 - Mix of data-driven research (leveraging Roman's large surveys), observations, and blends of those
 - Analogous to Webb and Hubble GO funding, but with more emphasis on data-driven research
- *Secondarily*, this supports funding of the Roman cloud computing capability for large projects.
 - Anticipating large, compute-intensive proposals that require resources beyond those already available in the Roman Science Platform
 - Costs include data ingress, data egress, compute cycles
 - New cost element for science from an APD mission

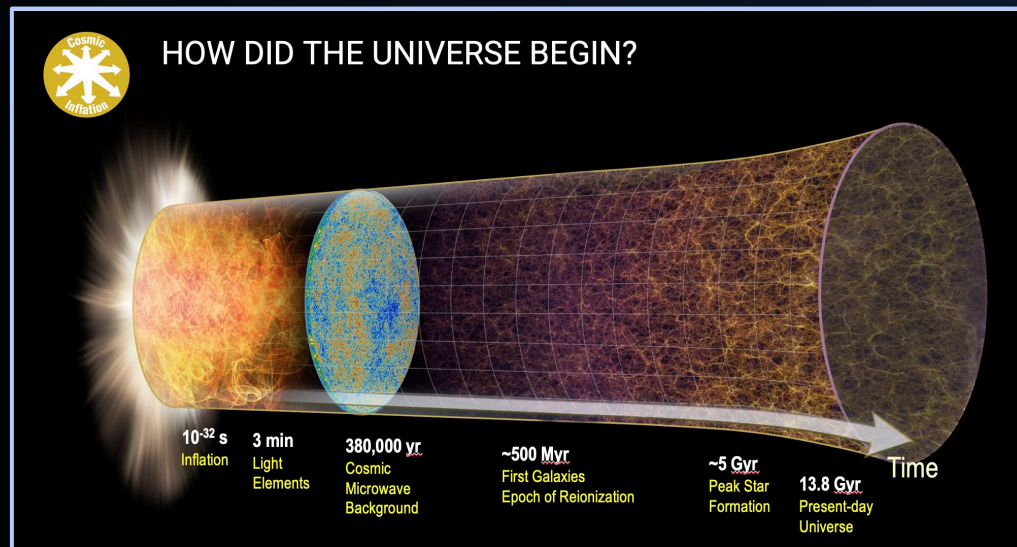
Roman Pipelines and Data Processing

- Roman's large surveys and associated large data volumes are the defining feature of the mission
 - Compute demands mean pipelines must produce broadly useful high level data products
 - Including Robust calibrated data, image cutouts, catalogs, light curves, spectra etc.
- Most processing and archives are in the cloud
 - Provides large volumes of compute on demand (enabling efficient reprocessing capability)
 - Roman Science Platform provides convenient cloud-based analysis environment for users
- Simple operations
 - One instrument with two observing modes
 - Reduced pipeline complexity relative to JWST
 - 3 core community surveys and <30 General Astrophysics Surveys
 - Survey specific processing/ reprocessing

Roman Pipelines and Data Processing

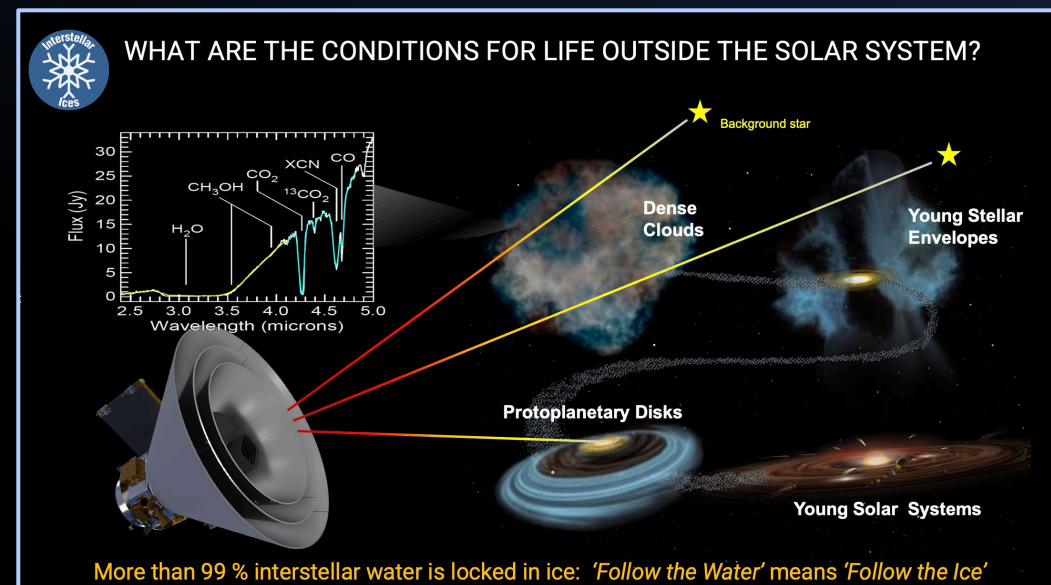
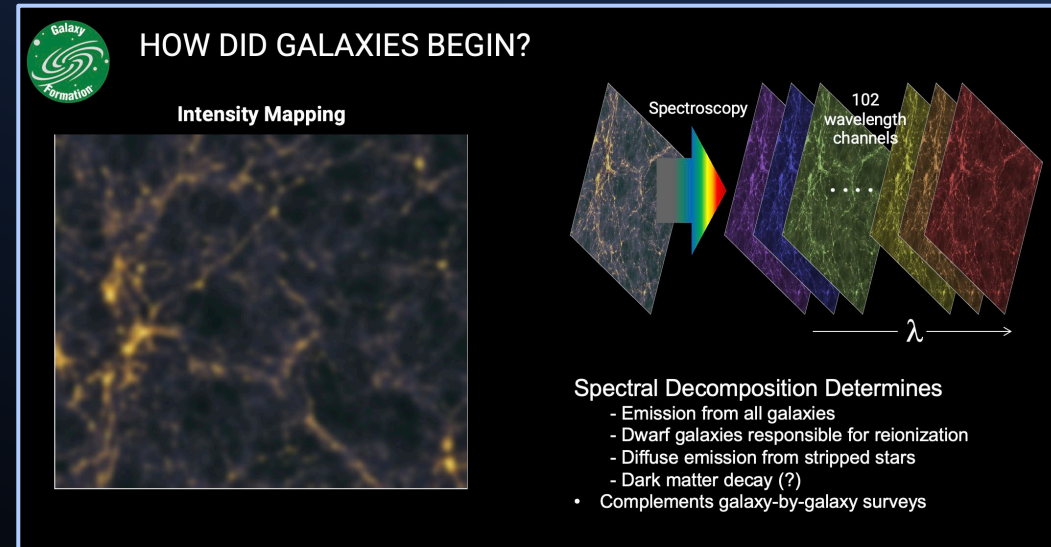
- Calibration pipeline will be well vetted prior to launch
 - Pipeline implemented early (already available and code is in the public domain)
 - In-depth process for science validation by scientists in Roman Telescope Branch
 - E.g. development “scrums” led by STScI scientists
- Distributed science operations (STScI, IPAC and Project Infrastructure Teams)
 - Provides early experience serving, sharing and using data across institutional boundaries, acting as a pipe cleaner for external users of Roman data
- Adopting lessons learned from Euclid

SPHEREx: Science Areas



SPHEREx will map entire sky in near-infrared light to study the origin of stars, galaxies, and the chemical composition of the universe.

- Origin of the Universe
- Origin and History of Galaxies
- Origin of Water in Planetary Systems
- First All-sky Infrared Spectral Survey
- Over a two-year mission SPHEREx will collect data on $>3 \times 10^8$ galaxies along with $>10^8$ stars



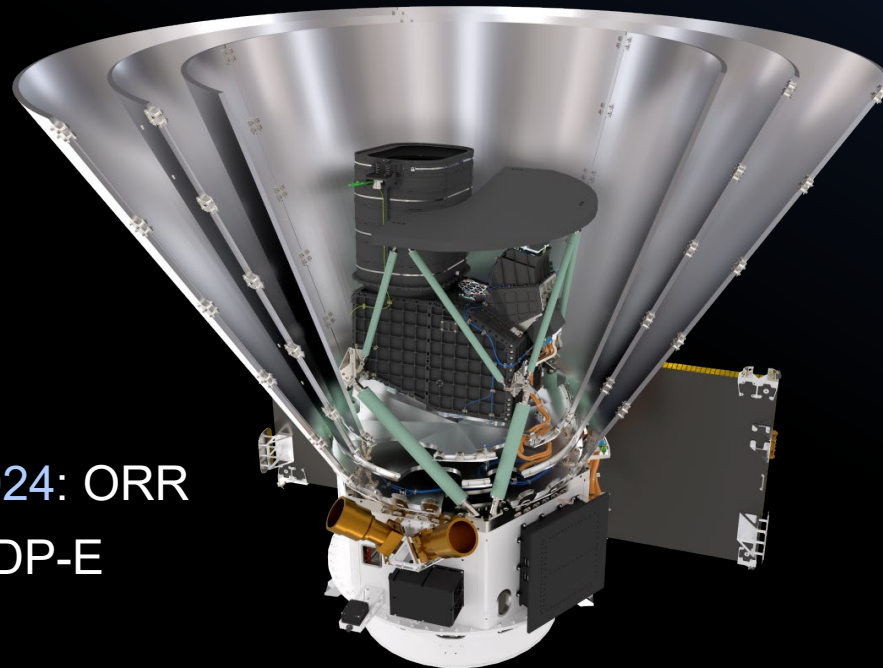
SPHEREx

Status

- Reaction wheels have been reworked, re-integrated into the spacecraft and are currently undergoing regression testing.
- Maintaining schedule towards launch

Upcoming Milestones

- December 10-12, 2024: ORR
- February 4, 2024: KDP-E
- April 2025: LRD



SPHEREx observatory being lifted and installed onto the vibration table, in the Z-axis configuration, at BAE Systems in Boulder CO in early August 2024.

COSI

The Compton Spectrometer and Imager

Science

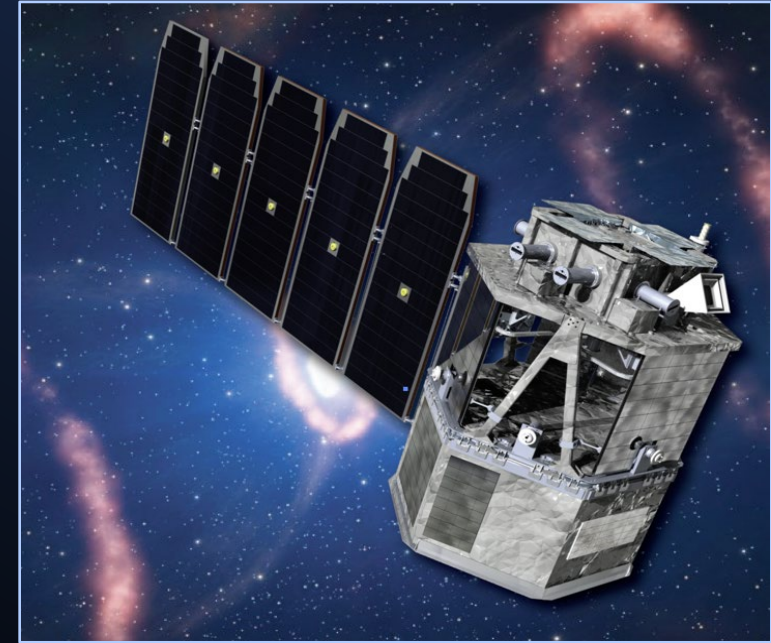
- Source of 511 keV γ -ray lines, the signature of positron annihilation
- Reveal galactic element formation
- Insight into extreme environments with polarization
- Probe the physics of multi-messenger events

Status

- The second of 16 flight germanium detectors successfully was completed (current schedule calls for all 16 flight detectors completion by mid-2025).
- SpaceX Falcon 9 selected as the COSI LV in July 2024.

Upcoming Milestones

- December 4-6, 2024: COSI CDR at Northrup Grumman (Dulles, VA)
- August 2026: SIR
- September 2026: KDP-D
- August 27, 2027: LRD



LISA

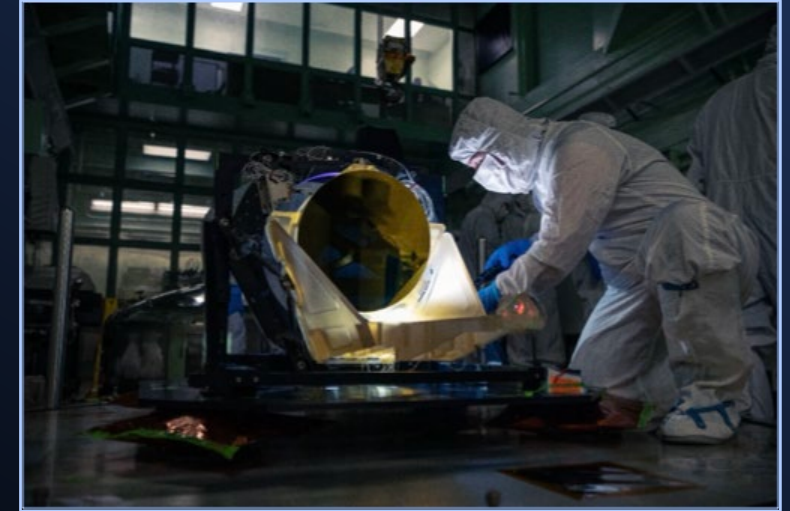
Laser Interferometer Space Antenna

Status

- January 25, 2024: ESA adopted the mission and is now in a process to finalize the industrial contractor for the construction and integration of the spacecraft.
- August 1, 2024: NASA established a project office at GSFC.
- NASA is providing key technological subsystems such as lasers, telescope and charge management devices for the 3-spacecraft constellation.
- NASA technologies have now mostly achieved TRL 5 stage after a significant investment in resources with plans to achieve TRL6 for all technologies by Mission PDR.
- NASA plans to initiate a production of multiple copies of these technologies after a successful completion of KDP-B milestone review in March 2025.
- ESA with the help of NASA has established a formal science team where NASA has one third membership

Upcoming Milestones

- January 2025: NASA Systems Requirement Review
- March 2025: NASA KDP-B - March 2025



*EDU1 being inspected at GSFC
after delivery from L3Harris*

UVEX

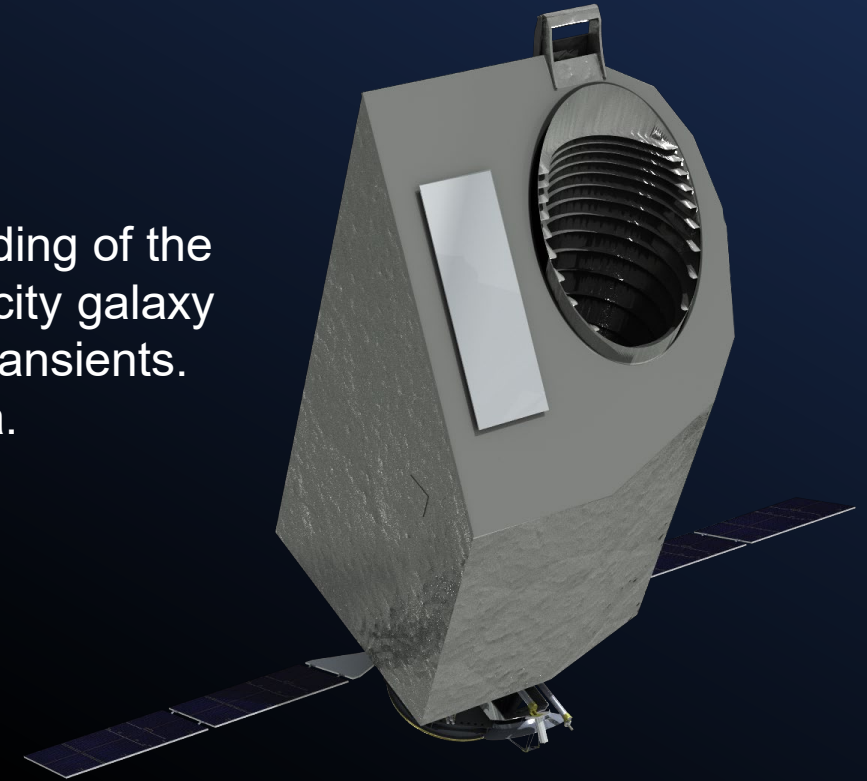
UltraViolet Explorer

Status

- UVEX selected as next astrophysics medium-class explorer.
 - Principal investigator: Fiona Harrison at Caltech.
 - UVEX will address outstanding questions in our understanding of the Universe, including the nature of the low-mass, low-metallicity galaxy population and the early ultraviolet emission of explosive transients. UVEX will also leave a rich legacy of all-sky ultraviolet data.
 - Team is making good forward progress in phase B

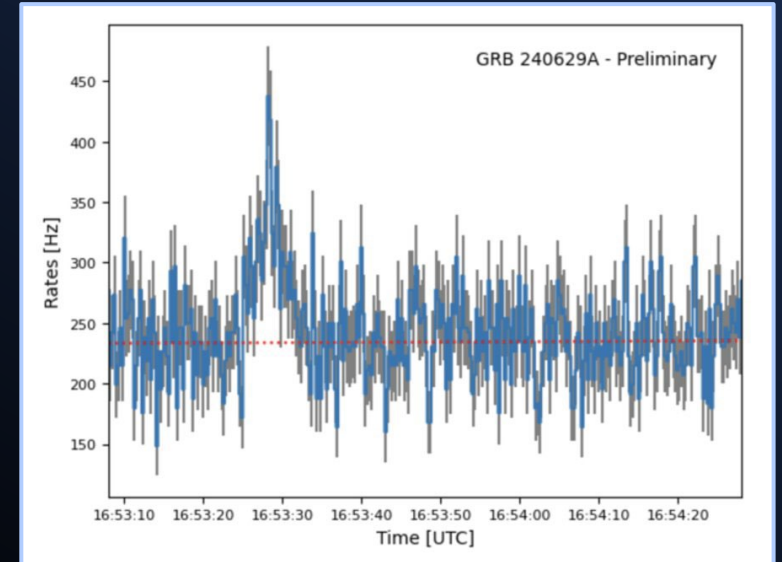
Upcoming Milestones

- February 2025: Systems Requirement Review



CubeSats, SmallSats, Balloons and ISS Payloads

- CUTE
 - 2021: Launched
 - Proposal was submitted for extended operations and awarded.
- BurstCube (Completed)
 - 6U CubeSat designed to detect Gamma-ray Bursts with 4 CsI detectors read out with SiPMs.
 - March 21, 2024: Launched on CRS-30 to ISS
 - April 18, 2024: Deployed from ISS
 - Detected at least one GRB
 - GRB 240629A (GCN Circular 37340)
 - Searching through data for other detections.
 - Sep. 16, 2024: Reentered the atmosphere
 - Technical issues reduced the mission duration.



Pioneers SmallSats, Balloons and ISS Payloads

- Pandora (SmallSat): Multiwavelength Characterization of Exoplanets and their Host Stars
 - Launch date: 09/2025
 - Completed flight integration of the Near-Infrared Detector Assembly (NIRDA) detector. The payload electronics module (PEM) was assembled and tested. The flight cryocooler electronics (CCE) were received and verified.
- PUEO (Balloon): A Long-duration Balloon-borne Instrument for Particle Astrophysics at the Highest Energies
 - Launch date: 12/2025 in Antarctica
 - All flight antennas have been tested. Completed RF chain thermal test.
- Aspera (SmallSat): IGM Inflow/outflow from galaxies via OVI 10^5K emission line imaging
 - Launch date: 02/2026
 - CDR dPMP occurred on 07/22/2024, approval is pending open actions from dPMP.
- StarBurst (SmallSat): Gamma-ray ASM, Simultaneous detection of NS/NS mergers with LIGO
 - Launch date: ~Mid 2027
 - CDR dPMP planning is underway. The Integration & Testing facility has been identified, TVAC and vibration testing facilities costs are within expectations.

Pioneers SmallSats, Balloons and ISS Payloads

- TIGERISS (ISS): Measuring ultra-heavy (r-process) cosmic rays on ISS
 - Launch date: 02/2027
 - SRR/MDR dPMP took place on 8/27/24 at HQ. APD formally submitted ISS location request to SMD/DAAP on 08/27.
 - Submitted the TIGERISS overview to the ISS POC. ISS Payload Integration Manager (PIM) assignment has been requested from ISS.
- Landolt (SmallSat): Absolute stellar photometry to $<0.5\%$, PI Peter Plavchan, George Mason University
 - Launch date: 2028
 - Interagency Agreement (IAA) process in underway.
- POEMM (Balloons): High resolution FIR tomography of protoplanetary disks, PI Gordon Stacey, Cornell
 - Launch 12/2029 from Antarctica (TBD)
 - Start date TBD

Time-Domain Multimessenger Astrophysics (TDAMM)

- **October 3, 2024:** The international agency TDAMM working group met for the 3rd time with representatives from 3 US funding agencies and 11 countries discussing recently-launched missions and progress on coordinating TDAMM activities between space and ground observatories.
- The 3rd TDAMM workshop was held at Louisiana State University, sponsored by LSU, NASA, DoE and NSF, to discuss multidisciplinary science enabled through TDAMM observations, and the facilities and infrastructure needed to maximize scientific return. A White Paper will be written for consideration by the Agencies by year end.
- The 4th TDAMM workshop will be held in Fall '25, hosted by NASA's Physics of the Cosmos TDAMM pilot initiative, ACROSS. This workshop will develop community-driven coordinated observation plans for space and ground facilities based on specific TDAMM science cases.



WORKSHOP
**Emerging Technologies for
Astrophysics Missions**
(invitation only)

March 25-27, 2025
NASA Ames Conference Center
Mountain View, CA

More details to come in Fall 2024



Habitable Worlds Observatory (HWO)

...e designed specifically to search for
...n planets outside our solar system

Large-aperture IR/Op
performing transform

The Habitable Worlds Observatory

Big Picture Strategy

- **Build to schedule:** Mission Level 1 Requirement
- **Evolve technologies & architectures from what we have done before:**
 - Build upon current NASA investments and TRL-9 technology
 - Segmented optical telescope system from JWST
 - Coronagraph from Roman's coronagraphic imager program
- **Next Generation Rockets:**
 - Larger telescope aperture sizes
 - Leverage opportunities for mass & volume trades
- **Planned Servicing:** Robotic servicing at L2
- **Robust Margins:** Large scientific, technical, and programmatic margins
- **Mature technologies first:** Reduce risk by fully maturing the technologies prior to development phase.



FY24 Appropriations for HWO

Habitable Worlds Observatory

The Senate Report language regarding “Habitable Worlds Observatory” is adopted and the agreement provides no less than \$10,000,000 for the mission. In addition, the agreement directs NASA to establish a Habitable Worlds Observatory project office at Goddard Space Space Flight Center to leverage expertise in astrophysics and segmented mirror technology.

Senate Report Language - Habitable Worlds Observatory

The Committee supports the Great Observatory Maturation Program (GOMAP) as recommended by the Decadal Survey on Astronomy and Astrophysics, “Pathways to Discovery in Astronomy and Astrophysics for the 2020s” [Astro2020]. GOMAP will mature science and technologies needed for future flagship missions starting with the Habitable Worlds Observatory to observe habitable exoplanets. In order to cement continued American leadership in astronomy, the Committee provides the requested level for GOMAP to implement the Astro2020 recommendations. NASA is encouraged to articulate funding for GOMAP separately in future budget requests.

Habitable Worlds Observatory (HWO)

Recent Achievements

- May 31: ROSES grants awarded to 3 industry partners to develop HWO technologies.
- August 1: Established the HWO Technology Maturation Project Office (HWO TMPO) in response to direction from Congress
- August 12: HWO participation in NASA MOSAICS Program: New York Institute of Technology's Mechanical Engineering Department and Physics Department were selected for 2 MOSAIC awards. With mentors at GSFC.
- August: Boston Micromachines Corporation (BMC), ALPAO, and AOX will study how to build 96x96 deformable mirrors (DMs) for JPL, report coming March 2025.
- October 8: Splinter Session at DPS on HWO's status and mission planning, and HWO's potential for studying solar system bodies including icy worlds, giant planets, small bodies, etc.
- HWO Fall F2F (Oct. 22-24): Hosted in Rochester, NY, with tours of L3Harris. HWO TMPO updates included science, systems engineering, modeling, mentorship, technology, and look-ahead schedule.

Upcoming Events and Milestones

- Winter AAS (Jan. 2025): 90-min special session on HWO progress and current activities. 4-hour splinter session discussing Working Group science cases, including future science teams and Working Group status and plans forward.

HWO Technology Development

- The HWO Technology Plan is organized along three *tracks*:
 - Coronagraph System Technologies (CST)
 - Ultra-stable Telescope System Technologies (UTST)
 - High-sensitivity UV and Instrument Technologies (HUVIT)
- Gaps will be classified as one of the following:
 - **Technology Gap:** An element for which the required function/performance, form, fit, environment, or interface is novel or not bounded by existing demonstration.
 - **Engineering Gap:** An element for which the required function/performance is bounded by existing demonstration, but not necessarily in the same form, fit, environment, or interface as needed for HWO.
 - **Modeling / Testbed / Facility Gap:** A capability needed to support the development or modeling of a critical technology element or improve the manufacturability, testability, yield, or reliability of an element.

HWO Leadership

Program Executive



Julie Crooke

Program Scientist



Megan Ansdell

Deputy Program Scientist



Joshua Pepper

NASA HQ Leadership

HWO TMPO Leadership

Principal Architect



Lee Feinberg
GSFC

Project Manager



J. Scott Smith
GSFC

Mission System Engineer



Mike Menzel
GSFC

Project Scientist (interim)



Giada Arney
GSFC

Pre-formulation Scientist (interim)



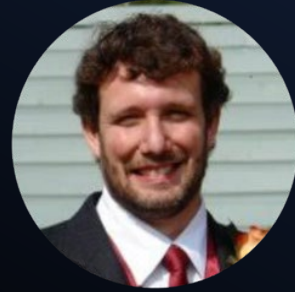
Aki Roberge
GSFC

Pre-formulation Scientist (ex-officio)



Bertrand Mennesson
JPL

Pre-formulation Architect (ex-officio)



John Ziemer
JPL

AI for NASA flagship missions: a vision for the Habitable Worlds Observatory	The Search for Life on Exoplanets (including both gaseous and surface biosignatures)
Generative AI for Overall Mission Effectiveness at the Habitable Worlds Observatory	Characterizing Prebiotic Planets
AI/ML in the context of integrated modeling and uncertainty quantification for HWO	Characterizing Technosignatures
Habitable worlds observatory: AI/ML Models and Tools for Processing and Analysis of Observational Data	The origin of water and planetary system architecture
Using HWO to Decipher Multi-phase AGN-driven Outflows and Their Multiscale Impact	Survivability of liquid surface ocean on rocky planets
Exploring the Quiescent Black Hole Population with HWO	Retention of volatiles on rocky planets
The IMBH Mass and Spin Functions measured with HWO	Disk winds and protoplanetary disk evolution
Probing Energy Extraction from Black Holes with HWO	Protoplanet detections and mass growth/loss
Imaging the Dusty Torus around SMBH with HWO	Debris disks and their properties
Spatially Resolving the Fundamental Elements of Reionization in Galaxies with HWO	Exozodi
Modeling Lyman Continuum Escape with HWO	Linking planets atmospheric compositions back to origins (with the emphasis on Oxygen)
Tracking Cosmic Reionization via Green Pea Galaxies with HWO	Investigating ocean world habitability
Calibrating Lyman Continuum Indirect Estimators with HWO	When and where did the giant planets form?
Revealing the shape of the SED of Ionizing Radiation with HWO	Long term monitoring of giant planet atmospheres and aurorae
HWO Measurements of The Evolution of the Ionizing Photon Luminosity Function	Occurrence and orbital separation distribution of small exoplanets
Counting Extremely Faint Galaxies with HWO to Measure the Dark Matter Power Spectrum	Prevalence of post-disk dynamical evolution
Observing the Small-scale Power Spectrum of Dark Matter with Perturbed Einstein Rings Using HWO	How atmospheres of small planets evolve with time
Measuring SMBH Merger Timescales with HWO	Relationship between planetary system architectures and host star properties
A High Spatial and Spectral Resolution Absorption Map of the Inner CGM Enabled by HWO	Characterize composition of gaseous planet atmospheres in reflected light
Characterizing the Disk - CGM Interface with HWO	Characterization of clouds and photochemical haze
Characterizing the Morphology and Spatial Distribution of the CGM via Emission Line Mapping with HWO	Distinguish between large rocky planets, water worlds, and gas dwarfs
Dust extinction curves in the Milky Way and Local Group galaxies	Distinguish types of rocky planets
The cosmic build-up of dust using UV-spectroscopy-based depletions in local volume galaxies	Identify rocky planets with liquid-water oceans
Probing the Full Depth of ISM Properties with a UV-IFU	Characterize transiting exoplanets
UV fluorescence in Star Forming regions	Observations of atmospheric escape in exoplanets
Investigating accretion mechanism through outflows and proper motions at AU scales in nearby star forming regions	Identifying Cold Ocean Planets and characterizing their geologic activity
Massive Stars in Metal-Poor Environments	Survey for the Smallest Trans-Neptunian Objects
White Dwarfs as Probes of Fundamental Astrophysics	The nature of the astrophysical r-process
Resolved Stellar Populations in Nearby Galaxies	r-Process Elements
Gravitational Wave progenitor systems (Re-drawing the evolution of [binary] massive star)	Flash Spectroscopy of CCSNe
The first stars	Distance Ladder 3.0
Modeling atmospheres of stars from O to M in the UV	The Formation of Star Clusters

Questions

- Major decisions about funding for Hubble and Chandra will not be made until after the results of the Senior Review are in. Given the short fuse between that rough timescale (summer 2025) and the start of FY26, does NASA have a plan for a strategic, orderly change to operations of these telescopes that would retain the quality of archival data as well as allow for a graceful close-out of instruments should that be necessary?
- Given the severe budget constraints, will the 2025 Senior Review process operate in the same way as in the past, or do you anticipate any adjustments in the review process itself or the budgetary boundary conditions?
- Was an official report from the OPCR provided to the missions and the community?
- When would any staffing reductions occur as part of the OPCR outcome for Hubble and Chandra?
- Will the Senior Review reporting structure be changed?
- Could you comment on current coordination and prospects for possible collaborations in SMD between Astrophysics Division and ESSIO including future PRISM and ARTEMIS III science calls, for example as sequels to LuSEE-Night or in other areas?
- What is your thinking on interagency cooperation on data archives and specifically, is the division thinking about interoperability or incorporation of other non-NASA datasets in its development of new cloud archives?

A deep-field astronomical image showing a vast field of galaxies, including spiral, elliptical, and irregular shapes, scattered across a dark cosmic background. The galaxies are illuminated in various colors, including yellow, orange, red, and blue, representing different wavelengths of light.

THANK YOU!