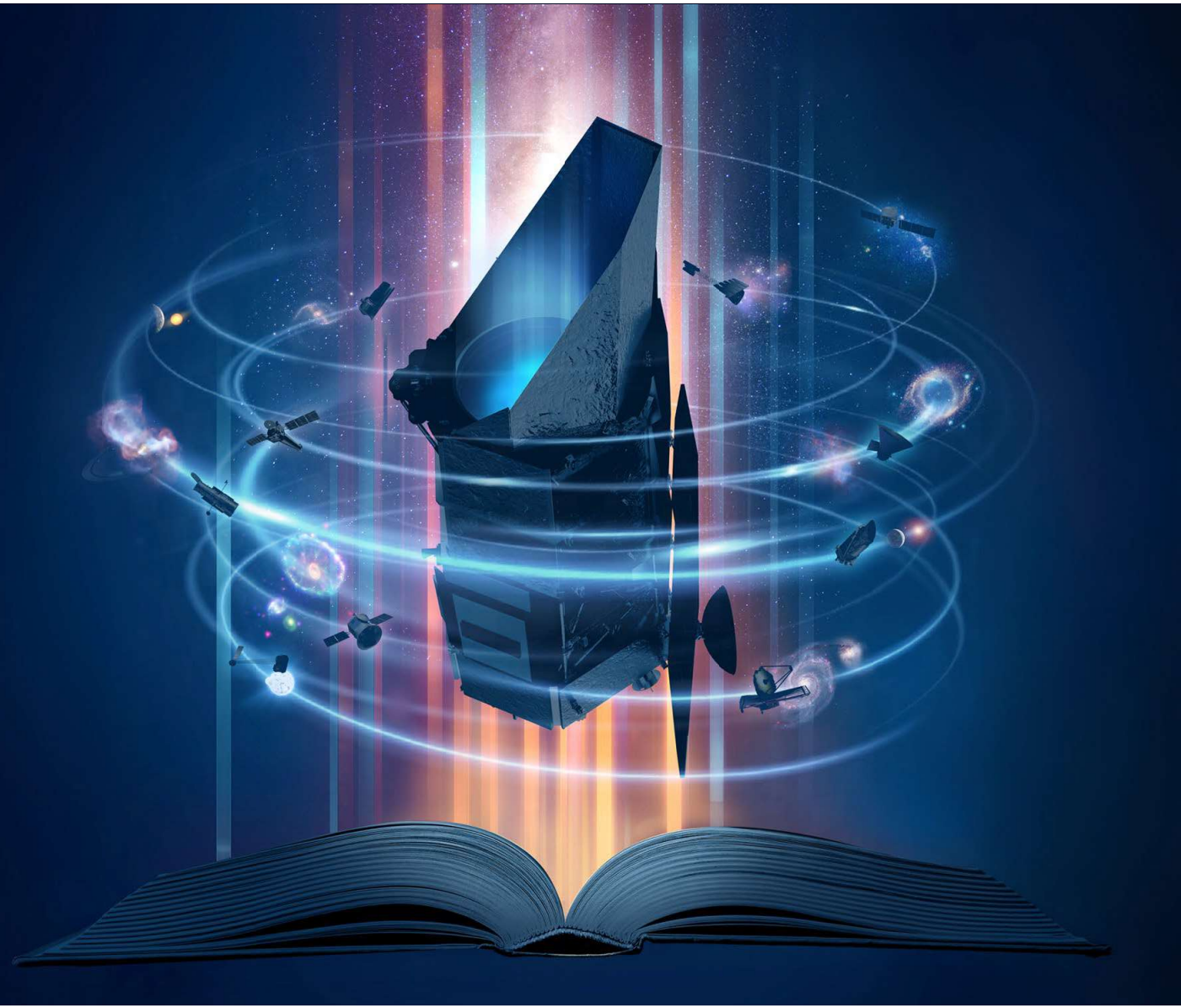
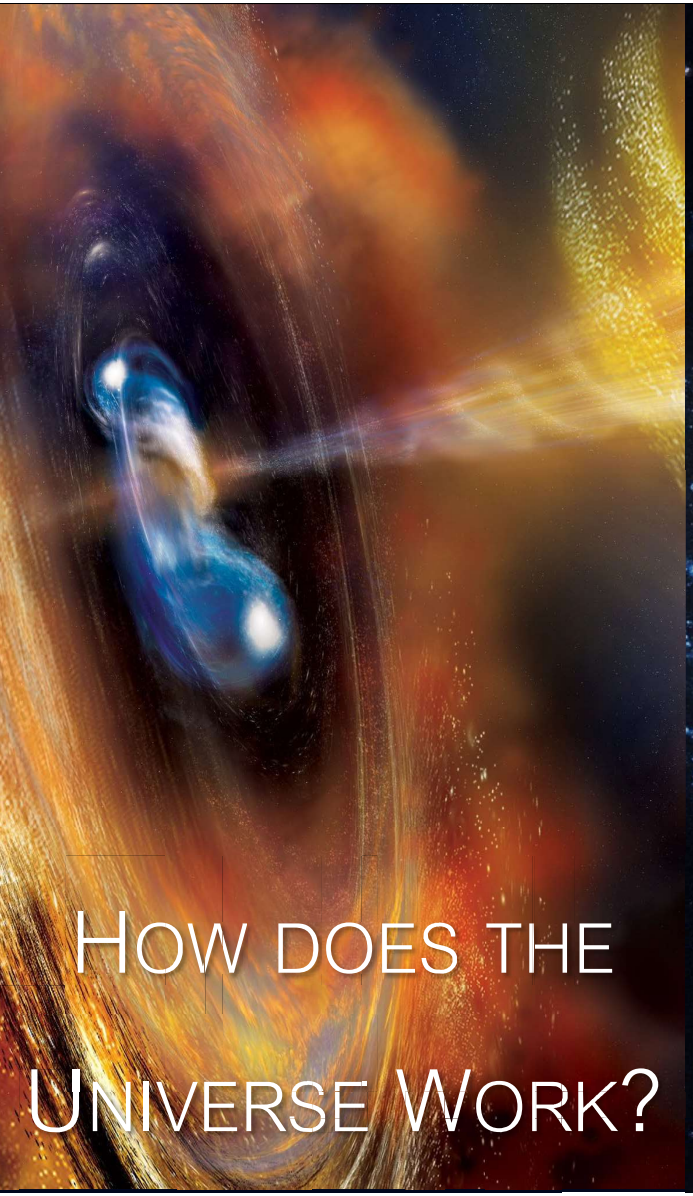
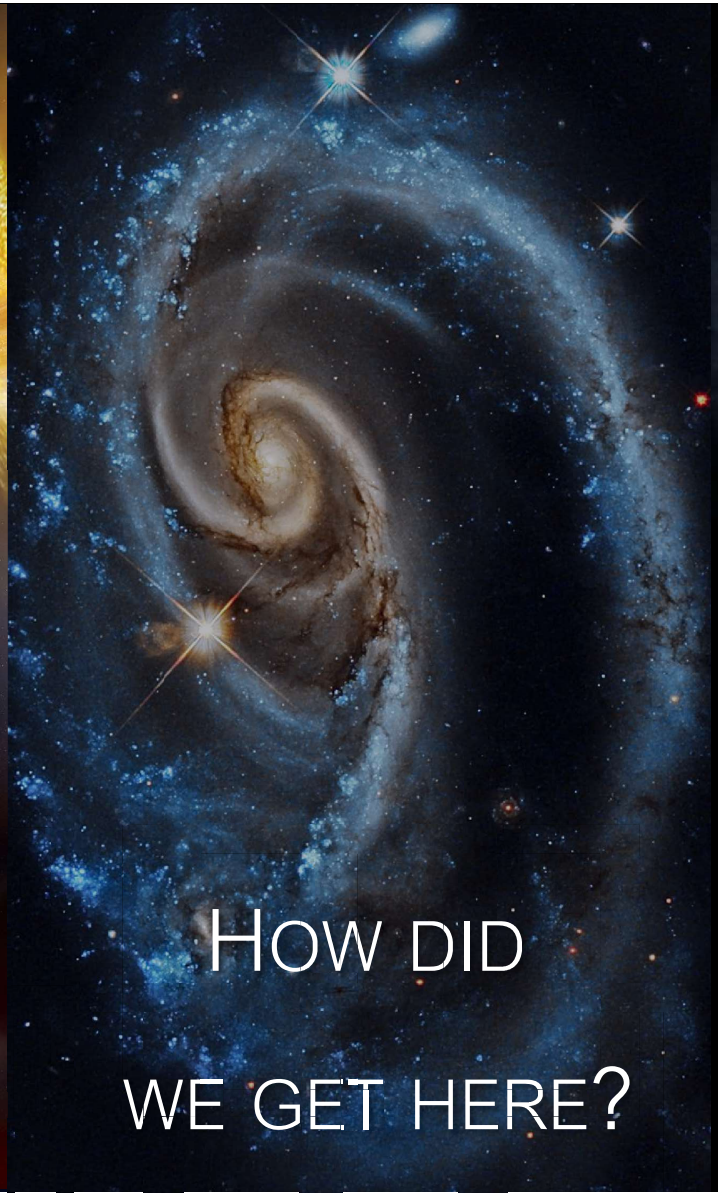
National Aeronautics and Space Administration

Committee on Astronomy and Astrophysics

Shawn Domagal-Goldman
Director, Astrophysics Division
NASA Science Mission Directorate
March 26, 2026



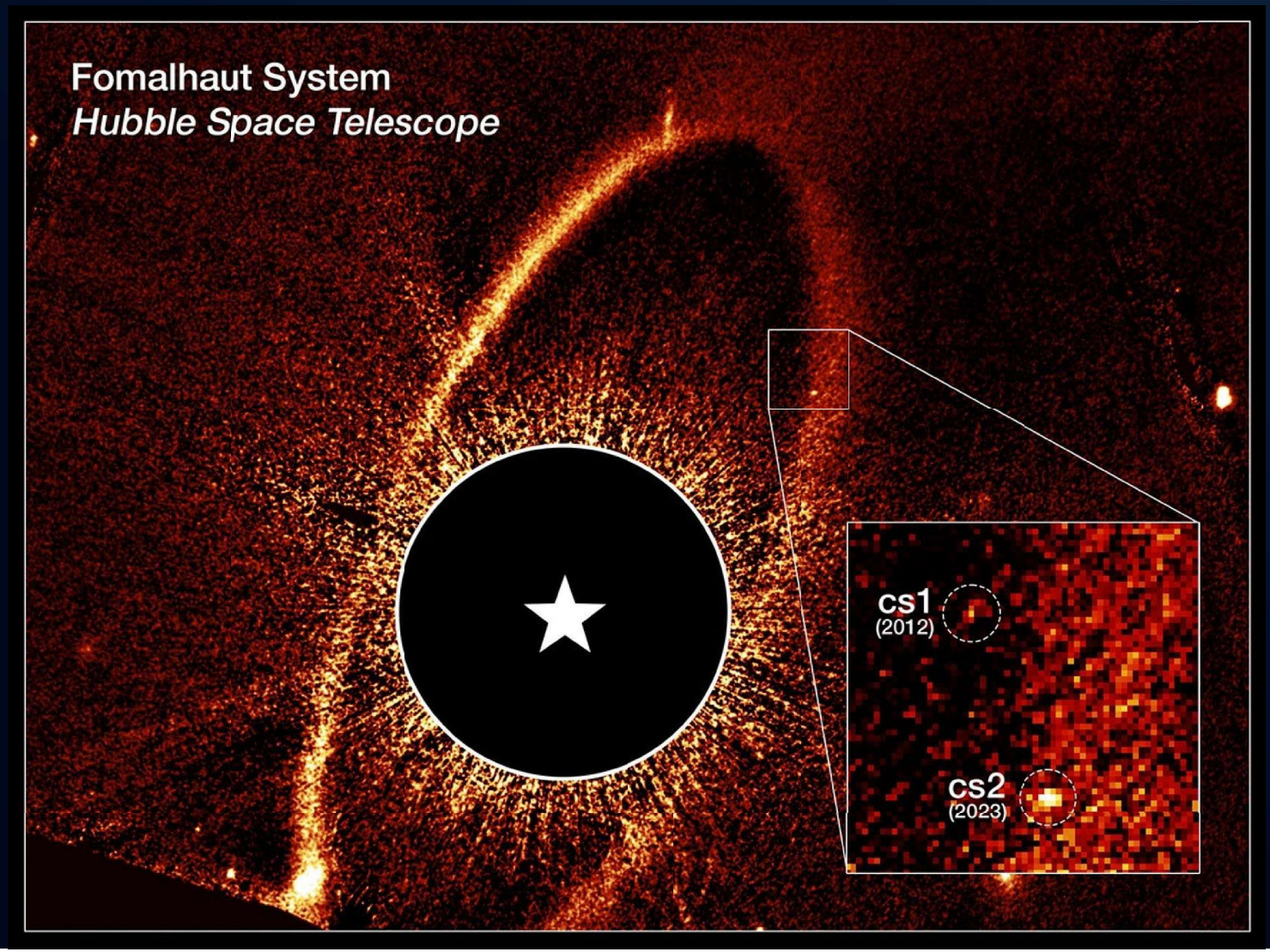

How does the
Universe Work?


How did
we get here?

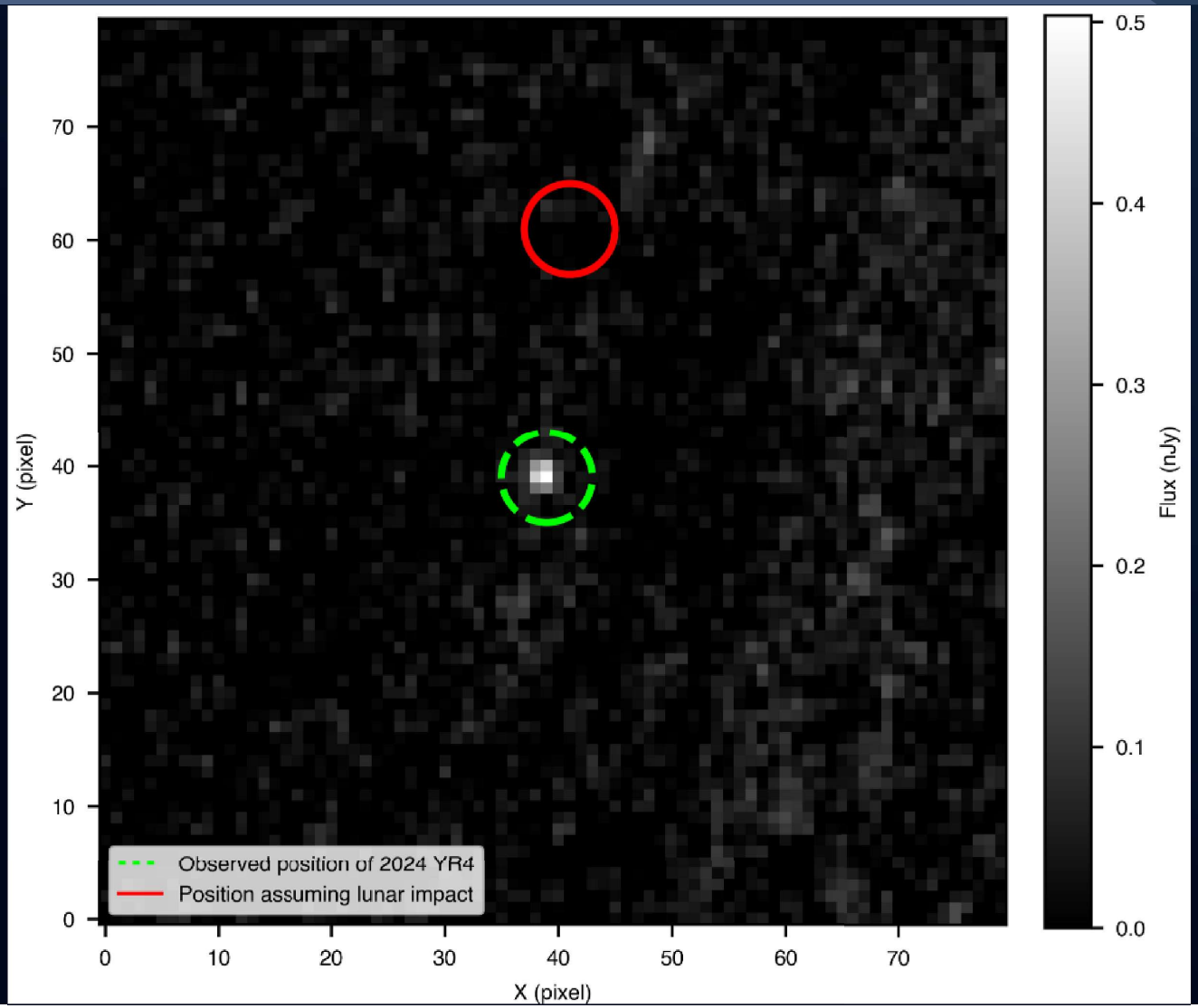

Are we Alone?

Black Hole Eats Star: The Longest Gamma-Ray Burst Ever Seen

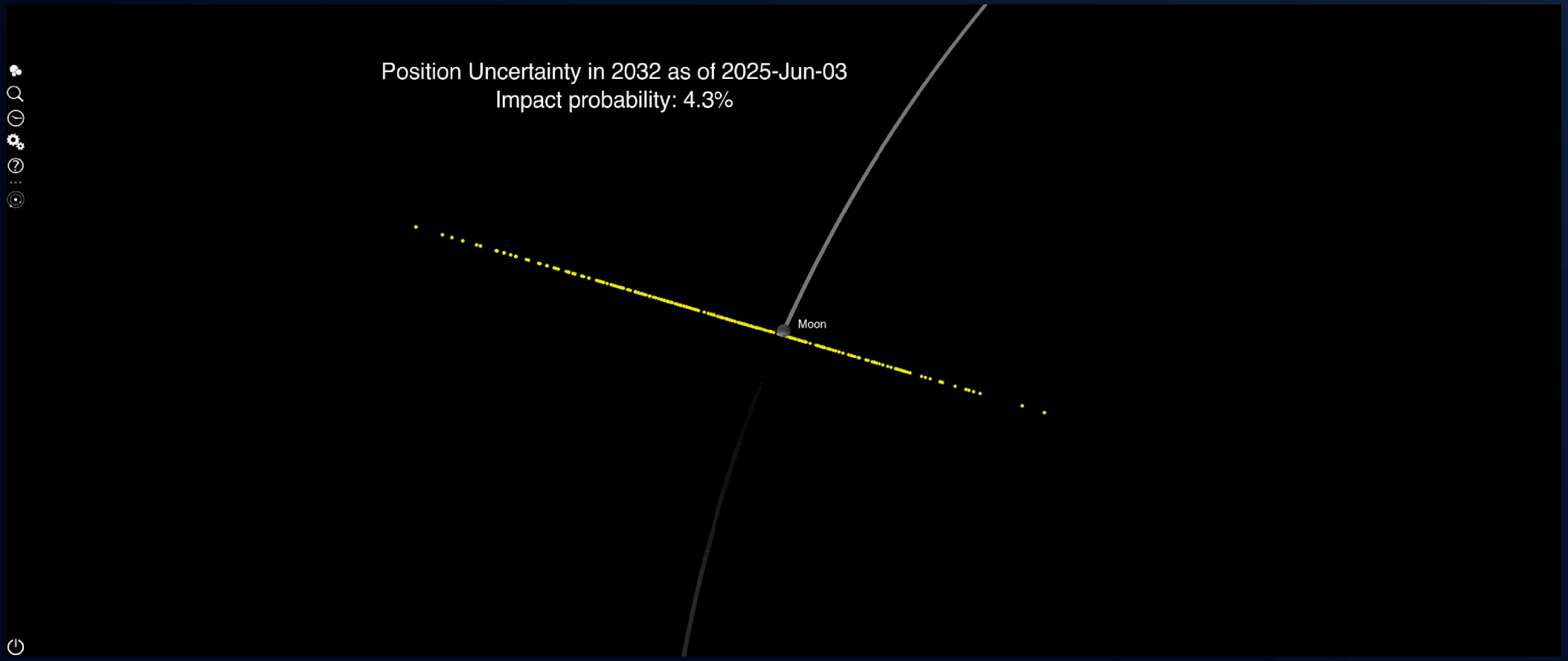
Hubble Sees Asteroids Colliding at Nearby Star for First Time



How NASA's Webb Helped Rule Out Chance of Asteroid 2024 YR4 2032 Lunar Impact



New NASA Asteroid Observations Eliminate Chance of Asteroid 2024 YR4 Lunar Impact in 2032



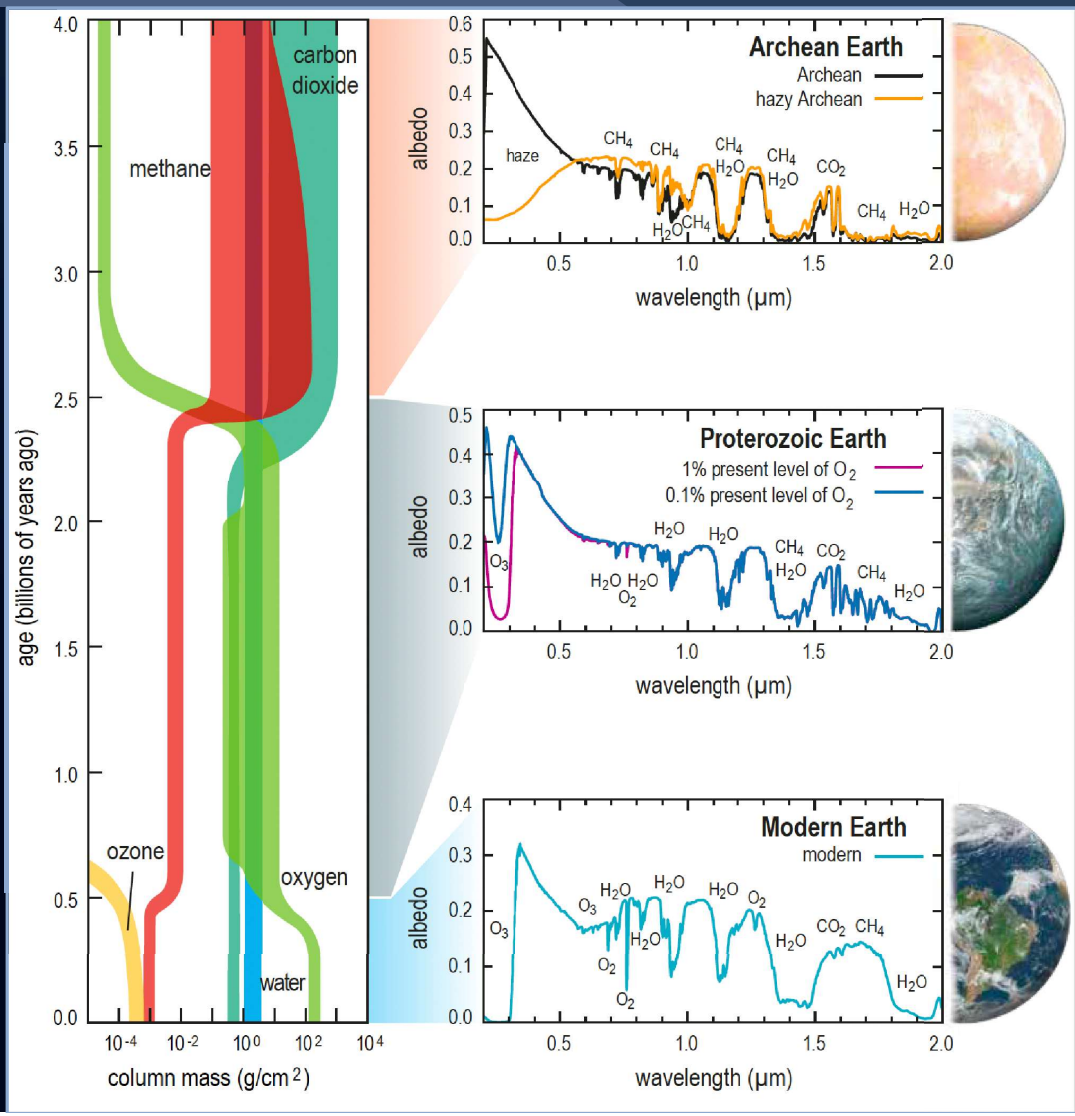
Galactic Feedback from an Active Galactic Nuclei

- New observations show a jet from a central black hole pushing gas out of a galaxy
- This outflow can limit the gas available to form new stars
- The jet changes direction over time, creating a wide, cone-shaped outflow
- Provides clear evidence that black holes actively influence how galaxies grow and evolve

Research Article:
https://www.science.org/doi/10.1126/science.adp8989

Credit: NASA, CXC, IfA, NRAO, STScI, D. Sanders, and A. Evans

Science Inspires Art



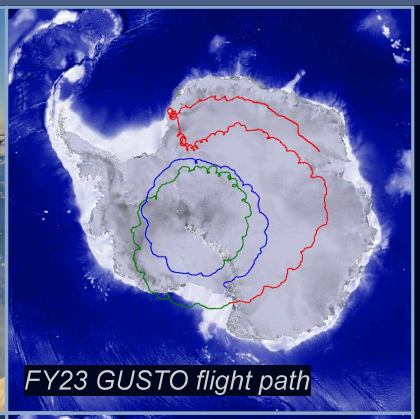
2025/2026 Long Duration Balloon (LDB)

PUEO antenna array during ground calibration

GAPS on the Launch Vehicle

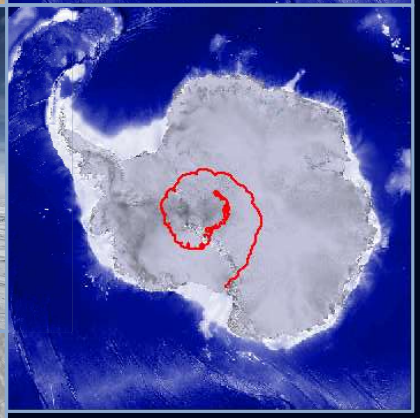
Science enhancement through new ground traverse payload recovery capability

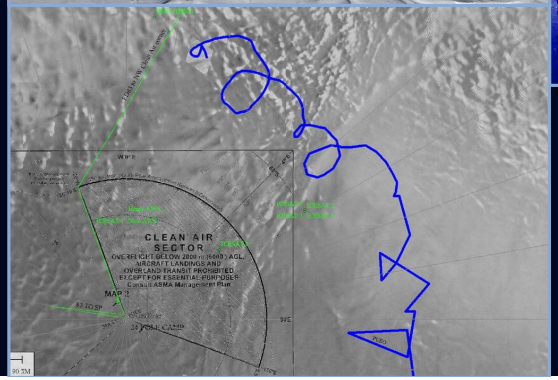
GUSTO recovery 2 years post flight



FY23 GUSTO flight path

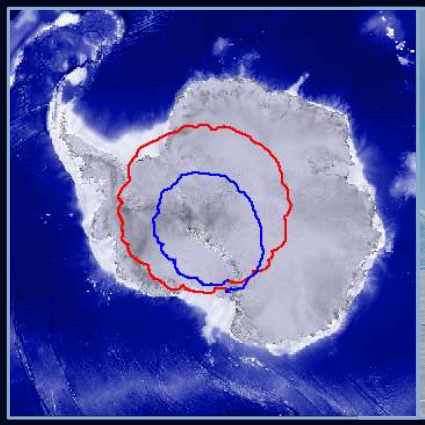
Arctic Trucks arriving at PUEO





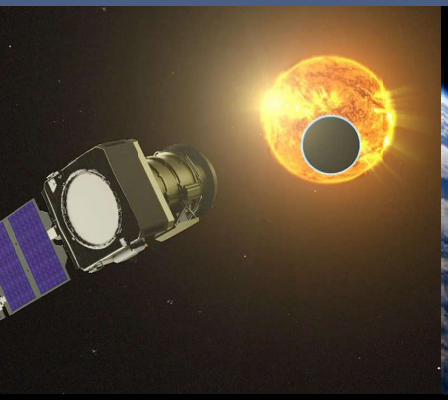
PUEO FY26 flight path and land site relative to South Pole Station.

- Balloon Program Office contracted Arctic Trucks to provide additional recovery capabilities
  - Enabling access to more recovery location, providing longer flight durations
  - GUSTO was successfully recovered in this season's campaign!



Left: GAPS FY26 flight path and land site close to McMurdo. Right: NSF Intermediate Science Traverse recovered GAPS and delivered it to McMurdo.

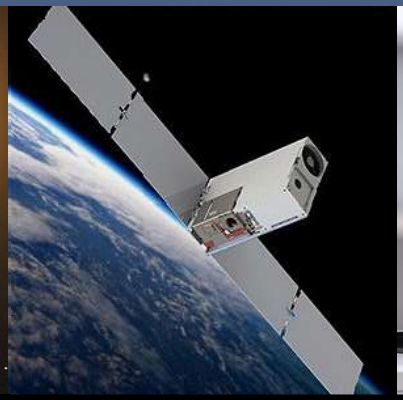
SmallSats and CubeSats



Pandora

Launched Jan. 11, 2026

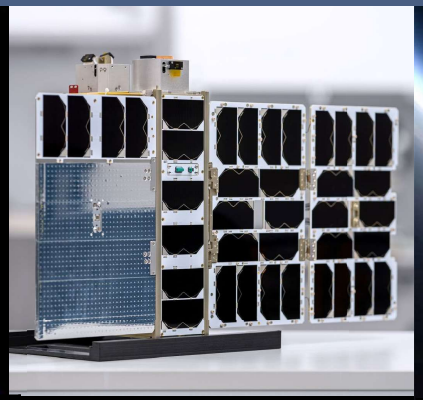
SmallSat (Pioneer): Will observe transiting exoplanets and their host stars with long time baselines and simultaneous optical photometry and infrared spectroscopy.



Star-Planet Activity Research CubeSat (SPARCS)

Launched Jan. 11, 2026

CubeSat: The first mission to provide dedicated, long duration UV observations of red dwarf stars.



The BlackCAT CubeSat Wide-Field X-Ray Transient Monitor

Launched Jan. 11, 2026

CubeSat: Will be used to search for transient objects such as early universe stars collapsing to form black holes and will enable studies of early star formation.

SPRITE

NET Mid 2026

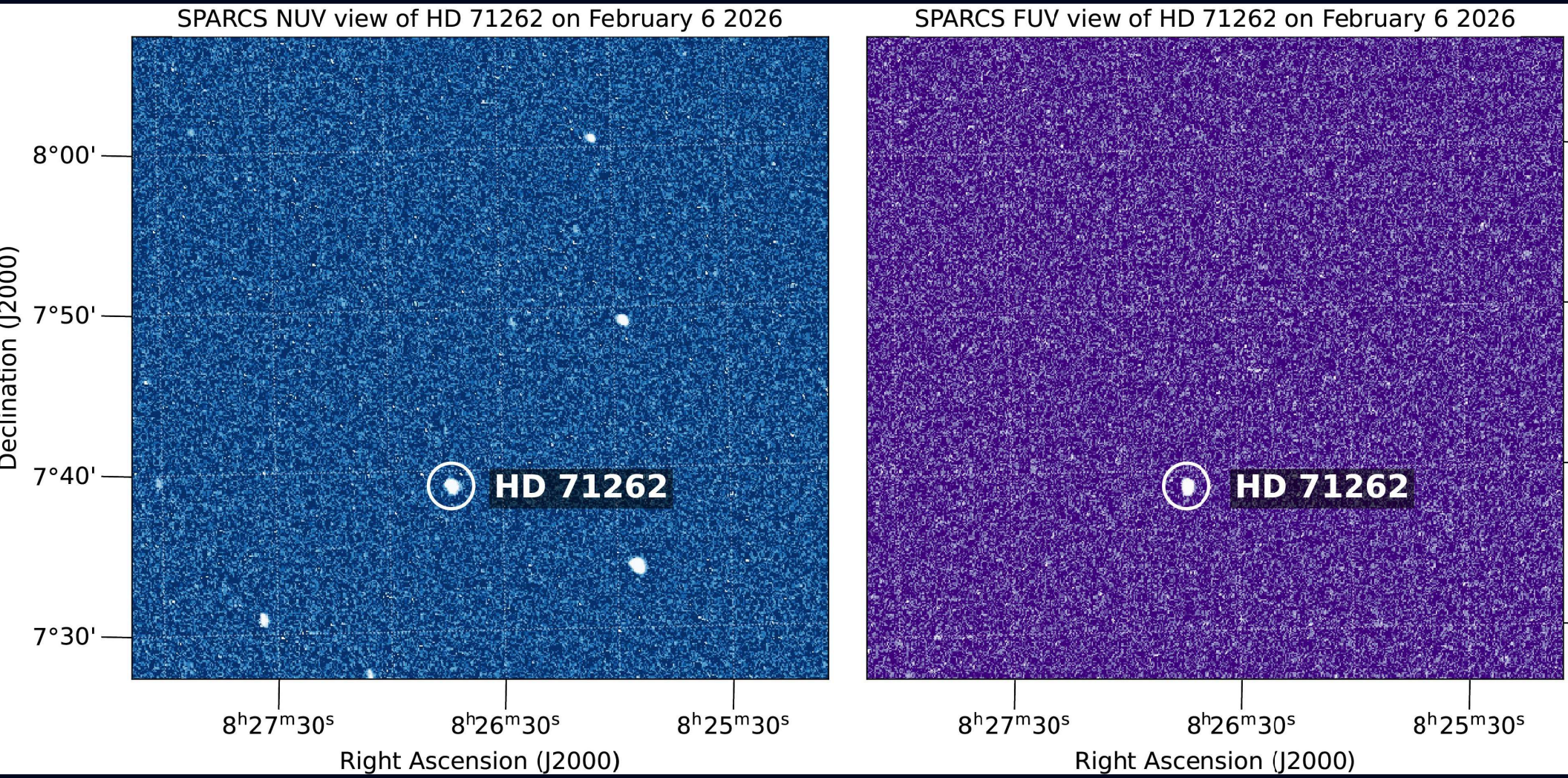
CubeSat: Will study shock emission in nearby SNRs and will measure the escape fraction of H-ionizing radiation from low-Z star-forming galaxies.

Aspera

NET Late 2026

SmallSat (Pioneer): Designed to study the gas flows into and out of galaxies, making the first maps of 'missing' matter surrounding nearby galaxies.

SPARCS CubeSat ‘First Light’ Images

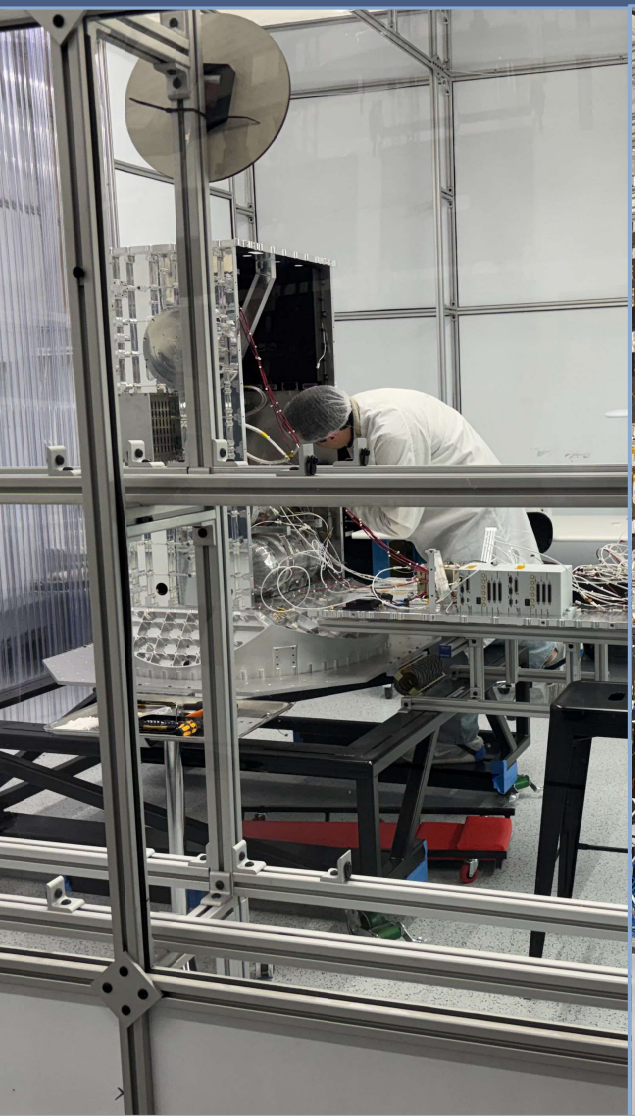


Neil Gehrels Swift Observatory Reboost Planning and Progress

Katalyst

Northrop Grumman

Katalyst

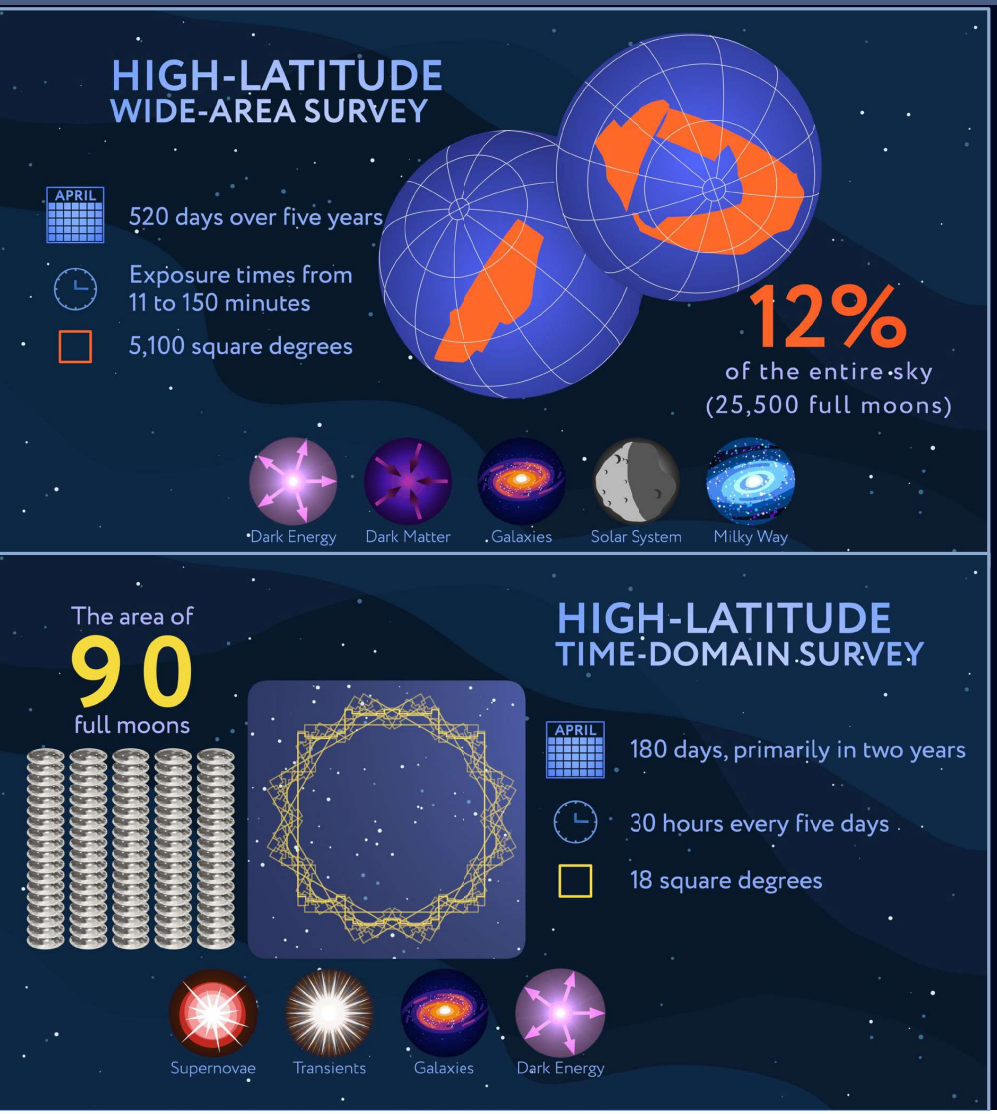


Swift Update

Swift's rapid-response multiwavelength capability is considered scientifically irreplaceable; boosting is a mission priority

- **Swift's orbit has dropped below 250 miles (~ 400km km), accelerating the need for re-boost to this summer**
  - Swift's orbit is decaying faster due to recent solar activity increasing atmospheric drag
  - Without intervention, Swift is projected to re-enter Earth's atmosphere in 2026
  - NASA has paused most Swift science operations to minimize drag and preserve altitude
  - The Burst Alert Telescope continues detecting GRBs, but slews for follow-up are suspended
  - Swift has already had a 21-year operational life, far beyond its original requirement
- **Reboost mission expected no earlier than June 2026**
  - NASA contracted Katalyst Space Technologies to perform the rendezvous and re-boost
  - Katalyst will use a Pegasus XL air-dropped launch for the servicing spacecraft
  - Mission aims to demonstrate commercial in-space servicing on an unprepared NASA science satellite
- **NASA sees the mission as an opportunity to advance rapid, low-cost spacecraft servicing**
  - Sequence includes launch, phasing, rendezvous, proximity operations, docking, and boosting

Cosmology with the Nancy Grace Roman Space Telescope



Dark Energy and the Expansion of the Universe

- 20,000 Type 1a supernovae mapping the expansion history of the universe
- ~30 lensed supernovae enabling independent H_0 constraints
- Spectroscopic mapping of ~20 million galaxies using Baryon Acoustic Oscillations (BAO) to measure the cosmological distance scale
- Redshift-space distortions (RSD) probe dark energy & gravity

Dark Matter and Large-Scale Structure Formation

- ~600 million galaxies for weak lensing, mapping dark matter
- ~160,000 strong lenses (500 resolved) revealing dark matter substructure
- Kinematic lensing of ~20 million galaxies strengthening dark energy constraints
- Thousands of cosmic voids to trace structure growth and gravity

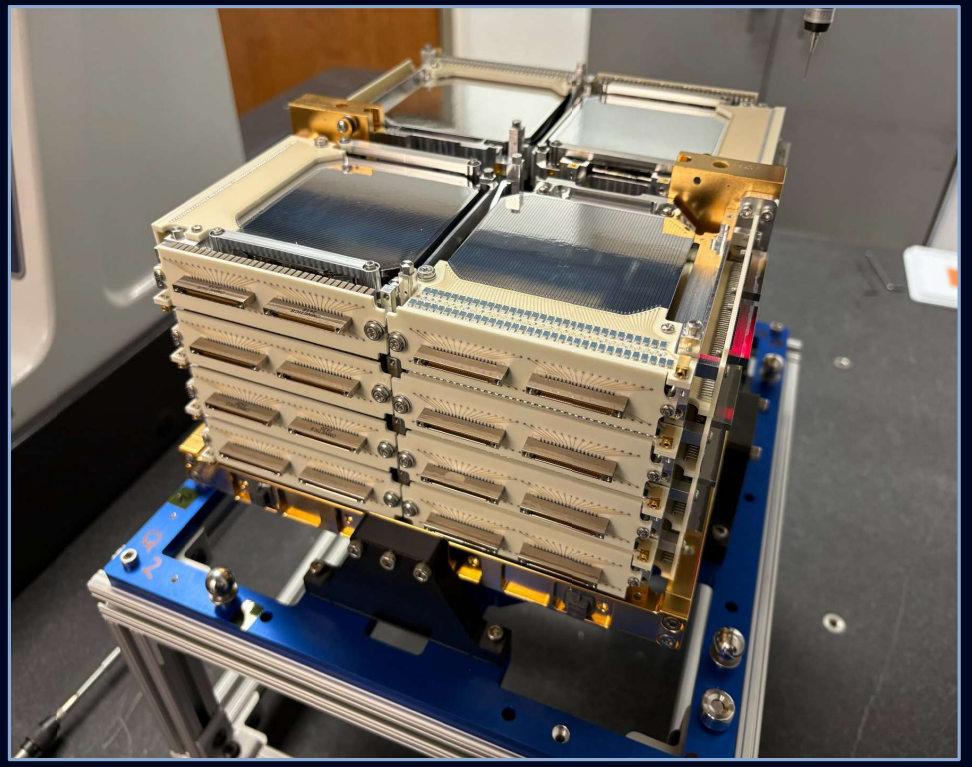
Roman uniquely combines weak lensing, supernovae, BAO, RSD, and strong lensing in a single mission to deliver precision constraints on dark energy matter and dark matter.

Roman Observatory Completed Major Environmental Testing

- Tests Passed: Successfully completed all axes of sine vibration and all levels of acoustic testing!
- 100% Healthy: Post-test functional checks confirm that both the observatory and instruments are in great shape.
- Roman is back in the clean room for shock/separation and mission readiness tests.
- On Schedule: Roman remains perfectly on track for the Pre-Ship Review at the end of May.

Team after completing vibe testing

Launch Readiness in 2027!

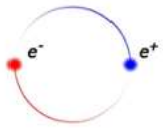


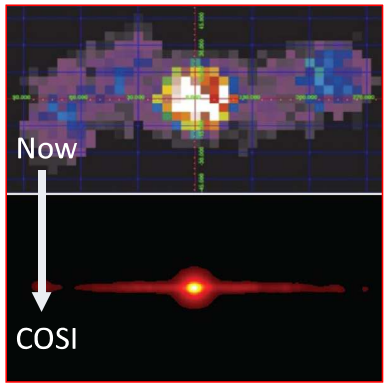
Detector Assembly on Payload Interface Plate

- Payload and spacecraft bus integrations are ongoing
- Systems Integration Review 10/2026

COSI's Key Science Goals

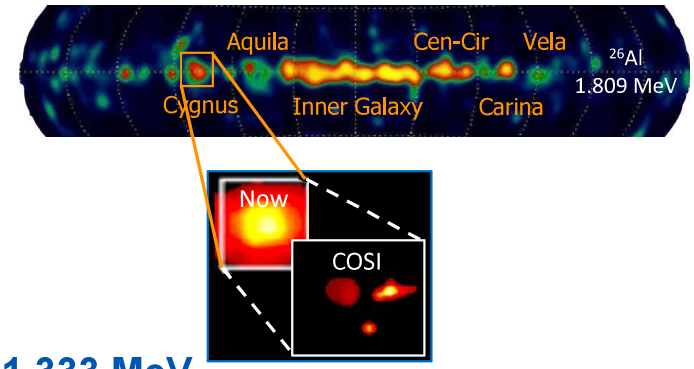
A. Uncover the Origin of Galactic Positrons





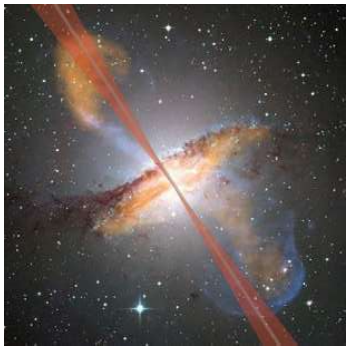
e^-e^+ @ 511 keV

B. Reveal Galactic Element Formation



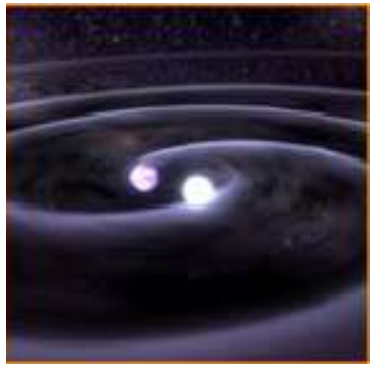
^{26}Al @ 1.809 MeV
^{60}Fe @ 1.173 and 1.333 MeV
^{44}Ti @ 1.157 MeV

C. Gain Insight into Extreme Environments with Polarization



AGN and Galactic Black Holes @ 0.2-0.5 MeV

D. Probe the Physics of Multimessenger Events

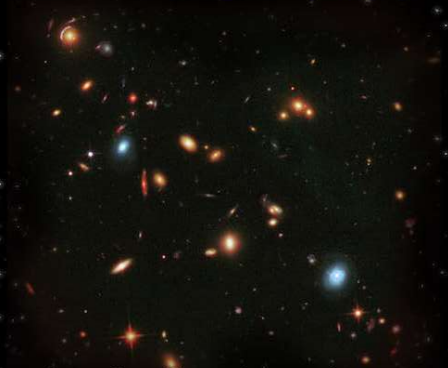


GRB Alerts

Credit: John Tomsick/COSI team

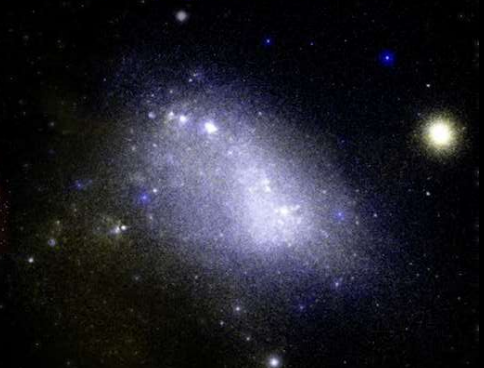
Ultraviolet Explorer (UVEX)

UVEX explores the lowest-mass, lowest-metallicity galaxies:



Finding local low-mass galaxies

Physical processes of low-metallicity environments

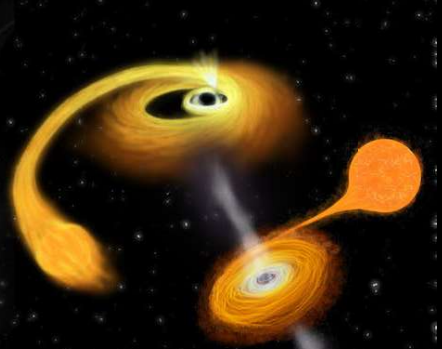


LMC/SMC laboratory

UVEX captures the early ultraviolet emission of transient events:

Merging compact objects

Core collapse supernovae



Community-driven follow-up

Overview

- NASA plans to release the 2026 Astrophysics Small Explorer Announcement of Opportunity in 2026
- SMEX missions are PI-led, cost-capped space missions that address focused astrophysics science priorities
- The 2026 AO adopts a single-step selection process and streamlined early development to improve efficiency
- Updates reflect community feedback and lessons learned, supporting cost, schedule, and risk discipline
- SMEX supports Decadal Survey priorities by enabling timely, competed missions within the NASA Astrophysics Explorers Program

Notional Timeline

- Final AO Release: NET Spring 2026
- Mission Selection: ~Early 2027
- Launch Readiness: By ~2031

Last APD SMEX: IXPE – Imaging X-ray Polarimetry Explorer

Questions: John Wisniewski, Astrophysics Small Explorers Program Lead Scientist, john.p.wisniewski@nasa.gov and E. Lucien Cox, Astrophysics Small Explorers Program Executive, elbert.l.cox@nasa.gov using subject line “APD 2026 SMEX CA”

Streamlining the SMEX Selection Process

Objective

- Reduce time between AO release and mission confirmation

Approach

- Replace traditional two-step selection with a one-step selection process
- Conduct non-competitive Phase A concept development
- Replace Concept Study Report (CSR) evaluation, site visit, and down-selection with a single Gate Review (SRR/MDR)

Result

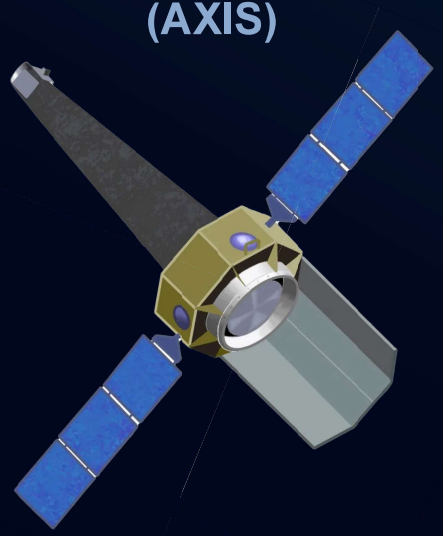
- ~11 months faster path to mission confirmation

Two-Step		One-Step	
draft SMEX 2025 Nominal Planning	Months	SMEX 2025 Nominal Planning	Months
Phase A CSR development	9	Phase A and Gate Review	6
CSR Evaluation & Site visit	6	Phase B	12
CSR Selection	2	PDR & Confirmation	1
Phase B	12	Total Time to Confirmation	19
PDR & Confirmation	1		
Total Time to Confirmation	30	Nominal Time Savings	11

Durations based on nominal planning assumptions.

Probe Explorer Phase-A Concept Studies

Advanced X-ray Imaging Satellite (AXIS)

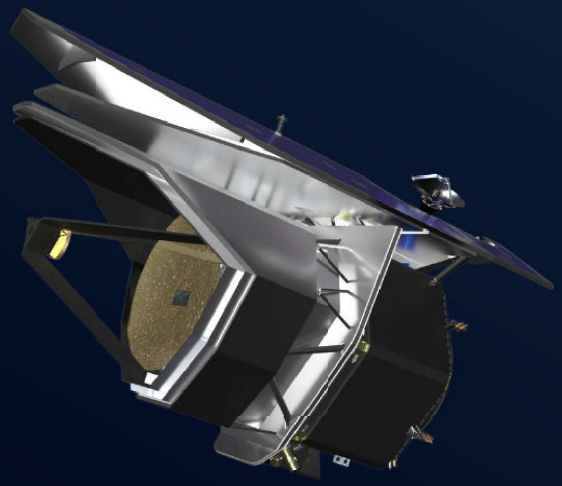


What seeds supermassive black holes and how do they grow?

How do gas, metals, and dust flow into, through and out of galaxies?

What powers the diversity of explosive phenomena?

Probe far-Infrared Mission for Astrophysics (PRIMA)



Origin of Planets and their Atmospheres

Co-Evolution of Galaxies and Supermassive Black Holes Since Cosmic Noon

Buildup of Dust and Metals

LISA: Laser Interferometer Space Antenna

Recent

- NASA successfully completed Key Decision Point B, which is a significant milestone, authorizing the mission to continue into Phase B.

Upcoming

- June 21-26: 16th International LISA Symposium in College Park, MD