



National Aeronautics and
Space Administration

NASA Town Hall

241st AAS Meeting
Seattle / January 9, 2023

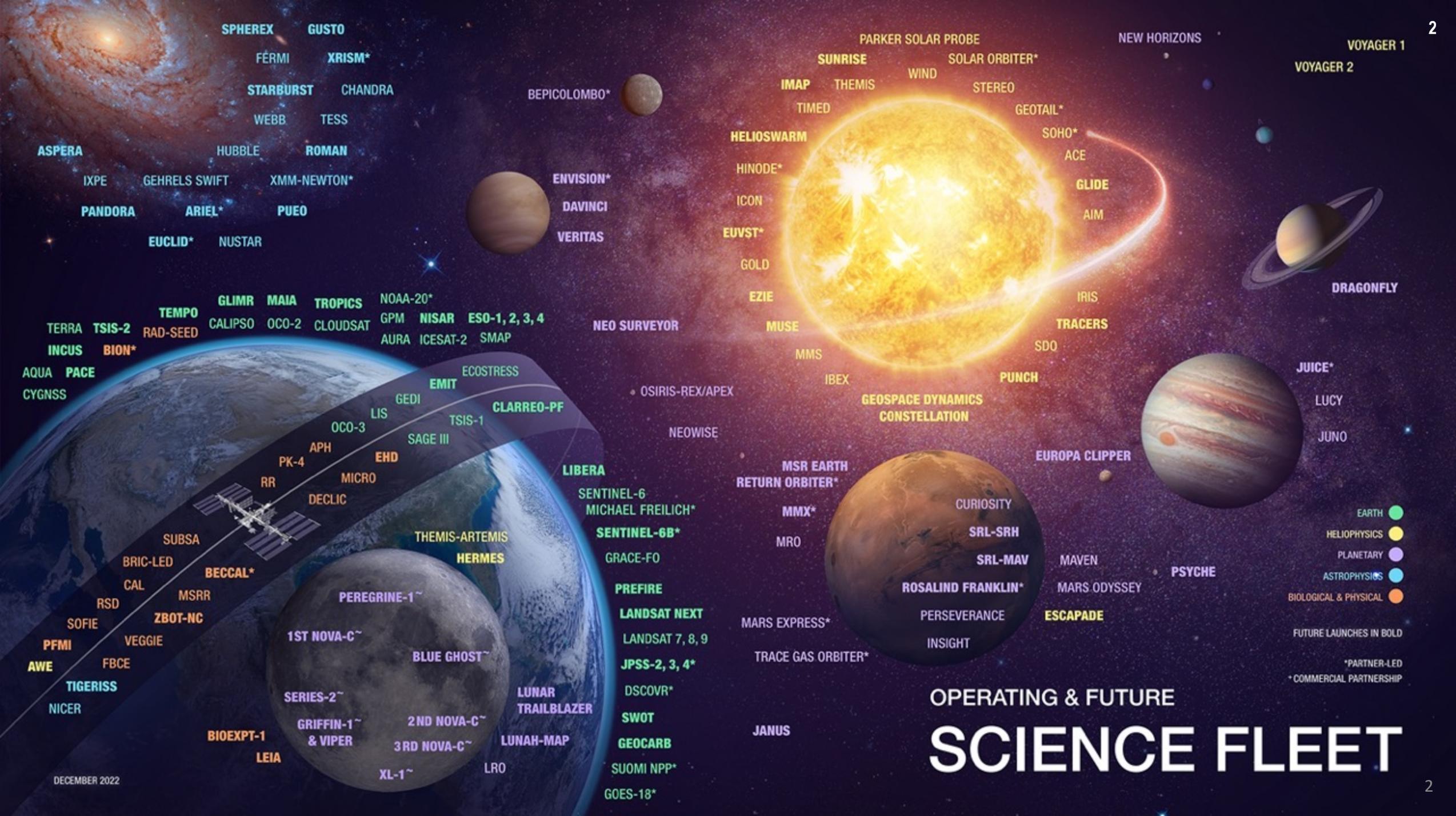
Paul Hertz

Senior Advisor
NASA Science Mission Directorate

Mark Clampin

Director, Astrophysics Division
NASA Science Mission Directorate





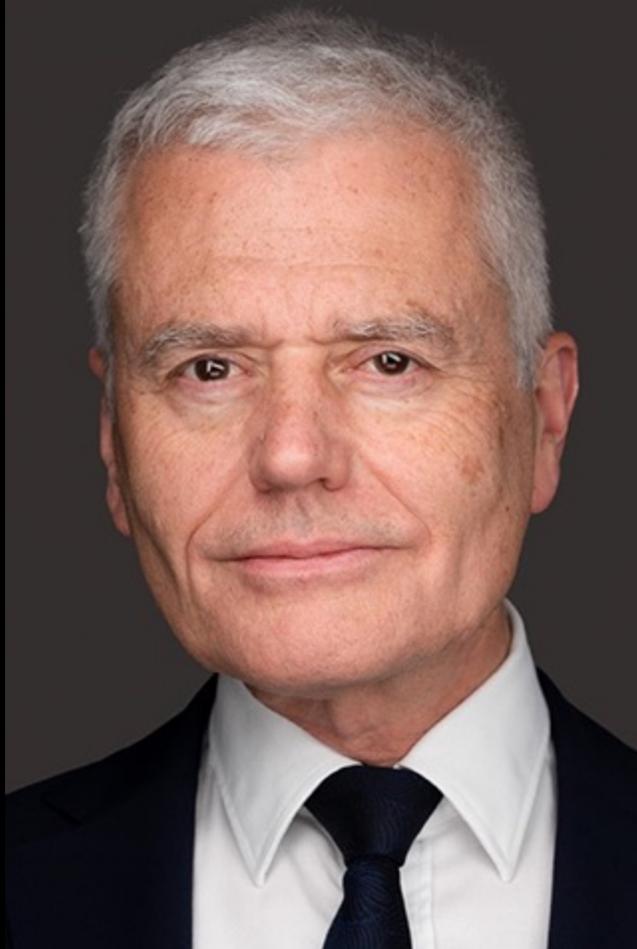
SPHEREX **GUSTO**
FÉRMÍ **XRISM***
STARBUST **CHANDRA**
WEBB **TESS**
ASPERA **HUBBLE** **ROMAN**
IXPE **GEHRELS SWIFT** **XMM-NEWTON***
PANDORA **ARIEL*** **PUEO**
EUCLID* **NUSTAR**
NOAA-20* **GLIMR** **MAIA** **TROPICS**
GPM **NISAR** **ESO-1, 2, 3, 4**
AURA **ICESAT-2** **SMAP**
TEMPO **CALIPSO** **OCO-2** **CLOUDSAT**
TERRA **TSIS-2** **RAD-SEED**
INCUS **BION***
AQUA **PACE**
CYGNSS
ECOSTRESS
EMIT
CLARREO-PF
OCO-3 **LIS** **GEDI** **TSIS-1**
APH **SAGE III**
PK-4 **EHD**
RR **MICRO**
DECLIC
LIBERA
SENTINEL-6 **MICHAEL FREILICH***
SENTINEL-6B*
GRACE-FO
PREFIRE
LANDSAT NEXT
LANDSAT 7, 8, 9
JPSS-2, 3, 4*
DSCOVr*
SWOT
GEOCARB
SUOMI NPP*
GOES-18*
THEMIS-ARTEMIS
HERMES
PEREGRINE-1~
1ST NOVA-C~
BLUE GHOST~
SERIES-2~
GRIFFIN-1~ & VIPER
2ND NOVA-C~
3RD NOVA-C~
LUNAR TRAILBLAZER
LUNAH-MAP
LRO
BIOEXPT-1
LEIA

PARKER SOLAR PROBE
SUNRISE **WIND** **SOLAR ORBITER***
IMAP **THEMIS** **STEREO**
TIMED **GEOTAIL***
HELIOSWARM **SOHO***
HINODE* **ACE**
ICON **GLIDE**
EUVST* **AIM**
GOLD
EZIE **IRIS**
MUSE **TRACERS**
MMS **SDO**
IBEX **PUNCH**
OSIRIS-REX/APEX
NEOWISE
NEO SURVEYOR
GEOSPACE DYNAMICS CONSTELLATION
MSR EARTH RETURN ORBITER*
MMX* **CURIOSITY**
MRO **SRL-SRH**
SRL-MAV **MAVEN**
ROSA LIND FRANKLIN* **MARS ODYSSEY**
PERSEVERANCE **PSYCHE**
INSIGHT **ESCAPADE**
MARS EXPRESS*
TRACE GAS ORBITER*
JANUS
EUROPA CLIPPER
JUICE*
LUCY
JUNO
DRAGONFLY
VOYAGER 1
VOYAGER 2
NEW HORIZONS

OPERATING & FUTURE
SCIENCE FLEET

EARTH ●
 HELIOPHYSICS ●
 PLANETARY ●
 ASTROPHYSICS ●
 BIOLOGICAL & PHYSICAL ●
 FUTURE LAUNCHES IN BOLD
 *PARTNER-LED
 *COMMERCIAL PARTNERSHIP

Introducing: Mark Clampin



- As of August 2022, Mark is the Director of Astrophysics at NASA
- Mark's background includes
 - Director of Sciences and Exploration at NASA Goddard
 - Director of the Astrophysics Division at NASA Goddard
 - JWST Observatory Project Scientist
 - Hubble ACS Detector Scientist and Group Lead at Space Telescope Science Institute
 - Technology development of telescope instruments including adaptive optics systems, coronagraphs and detectors
 - Research focused on the formation and evolution of planetary systems



EXPLORE SCIENCE

NASA Townhall

Dr. Mark Clampin

Astrophysics Division Director

NASA Science Mission Directorate

241st AAS Meeting

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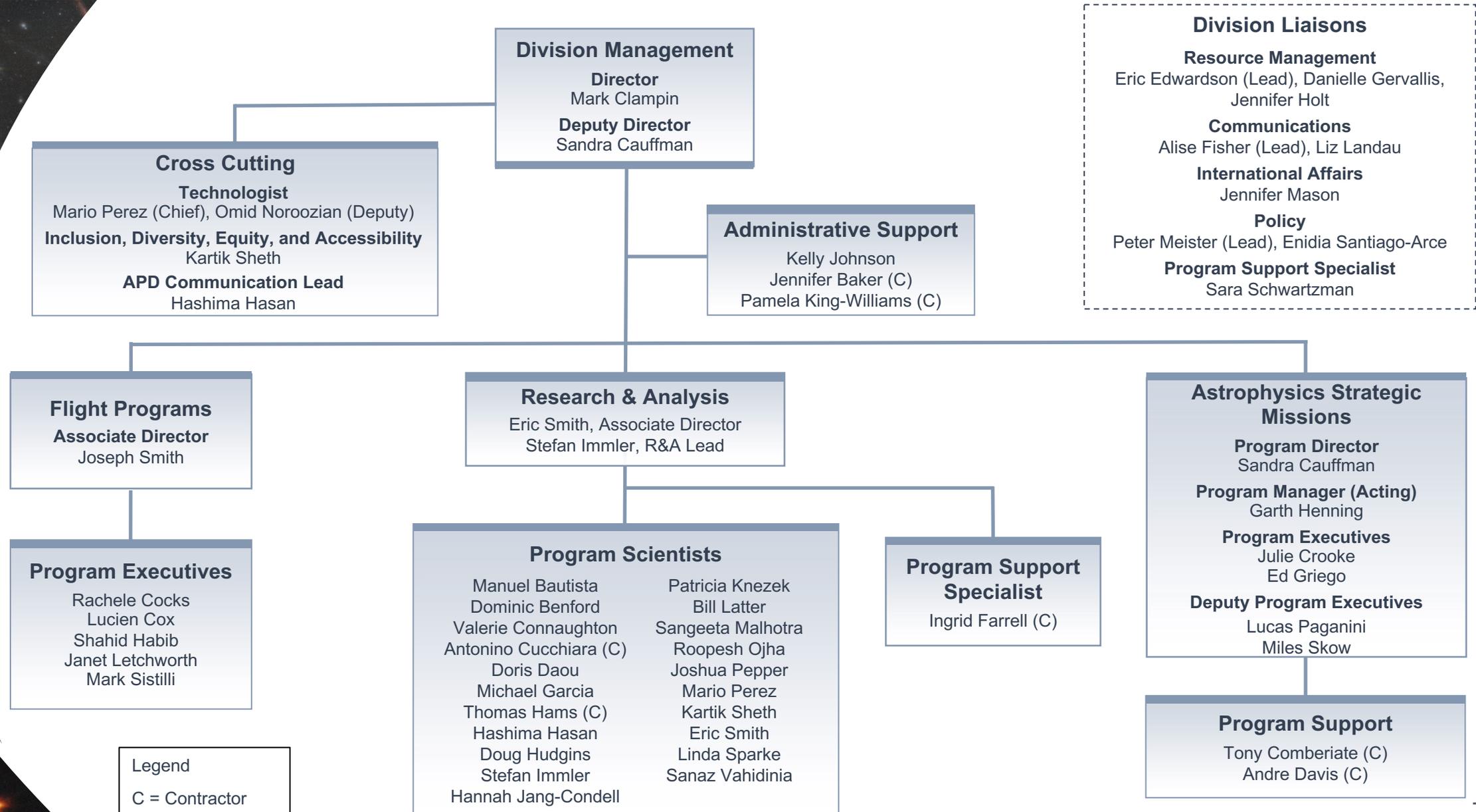
Agenda

- **NASA Astrophysics Team**
- **2022 - Year in review**
- **Astro2020 Decadal Survey**
- **Program Updates**
- **Summary**

Astrophysics Team



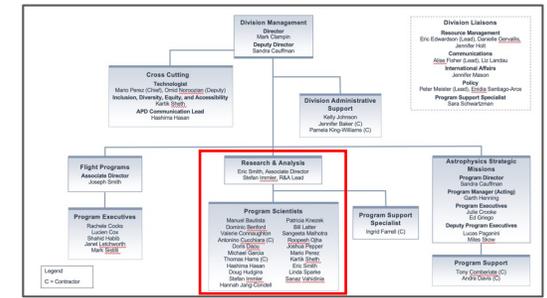
NASA Astrophysics Division



Research & Analysis

Eric Smith, Associate Director
Stefan Immler, R&A Lead

- | | |
|------------------------|--|
| Manuel Bautista | - Cosmic Origins |
| Dominic Benford | - Roman, Roman Coronagraph, Astrophysics R&A |
| Valerie Connaughton | - XRISM, ULTRASAT, XMM-Newton, High-Energy APRA, PhysCOS |
| Antonino Cucchiara (C) | - FINESST, NHFP, PhysCOS, and TDAMM |
| Doris Daou | - Euclid, Precursor Sci, APD PAO |
| Michael Garcia | - Hubble, Optical/Ultraviolet, CubeSats, Pioneers |
| Thomas Hams (C) | - GUSTO, Particle Astrophysics, Fundamental Physics, LISA prep sci, Balloon prog, APD Sounding Rocket prog |
| Hashima Hasan – | - NuSTAR, IXPE, ADCAR, APD Comm, APD SciAct, APD Citizen Science |
| Doug Hudgins | - SMD DAPR Dir, ExEP, Exoplanet Tech, Ariel/CASE |
| Stefan Immler | - Chandra, Spektrum X Gamma ART-XC |
| Hannah Jang-Condell | - TESS, Exoplanets Research, ExEP |
| Patricia Knezek | - SOFIA, Explorers Prog, Probe AO, NHFP |
| Bill Latter | - SPHEREx, Fermi, Lab Astrophysics |
| Sangeeta Malhotra | - Roman and Roman Coronagraph deputy |
| Roopesh Ojha | - NICER, Data lead, High End Computing, AI/ML, Social Media |
| Joshua Pepper | - ADAP ExEP, TESS |
| Mario Perez | - Swift, Roman Tech Fellows, SAT, ISFM |
| Kartik Sheth | - Athena, SPHEREx, APRA low energy, Balloon Prog Review, IDEA |
| Eric Smith | - JWST |
| Linda Sparke | - COSI, Astrophysics Sci Platform, 2021 MIDEX/MO AO |
| Sanaz Vahidinia | - ATP, AMDS |



Program Scientists are the senior NASA scientists responsible for the science content of an SMD Science investigation. They ensure that the science NASA selected is the science NASA gets and advocates at HQ for the science of the mission.

Cross Cutting

Technologist

Mario Perez (Chief), Omid Noroozian (Deputy)

Inclusion, Diversity, Equity, and Accessibility

Kartik Sheth

APD Communication Lead

Hashima Hasan

Cross Cutting: Staff are responsible for a managing and developing the technology programs, coordinating IDEA activities and programs, APD communications, in support of the division.

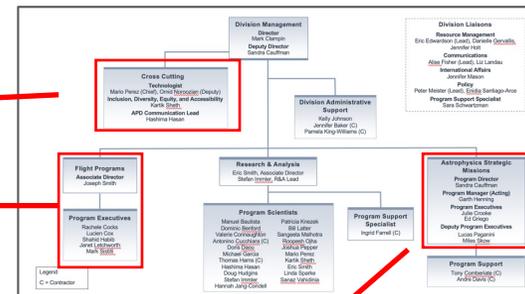
Flight Programs Associate Director

Joseph Smith

Program Executives

- Rachele Cocks - **Pioneers, CubeSats, TDAMM**
- Lucien Cox - **GUSTO, XRISM, SOFIA, ExEP prog**
- Shahid Habib - **LISA, Athena, Ariel/CASE, Euclid, Ultrasat, PhysCOS & COR progs**
- Janet Letchworth - **Operating Missions**
- Mark Sistilli - **COSI, SPHEREx, Balloon prog, Explorers prog**

Program Executives represent the mission for “up and out” HQ-level activities by tracking and reporting objectively on status, risk, and issues; advocate for the mission within SMD; manage and coordinate communication among project, stakeholder, and community members.



Astrophysics Strategic Mission Program

Program Director

Sandra Cauffman

Program Manager (Acting): Garth Henning

Program Executives:

- Julie Crooke (GOMAP)
- Ed Griego (Roman, Roman Coronagraph)

Deputy Program Executives

- Lucas Paganini (Roman, Roman Coronagraph)
- Miles Skow (Roman, Coronagraph)

The ASMP develops, launches, and operates large strategic observatories in accordance with NASA’s goals to understand the universe and our place in it.

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.)

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 various ROSES elements across all SMD divisions *
 2. Standard language for an IP will be included in Roses23 *
 3. Code of Conduct now adopted for panel reviews across all SMD divisions
 4. Statement of Principles adopted for NASA Astrophysics (see next slide)
 5. Dual Anonymous Peer Reviews adopted across all SMD divisions
 6. Inclusion Criteria in Senior Reviews of Missions adopted across all SMD divisions *
 7. Increasing diversity of reviewers for all panels expected across all SMD divisions
 8. Collection, evaluation, and publication of demographics (ROSES) *
 9. Regularly report data on proposal submissions and success rates *
 10. SMD Bridge Program funded for better engagement with MSIs *
<https://science.nasa.gov/smd-bridge-program>
 11. New approach to Community Engagement

* Responsive to an
Astro2020 Decadal Survey
recommendation

NASA Astrophysics Statement of Principles

Purpose of this Statement of Principles:

The purpose of the Statement of Principles is to help NASA Astrophysics carry out community best practices to create an inclusive work environment. This document is not intended to nor can be a legal document, but rather a tool in the toolbox to shape crucial conversations around problematic actions.

Applicability:

- NASA Astrophysics personnel at NASA Headquarters (HQ) as well as NASA Astrophysics' Program Offices (POs) and associated support personnel, regardless of employer.
- Those who participate in meetings sponsored by NASA Astrophysics, such as conferences, workshops, panels, and Program Analysis Group (PAG) meetings.

<https://science.nasa.gov/astrophysics/documents>

All activities organized or sponsored by NASA Astrophysics, such as meetings and panels, should adopt a code of conduct.

In addition, there are best practices that are described in the following 5 areas:

- 1) Professional Conduct
- 2) Communication
- 3) Training
- 4) Maintaining a Safe Space
- 5) Reporting

Community Engagement

In CY 2023, we plan to launch a virtual/in-person road tour with APD leadership and staff.

- Provide an overview of NASA Astrophysics
- Listen to community members about their questions, concerns and suggestions on APD Plans
- Discussion and input on APD strategy and implementation of the Decadal priorities
- Expand the footprint of the scientific and technology community engaged in work with APD.

We are especially interested in engaging and expanding our partnerships with historically excluded institutions, groups, communities and organizations.

Process:

- a) Email pamela.j.king-williams@nasa.gov if you are interested in hosting a virtual visit.
- b) We want to encourage the hosts to reach out and coordinate with other neighboring institutions when appropriate, especially for in-person visits.

Stay Connected with the Astrophysics Division

- NSPIRES mailing list – information about NASA solicitations
<https://nspires.nasaprs.com/>

Cosmic Origins, Exoplanet Exploration, Physics of the Cosmos mailing lists.

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)

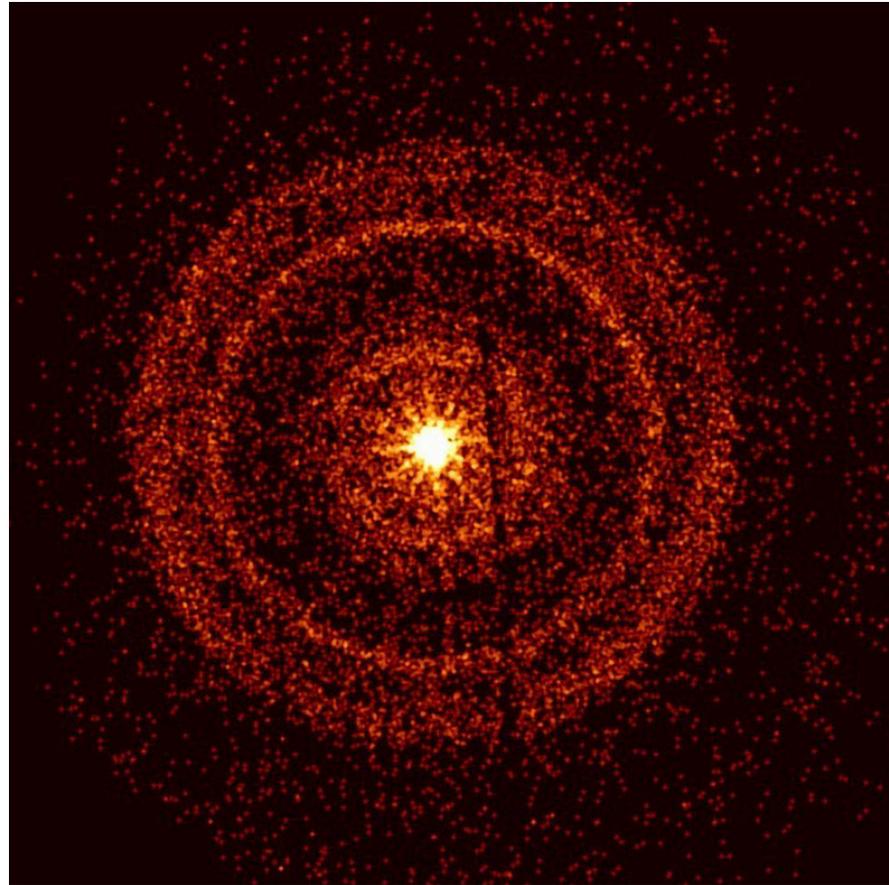
<https://www.nsf.gov/mps/ast/aaac.jsp>

Sign up to be a panel reviewer: <https://science.nasa.gov/researchers/volunteer-review-panels>

2022 - Year In Review

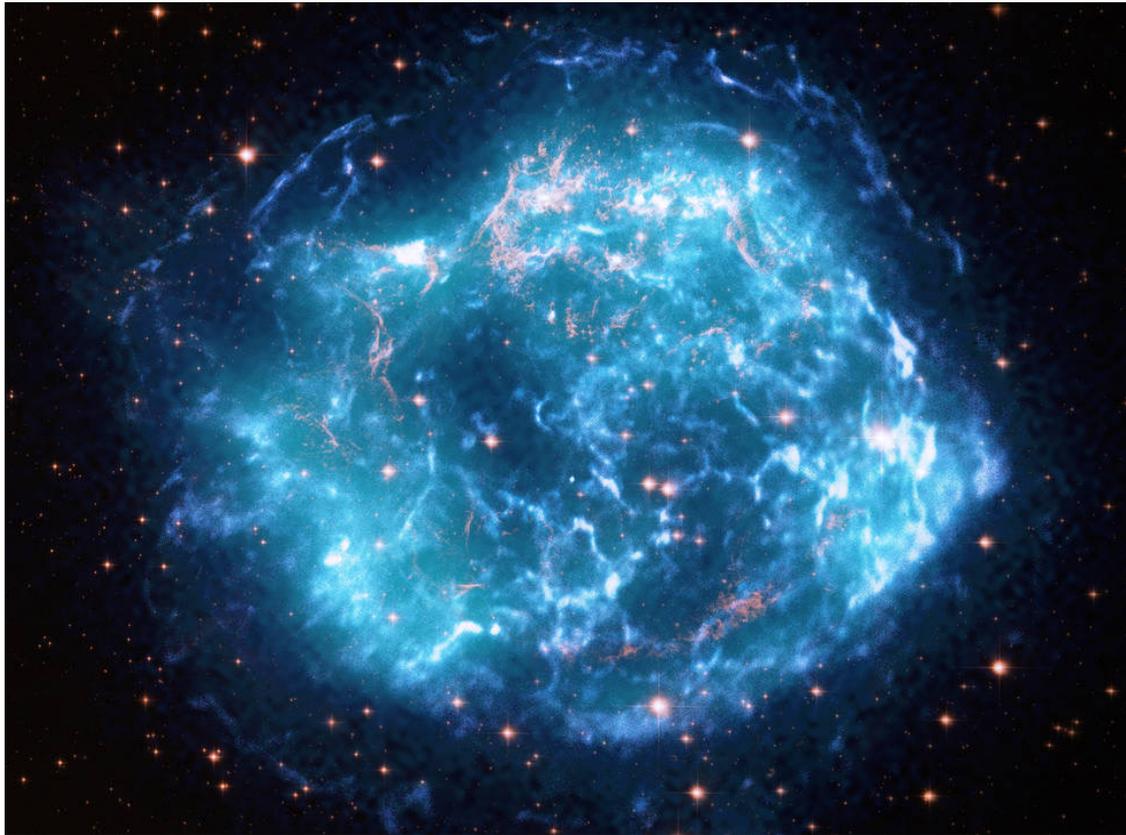


GRB 221009a was the brightest and closest gamma-ray burst we've yet seen !

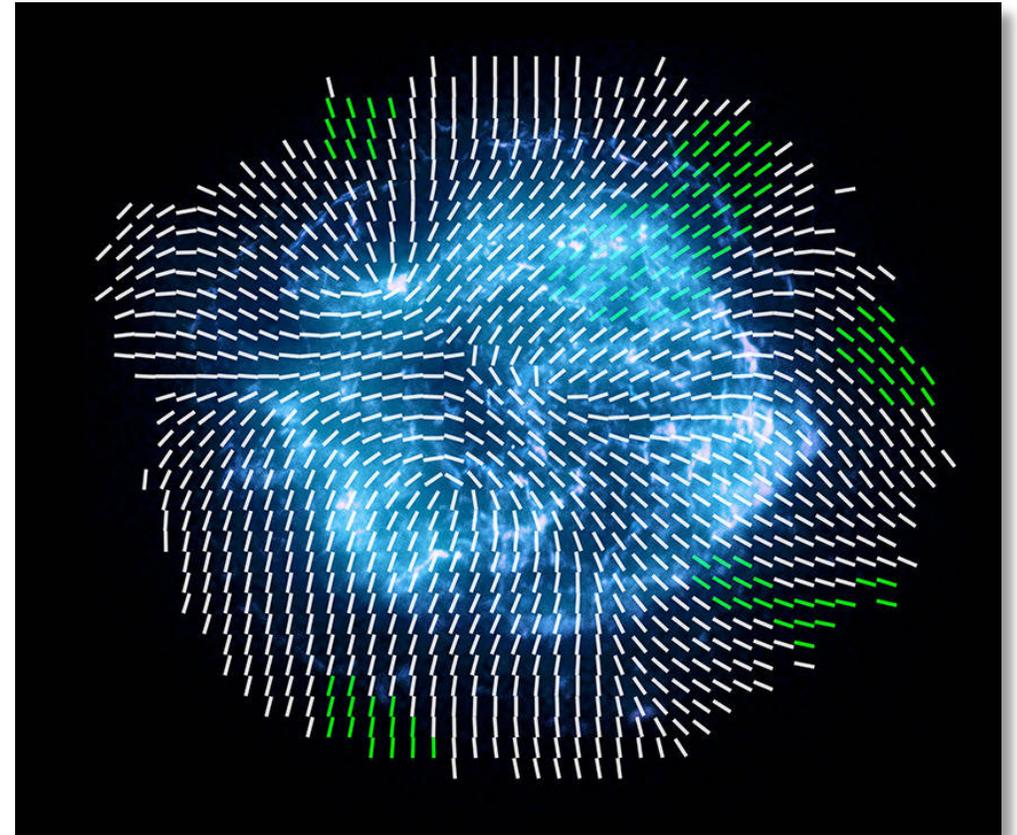


**SWIFT Image Credit: NASA/Swift/A. Beardmore
(University of Leicester)**

NASA's Imaging X-ray Polarimetry Explorer (IXPE) investigation of the supernova remnant Cas A



Credits: X-ray: Chandra: NASA/CXC/SAO, IXPE: NASA/MSFC/J. Vink et al.; Optical: NASA/STScI



Credits: X-ray: Chandra: NASA/CXC/SAO; IXPE: NASA/MSFC/J. Vink et al.

TESS

TESS: Transiting Exoplanet Survey Satellite

Planet Count: 285 confirmed planets

- 104 with radii $< 2.5 R_{\text{Earth}}$
- 176 with radii $> 2.5 R_{\text{Earth}}$
- 5 w/unknown radii
- 6,137 candidate planets

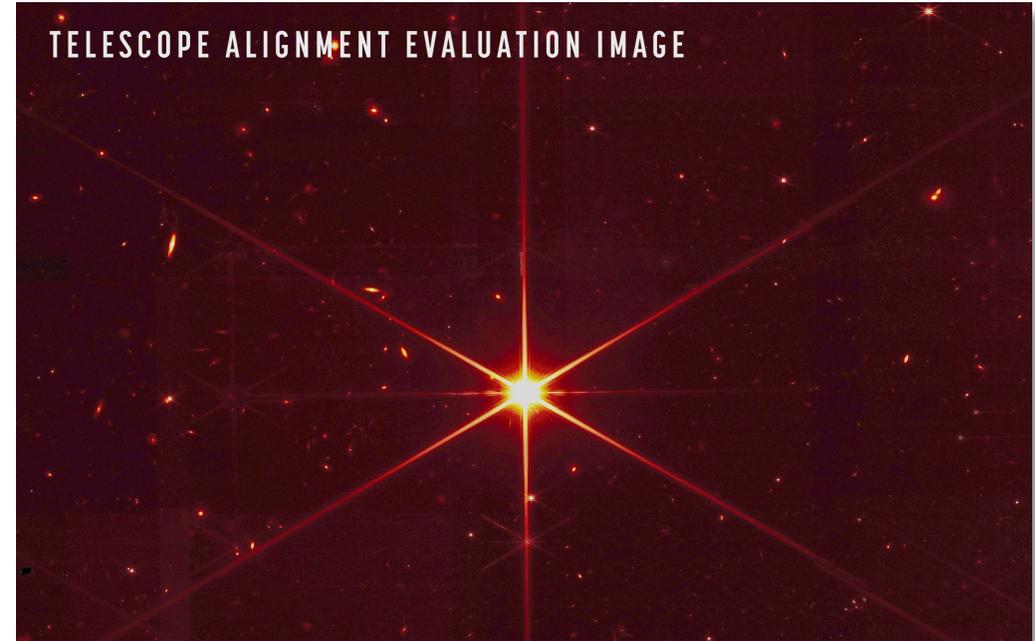
Publication Count: 1371 submitted, 1167 peer-reviewed
(40% exoplanets, 60% astrophysics)

**TESS has officially surpassed
1,000 peer-reviewed
publications!**

One year from JWST Launch



**JWST was launched on an Ariane 5
Dec 25, 2021. Credit: NASA/Chris Gunn**



JWST's first light image with 18 mirror segments phased

2023 Plans

- Science Operations
- 15-Jan-2023 Cycle 2 proposals due
- 15-Nov-2023 Cycle 3 proposal call release

JWST Performance Metrics

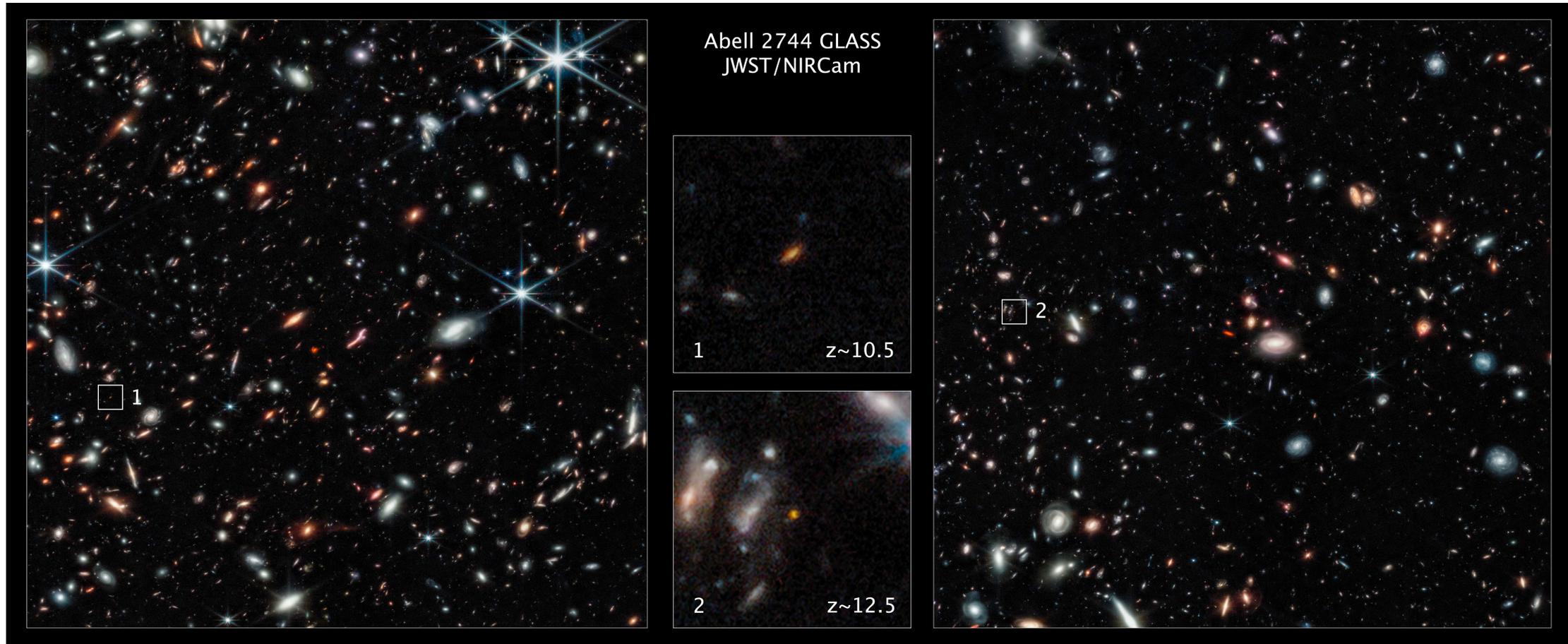
- **Lifetime:** > 2x initial goal (10 yr), 4x requirement based on propellant
- **Diffraction limit:** 1.1 μm vs 2 μm requirement
- **Sensitivity:** ~35% better than requirement (NIRCam W)
- **Pointing Stability:** Factor of ~6-7 better than requirement (achieving 1 mas)
- **Photometric Stability:** better than 1%
- **Thermal Stability:** within 40mK noise of the sensors
- **Moving Target Tracking:** > 2x required rate (req:30 mas/sec)
- **Backgrounds:** NIR (lower than predicted), MIR (as predicted)
- More details of observatory performance will be discussed in the JWST Town Hall
 - Tonight at 6:30pm

Protostar within the Dark Cloud L1527



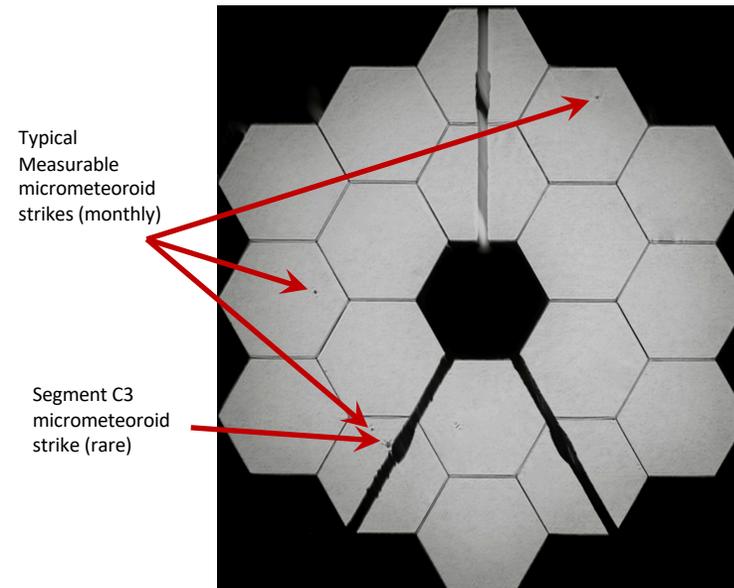
Credits: NASA, ESA, CSA, and STScI. Image processing: J. DePasquale, A. Pagan, and A. Koekemoer (STScI)

Abell 2744 - GLASS



JWST: Micrometeoroid Status

- The rates of micrometeoroids hitting the primary mirror are consistent with pre-launch predictions
 - Total of 21 micrometeoroid impacts that had a measurable change in wavefront error since launch
- Of those measurable, all but one are consistent with error budget allocations for micrometeoroid effects over expected prime lifetime
- Between May 22nd-24th we had a larger than expected strike on segment C3, increased system wavefront from 50 to 59 nanometers rms, versus a requirement of 150nm.
- Optical performance still exceeds requirements even with these micrometeoroid impacts

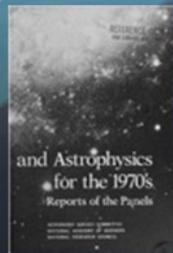


**Astro2020
Decadal Survey**

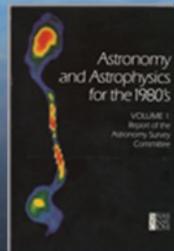


Astrophysics

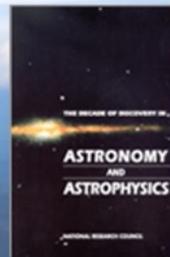
Decadal Survey Missions



1972
Decadal
Survey
Hubble



1982
Decadal
Survey
Chandra



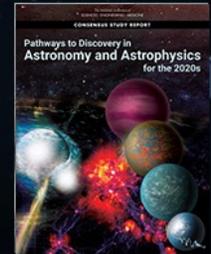
1991
Decadal
Survey
Spitzer



2001
Decadal
Survey
Webb



2010
Decadal
Survey
Roman



2021
Decadal
Survey

Roman Space Telescope

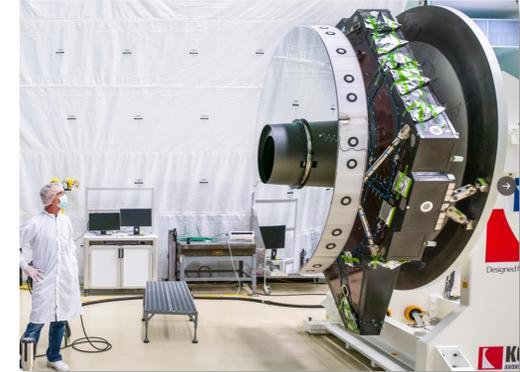
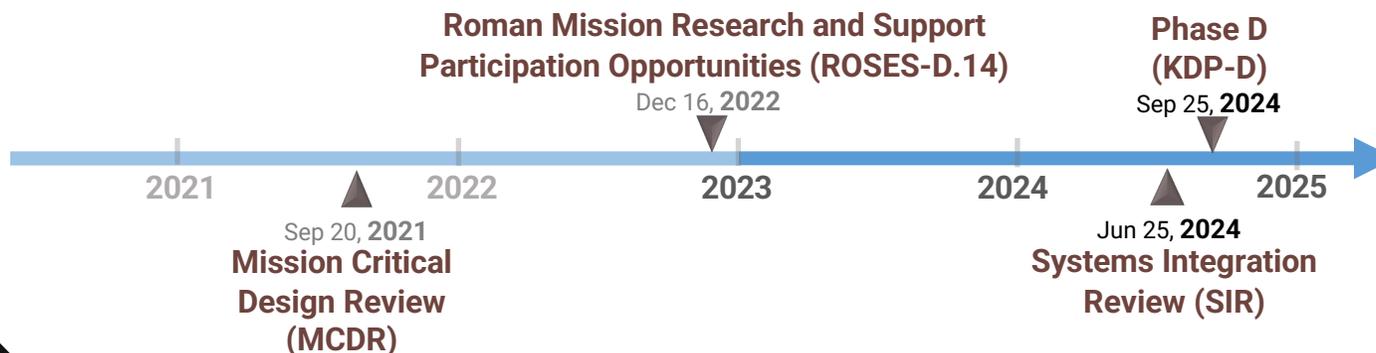
Features

- Determine the **nature of the dark energy** that is driving the current accelerating expansion of the universe
- Perform statistical **census of exoplanetary systems** through microlensing survey
- Survey the **NIR** sky with unprecedented sensitivity, scale, and efficiency

Status

- **Heritage telescope hardware** inherited from another program
- **Element Wheel Assembly** installed and aligned
- **Focal Plane Assembly** built, aligned and currently completing TVAC test
- Flight simplified Relative Calibration System assembled and **completing environmental testing in January 2023**

Important Milestones



Roman Coronagraph Instrument

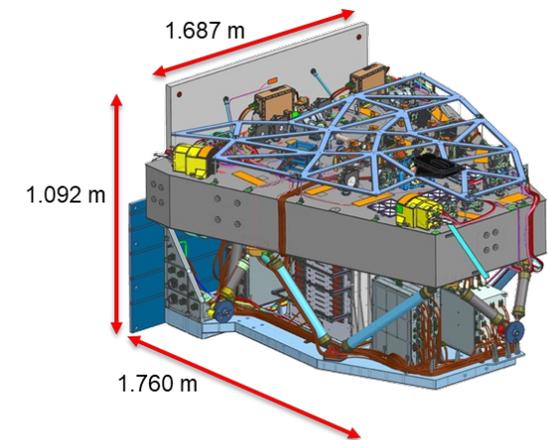
Features

- Able to directly image gas giant exoplanets; **pathfinder for future exo-Earth characterization**
- Employs **active optics** to achieve **1000× better** planet-to-host-star flux ratio
- **One of the two instruments** onboard the Roman Space Telescope (RST)

Status

- All **flight subsystems** have been completed
- All **flight optics** integrated onto the Optical Bench
- **Deformable mirrors** prepared for installation on Optical Bench (Jan 2023)
- Electronic boxes mounted to deck & tested; flight software functional testing ongoing; **w/full testing summer 2023**

Important Milestones



Astro2020 Key Recommendations

Key Mission Recommendations

Near- Infrared/Optical/Ultraviolet 6-m telescope with high-contrast imaging capability

- Image and characterize earth-like exoplanets w/compelling astrophysics program
- Formulate in second half of decade

Great Observatories Mission and Technology Maturation Program (GOMAP)

- IR/O/UV (first half of decade), far-IR and X- ray (second half of decade) missions

Space-based time-domain and multi-messenger counterparts program (*TDAMM*)

Astrophysics Probe Mission

End SOFIA operations by 2023

Astro2020 Acronyms

GOMAP – Great Observatory technology Maturation Program

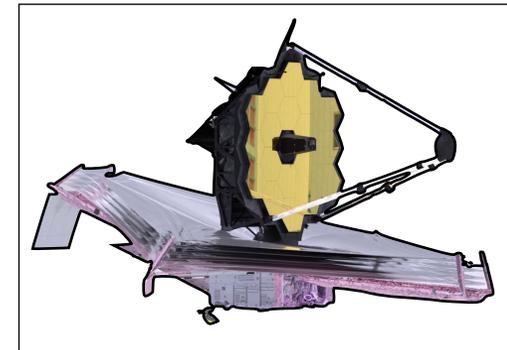
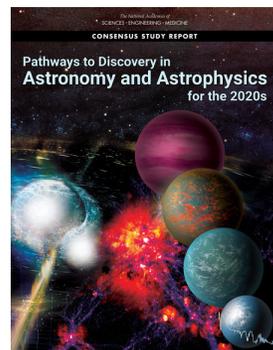
TDAMM – Time Domain Astronomy and Multi Messenger counterpart

Astro2020 Primary Recommendation

- Infrared / Optical / UV space telescope with ~ 6 -m inscribed diameter to search for life on exoplanets and enable transformative astrophysics

The Habitable Worlds Observatory

- Primary technical requirements for coronagraphic survey are:
 - System-level stability at \sim picometer-level
 - Coronagraphic contrast $\geq 10^{10}$
- Strategic guidance



The Habitable Worlds Observatory

- Working name identifies:
 - Primary science goal – survey nearby stars for habitable planets and characterize them for evidence of life (biosignatures)
 - Observatory – conducts general astrophysics program.
- Decadal Survey also recommends X-Ray and Far-IR future great observatory with investments to begin towards the end of the decade
 - APD will maintain X-Ray/far-IR technical capabilities this decade via:
 - SAT and APRA program investments
 - Probe and Explorers programs

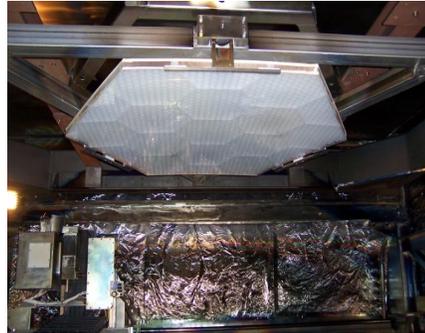
The Habitable Worlds Observatory: *The Big Picture*

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

Astrophysics Technology Investments

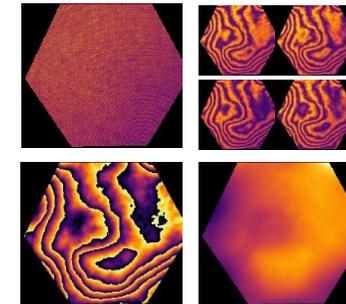
- System-level picometer stability

Lightweight ULE mirror segment



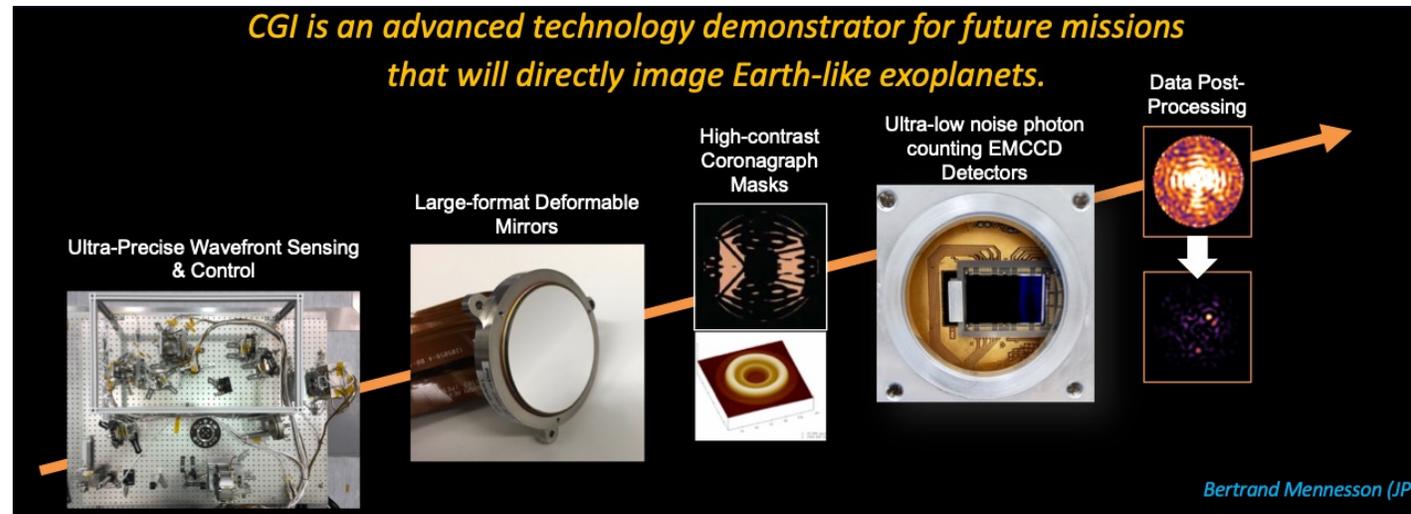
Credit: L3/Harris

Picometer-scale dynamics measured with high-speed interferometry



Credit: NASA GSFC

- High Contrast Imaging



GOMAP

Stage 1: HQ Preparation

Establish GOMAP plans and policies

Stage 2: Habitable Worlds Observatory Concept Maturation Study

Analyze architecture options; Mature enabling technologies;

Stage 3: Evolved Pre-Phase A for Habitable Worlds Observatory

*Establish mission architecture; Execute design trades; Mature technologies;
Maintain technical capabilities for Future Great Observatories (FGOs)*

Stage 2: HWO Concept Maturation Study

GOMAP HQ Leadership Team

Independent
Consultants

Habitable Worlds Observatory

Selection of Science, Technology, Architecture Review Team (START)

- Members selected from US science and technology communities
- Explore Astro2020 science objectives; break down one or more levels
- Analyze mission architecture options
- International ex-officio representatives included
- Support available for START members in recognition of community service
- Logistical support provided by NASA Program Offices
- Engineering / science analysis support provided by NASA & Science Centers

Community

Decadal Recommendation for Astrophysics Probe

- NASA has issued a draft AO for a PI-led Astrophysics Probe
- The target date for the final Probe AO was revised to July 2023
- Due to European Space Agency (ESA) consideration of whether the Athena mission will be substantially replanned, it was no longer practical to require proposed X-ray probes to “complement ESA’s Athena Observatory.” This requirement was therefore removed. Astrophysics will now accept proposals for:
 - A far-infrared imaging and/or spectroscopy mission
 - An X-ray probe
- Community announcements and FAQ at <https://explorers.larc.nasa.gov/2023APPROBE/>

Release of draft AO:	August 2022
Release of final AO:	July 2023 (target)
Proposals due:	NET 90 days after AO release

Time-Domain and Multi-Messenger Astrophysics: I

- 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 (capabilities).
 - 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 will be a game changer for TDAMM
 - New NASA missions address need for continuous monitoring for transients (X-Ray, γ -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: II

- 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
- PhysCOS/COR hosted TDAMM workshop in Annapolis, MD.
 - White Paper recently delivered and posted
 - https://pcos.gsfc.nasa.gov/TDAMM/docs/TDAMM_Report.pdf
 - International agency meeting identified areas of collaboration
 - International working group will be set up in 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
 - <https://pcos.gsfc.nasa.gov/TDAMM/>

Program Updates



Budget

- Omnibus appropriations budget for astrophysics
 - FY23 - \$1,510.0M
 - FY23 represents a ~4% reduction compared to FY22
 - Operating plan is under development
- Highlights
 - Roman is fully supported
 - Additional Webb General Observer funding
 - Supporting Great Observatory Precursor Science & GOMAP activities
 - Astrophysics Probe mission; AO release in July 2023
 - Time Domain Astrophysics infrastructure systems for Decadal Survey
 - SOFIA close out with budget recommendation of \$30M closeout funding in Omnibus bill
 - Maintains a healthy R&A program
 - Extended Phase B for COSI, with delayed development for next MIDEX
 - Slowed overall implementation of primary Decadal Survey recommendation

Paths for Community Engagement with Roman

- Help define and shape core community surveys
 - Submit science pitch and/or white paper for Core Community Survey definition
 - **Deadline Feb 2023, low bar to entry to encourage high participation**
 - White papers - science case, sketch of survey design and methods/metrics on how to evaluate science metric against survey parameters
 - **Deadline summer, detail enables more meaningful evaluation**
- Actively engage with mission partners on Roman technical topics
 - Join Roman Technical Working Groups
 - Groups pursuing topics of interest across many science areas
 - Two groups (calibration, software) w/ more after ROSES proposal selection
 - **Simple web sign up page, rolling deadline, open to all**
- Obtain funding to prepare for and enhance Roman Science
 - Submit proposal to Roman ROSES solicitation
 - Funding to work on Roman science preparation (including engagement in technical working groups and survey definition)
 - **Deadline March 21**

https://roman.gsfc.nasa.gov/using_Roman_Space_Telescope.html#engage

SOFIA Closed on a High Note!

- SOFIA ended science operations September 29, 2022
- The plane completed its final flight to Arizona on Dec 13th, where Pima Air & Space Museum in Tucson, AZ will prepare to exhibit it.
- An operations closeout plan and schedule was developed to define the closeout activities that will take place from FY2023 – FY2025
- A science closeout plan and schedule was developed and is being executed – expected completion is end of September 2023
 - Data from all SOFIA observing cycles are now archived at IRSA
 - Data from Cycles 5-9 will be reprocessed with the latest pipeline and archived at IRSA
 - Relevant documents, tutorials, webinars, and data tools will be also archived at IRSA
 - Bridge support provide for early career SOFIA staff scientists
 - Science instruments will be dispositioned according to either pre-existing agreements or through the federal disposition process
- SOFIA EXES and FORCAST archival data presentation at the NASA data demo booth on Monday at 5:30 p.m. PST.
- SOFIA hyperwall presentation at NASA booth on Wednesday at 9:20 a.m. PST



Balloon Program

- In response to the Astro2020 Decadal Survey recommendation, the Balloon Program Independent Review Subcommittee (BPIRS) of Astrophysics Program Advisory Committee (APAC) has been established with a report due in 18 months.
- NASA will use the Review findings to assess the funding and mission model of the Balloon Program.
- NASA will also use the findings from this Review to:
 - Define an implementation approach and mission model to achieve SMD science goals and astrophysics strategic objectives;
 - Prioritize the activities of the Balloon Program to maximize flight rates and science return;
 - Leverage the capabilities of commercial suborbital platform and system providers; and
 - Issue initial funding guidelines for the Balloon Project and payload development programs including the suborbital investigations elements within the APRA program.
- The Subcommittee will prepare a report that includes findings and recommendations to assist the Astrophysics Division implement a more effective Balloon Program

Balloon Program

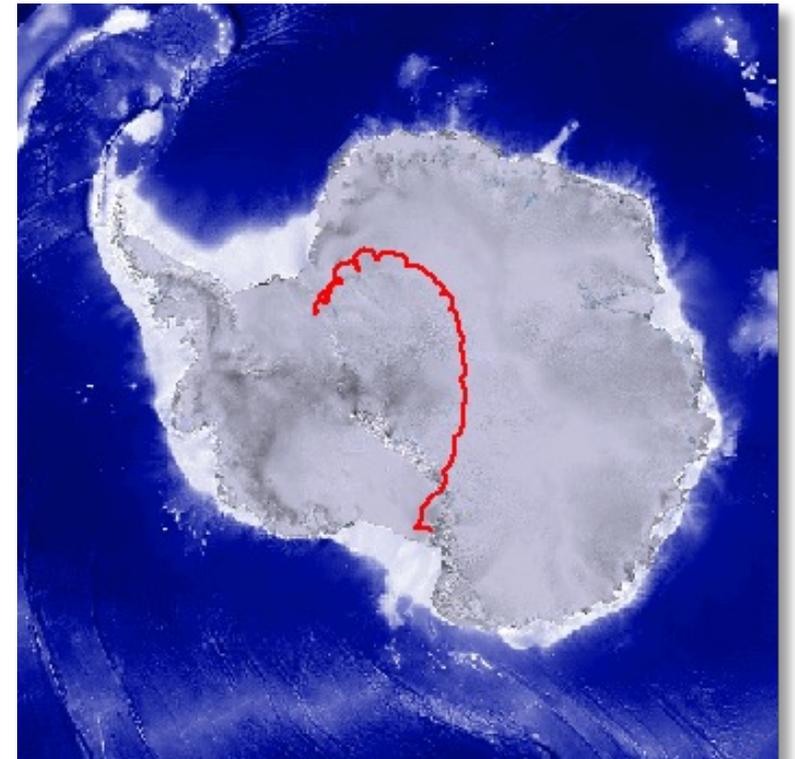
During 2022, NASA has successfully implemented a scientifically productive Balloon Campaign.

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



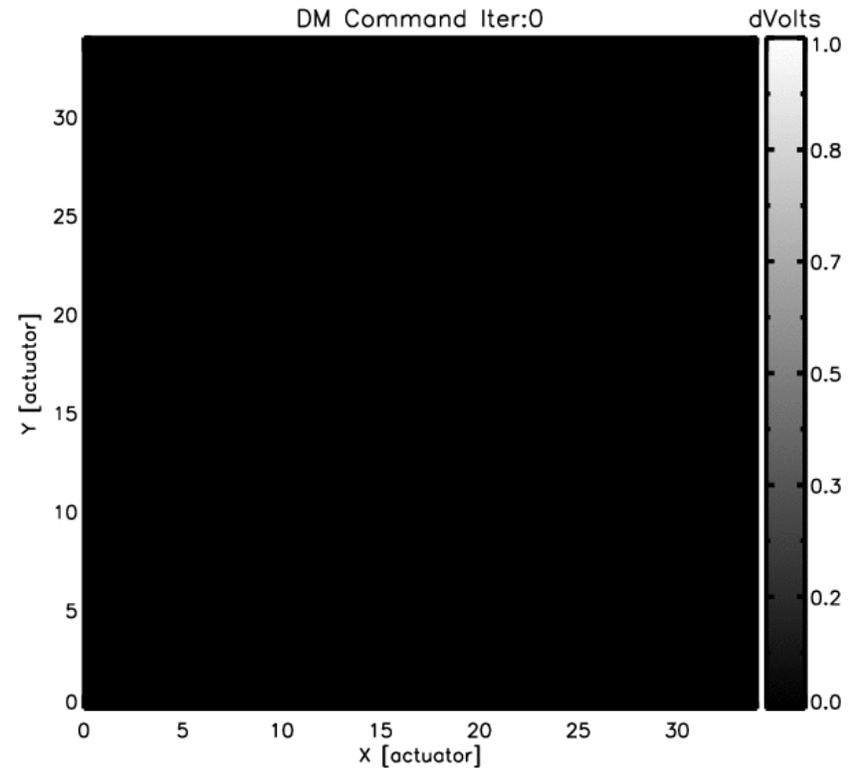
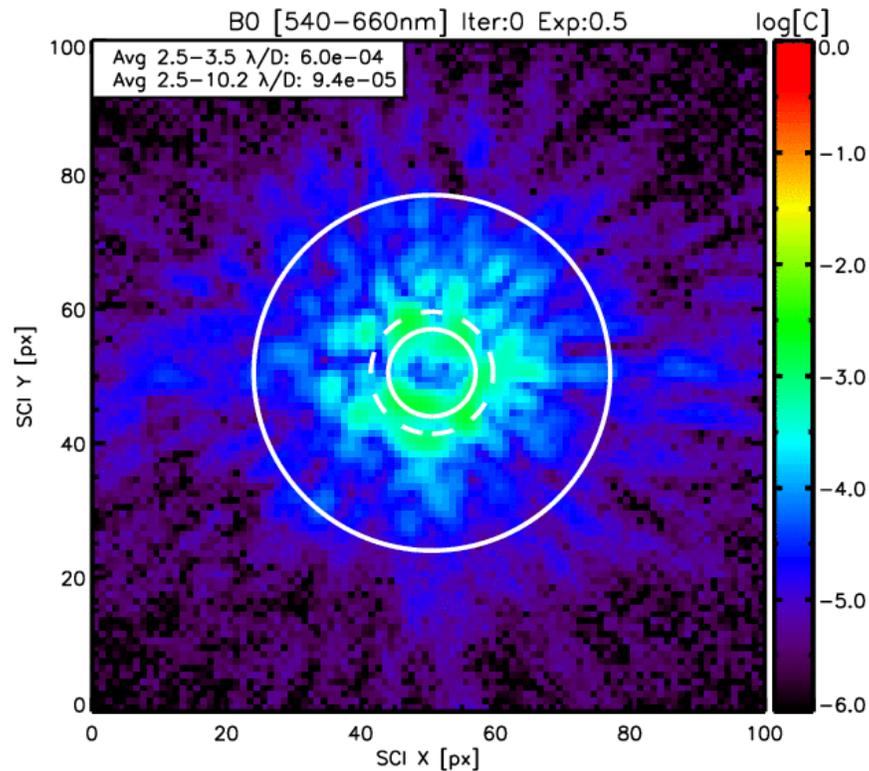
Filippini et al., U. Illinois

SPIDER Balloon flight track over Antarctica



PICTURE-C: Balloon-Borne Coronagraphy

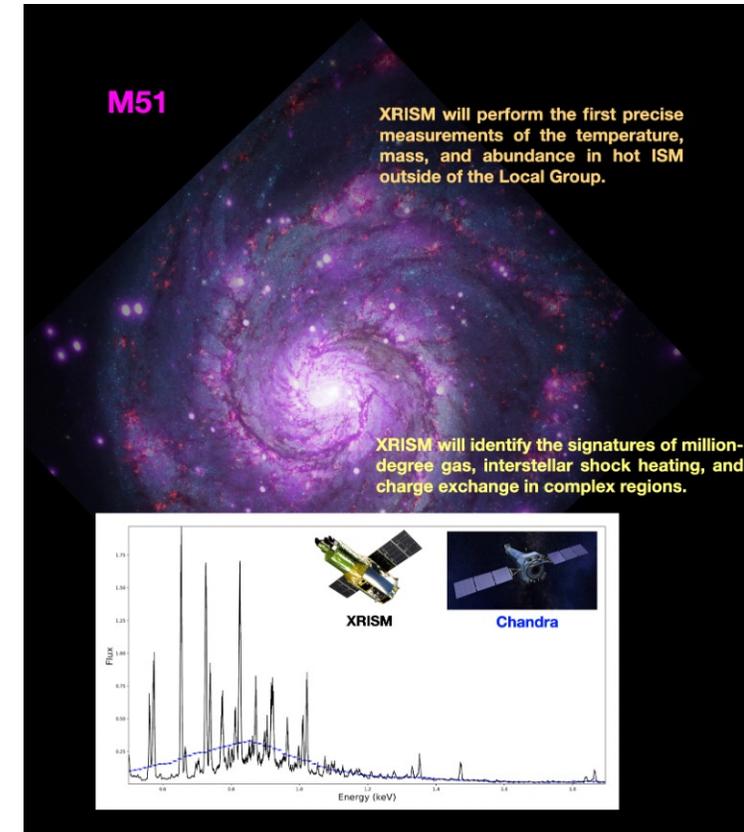
- The first on-sky coronagraph dark hole created in a space-like environment



Chakrabarti et al. - U Mass Lowell

X-ray Imaging and Spectroscopy Mission XRISM

- This JAXA-led mission with major contributions from NASA will investigate celestial X-ray objects with high-resolution spectroscopy and high-throughput imaging.
- Instruments fully integrated onto the spacecraft including NASA Resolve MicroCalorimeter and X-ray Mirror Assemblies.
- Spacecraft environmental testing underway in preparation for launch in Spring 2023
- 21 XRISM Guest Scientists selected by NASA in ROSES-2022 call will participate in Performance Verification science with XRISM Science Team and Guest Scientists selected by JAXA and ESA
 - General Observer call (AO-1) to be issued in months after launch
 - Visit the XRISM Booth at AAS 241.



Status of Athena

- **Athena is an ESA and NASA partnership**
 - Athena will map hot gas structures and determining their physical properties, search for supermassive black holes in the Hot and Energetic Universe
- **Status**
 - ESA initiated Mission Reformulation Study to reconfigure the mission in order to constrain the cost. Study to be completed late 2023
 - NASA may have to reprioritize its commitment and proposed contributions based on the outcome of the mission reconfiguration
 - Dr. Rachel Osten (STScI) and Dr. Lia Corrales (U. Michigan) are serving as NASA appointed US representatives to the New_Athena Science Reformulation Team.
 - Dr. Andy Ptak (GSFC) serves as the NASA representative on the New_Athena Mission Reformulation Team.

ULTRASAT

- **ULTRASAT:** a wide-field (>200 sq deg) UV survey & transient detection mission will be located at the geostationary orbit.
- NASA providing commercial launch ~ June 2025 for a 3-yr prime mission to geo-transfer orbit
 - Data public at IPAC following 12-mo exclusive data use period
 - Public alerts within 20-min of trigger.
- **Science:** main focus on gravitational wave sources, supernovae, variable and flare stars, and time domain astronomy.
- **Status**
 - ULTRASAT mission CDR completed in April 2022
 - NASA and ISA MoU is currently under negotiation.
 - NASA Flight Planning Board gave approval on September 8, 2022 to proceed with commercial launch
 - US Participating Scientist program ROSES-22 call is ready for release
 - **Splinter session: "Introducing ULTRASAT" Wed 9:30**



Explorer Missions

- The Astrophysics Division remains committed to the Explorers program and maintaining the cadence of missions as recommended by Astro2020
- Small Explorer (SMEX) missions typically open a new window on the cosmos by flying the first mission with a new capability
- Medium Explorer (MIDEX) missions are expected to address a focused science program to:
 - Provide greatly enhanced capability to make a “deeper dive” to address a focused science program, and also
 - Return a data set with broad value to the science community
- For the updated information please consult:
 - <https://explorers.gsfc.nasa.gov>

2022 Explorer Competitive Step-2 Studies

- MIDEX/MO selections

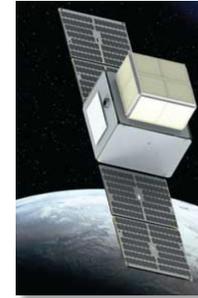
- **UltraViolet Explorer (UVEX):** Deep imaging survey in two bands of ultraviolet light, plus R~1000 spectroscopy, to provide new insights into galaxy evolution and the lifecycle of stars. UVEX distributes alerts for transient sources within 1 hour, follows up alerts within 3 hours.
UVEX Principal investigator: Fiona Harrison (Caltech)
- **Survey and Time-domain Astrophysical Research Explorer (STAR-X):** Sensitive wide-field X-ray surveys with < 5 arcsec imaging. STAR-X can respond within 2 hours to point X-ray and UV telescopes at transient cosmic sources.
STAR-X Principal investigator: William Zhang (GSFC)
- **Moon Burst Energetics All-sky Monitor (MoonBEAM):** From its lunar-resonant orbit, MoonBEAM sees almost the whole sky at any time, watching for bursts of gamma rays from distant cosmic explosions and providing rapid alerts.
MoonBEAM Principal investigator: Chuimun Michelle Hui (MSFC).
- **Large Area burst Polarimeter (LEAP):** Mounted on the ISS, LEAP studies gamma-ray bursts from the energetic jets launched during the formation of a black hole after the explosive death of a massive star, or in the merger of compact objects.
MO Principal investigator: Mark McConnell (University of New Hampshire)

Astrophysics Pioneers

- \$20M PI cost cap excluding launch, ROSES 2020 (4 selections) ROSES 2021 (1 selection)
ROSES 2022 NOI due Jan 26, Proposals due March 16



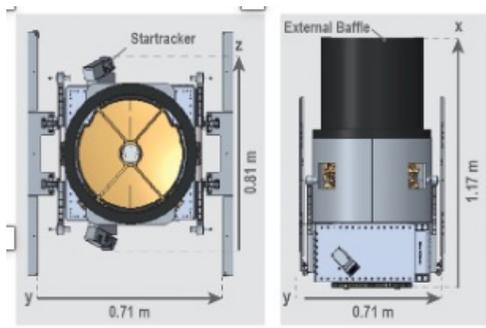
PUEO: A Long-duration Balloon-borne Instrument for Particle Astrophysics at the Highest Energies,
PI Abigail Vieregg, U Chicago
Launch: ~2024/2025



StarBurst: Gamma-ray ASM, Simultaneous detection of NS/NS mergers with LIGO,
PI Daniel Kocevski MSFC
Launch: ~2025



Aspera: IGM Inflow/outflow from galaxies via OVI 10^5K emission line imaging.
PI Carlos Vargas, U. Arizona
Launch: ~2025



Pandora: Multiwavelength Characterization of Exoplanets and their Host Stars,
PI Elisa Quintana, GSFC
Launch: ~2025



TIGERISS: measuring ultra-heavy (r-process) cosmic rays on International Space Station
PI Brian Rauch, Wash Univ.
Launch: ~2025

ROSES-23 Astrophysics Research Elements

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	IP	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
LISA Preparatory Science	LPS	IP	
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
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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.

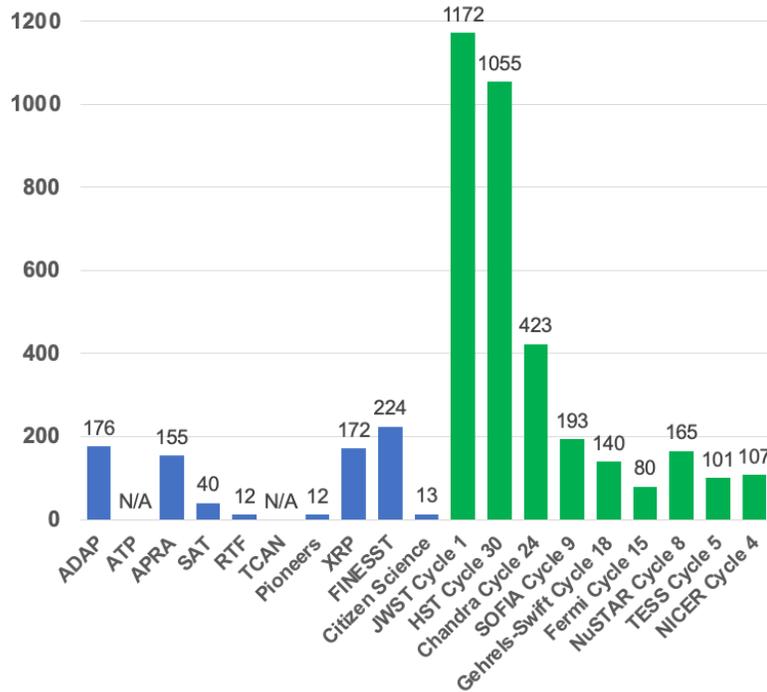
Inclusion Plan pilot program will continue in ROSES-23 (to be released Feb 2023) but likely not expand till later.

DAPR: Proposals evaluated using dual-anonymous peer reviews.

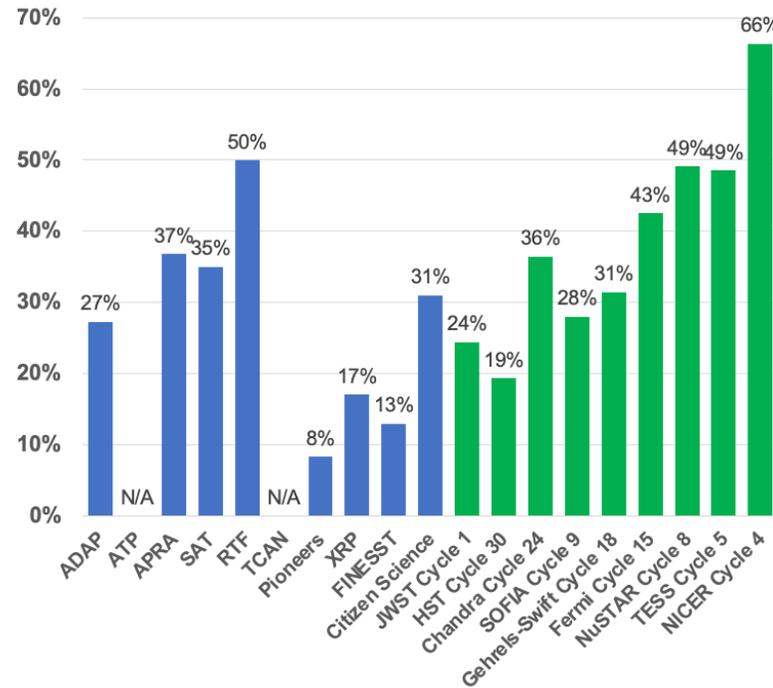
Astrophysics R&A Selection Rates

September 2021-2022

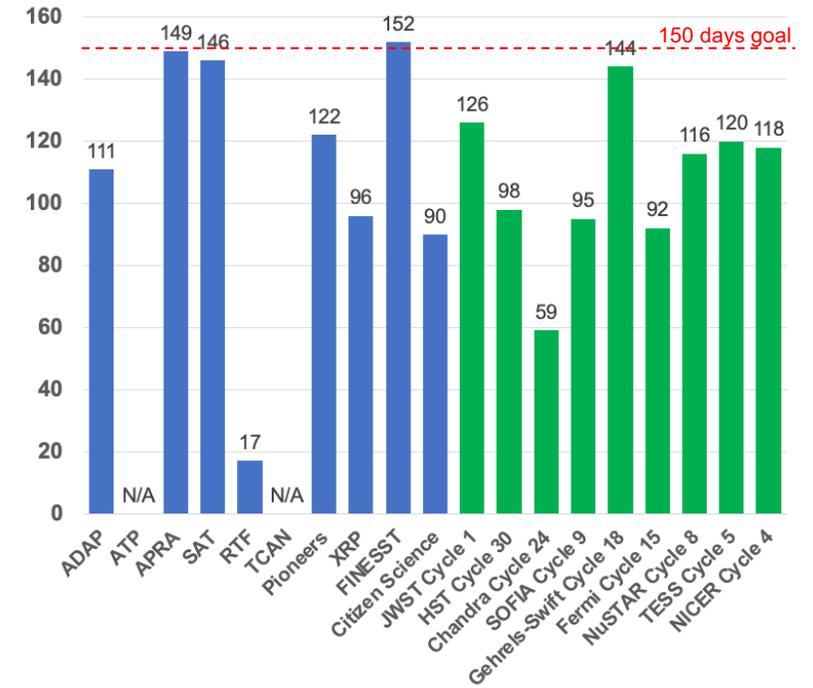
Number of Proposals



Selection Rates



PI Notification (Days)



R&A: 804 proposals
 GO/GI: 3,436 proposals
 Total: 4,240 proposals

R&A: 22% (19% last year)
 GO/GI: 28%
 Average: 27%

80% of PI notification:
 R&A: 125 days
 GO/GI: 109 days

* Only programs with selections made and PIs notified

Open Science: SMD Information Policy



- Year of Open Science
- NASA's Science Mission Directorate (SMD) has released an updated version of its Science Information Policy, SPD-41a
- Astrophysics is finalizing its own Science Information Policy that aligns with SPD-41a and is tailored to our community
 - Our credo continues to be “do no harm, enable, and incentivize”
 - Compliance applies to *scientifically useful* publications, data, and software
 - Each SMD division defines or provides guidance for what is “scientifically useful” for their communities
 - Our policy has been developed using the input we have received from the community through RFIs, AAS splinter sessions, and the Astrophysics archives
 - PIs can describe what scientific utility is via their data management plans
 - Astrophysics will cover cost of compliance
 - PI should propose to cover cost of their compliance
- See: NASA's Transform to Open Science (TOPS) Initiative Town hall: Tues. 12:45 PM, 602/603

Outstanding Year for Astrophysics

- **JWST completed Commissioning and is well into its Cycle 1 science program**
- **Roman telescope on track for SIR and KDP-D in 2024**
- **Implementing Recommendations of the Decadal Survey**
 - GOMAP, Habitable Worlds Observatory
 - First Probe AO in 2023
 - TDAMM missions, new infrastructure, and coordination w/NSF & DOE
 - Addressing state of the Profession recommendations with IDEA programs
- **Maintaining balanced portfolio**
 - Explorers and Pioneers programs
 - APRA, SAT and R&A programs
- **FY23 Appropriation supports these activities**
 - Limited funding for GoMAP/Habitable Worlds Observatory

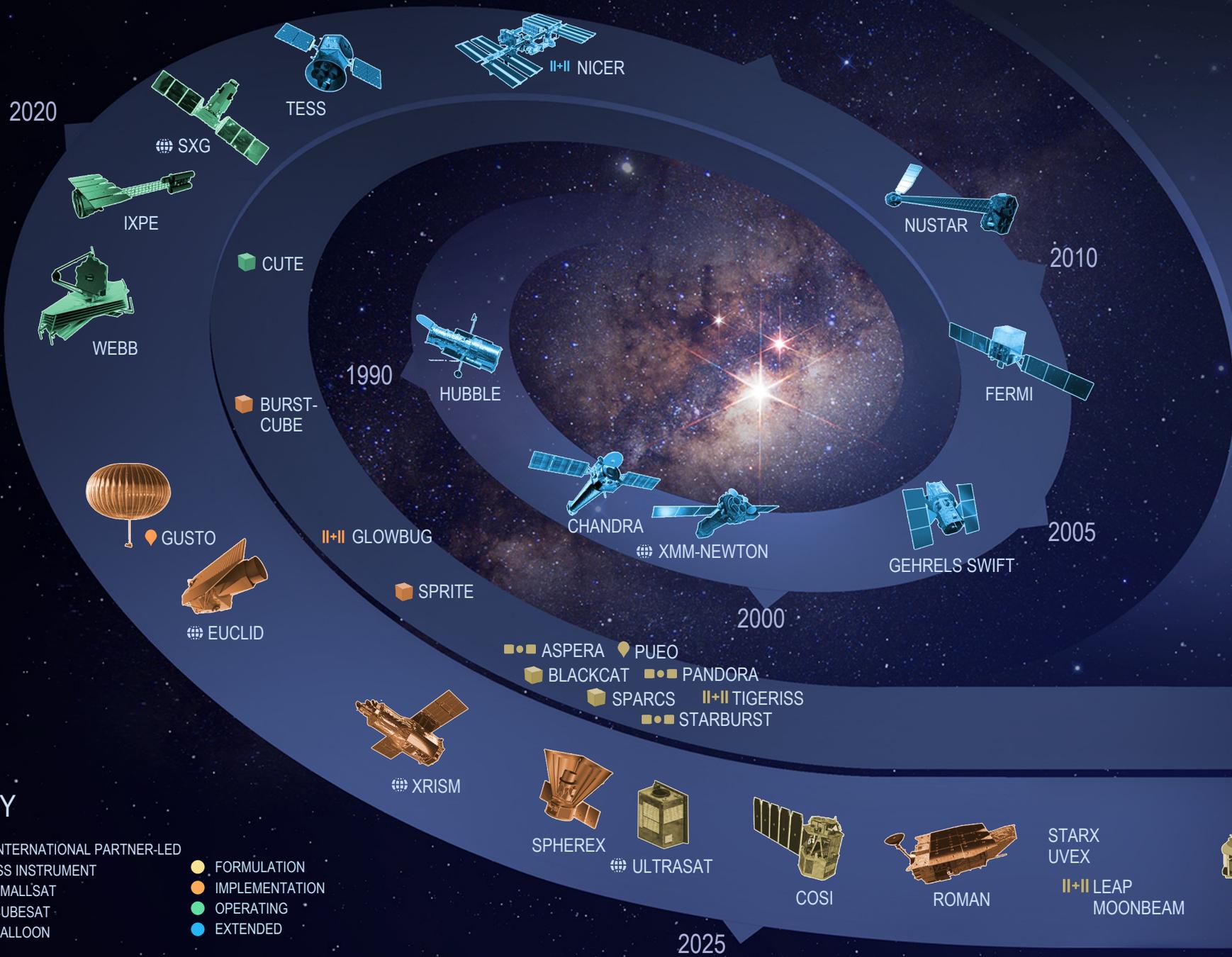
Astrobiology

- **Job Opening: Senior Scientist for Astrobiology, at NASA Headquarters, Washington D.C.**
 - NASA leads the world in Astrobiology research and exploration and is preparing for the discovery of life elsewhere by nurturing multidisciplinary research, developing exciting space missions to explore habitable worlds, and by cooperating with partners nationally and internationally for the benefit of humankind. Astrobiology is a scientific discipline devoted to the study of life in the universe - its origin, evolution, future, and distribution.

<https://www.linkedin.com/jobs/search/?currentJobId=3393498186&keywords=Senior%20Scientist%20for%20Astrobiology%20>



ASTROPHYSICS FLEET



PRE-FORMULATION

- MIDEX/MO PROBE ~2030
- ATHENA EARLY 2030s
- ISA MID 2030s ?

VERY SMALL MISSIONS

TRADITIONAL MISSIONS

KEY

- INTERNATIONAL PARTNER-LED
- ISS INSTRUMENT
- SMALLSAT
- CUBESAT
- BALLOON
- FORMULATION
- IMPLEMENTATION
- OPERATING
- EXTENDED

Questions ?

