

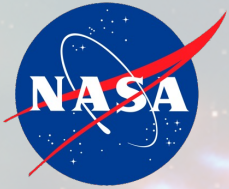


The Physics of the Cosmos Program Office

Francesca Civano and Brian Humensky

Chief Scientists, PhysCOS

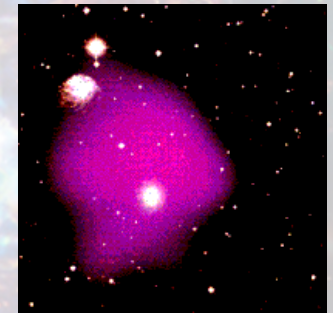
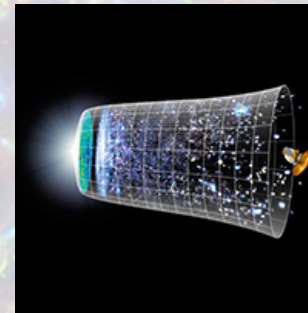
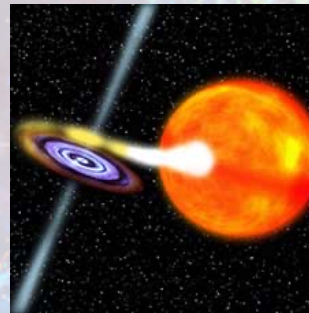
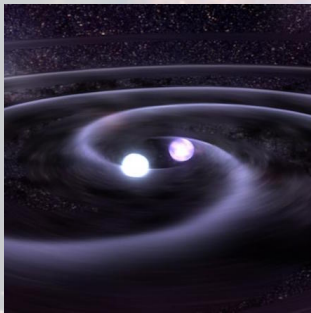




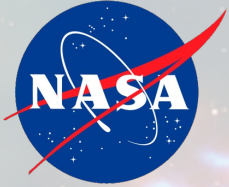
The PhysCOS Program Office



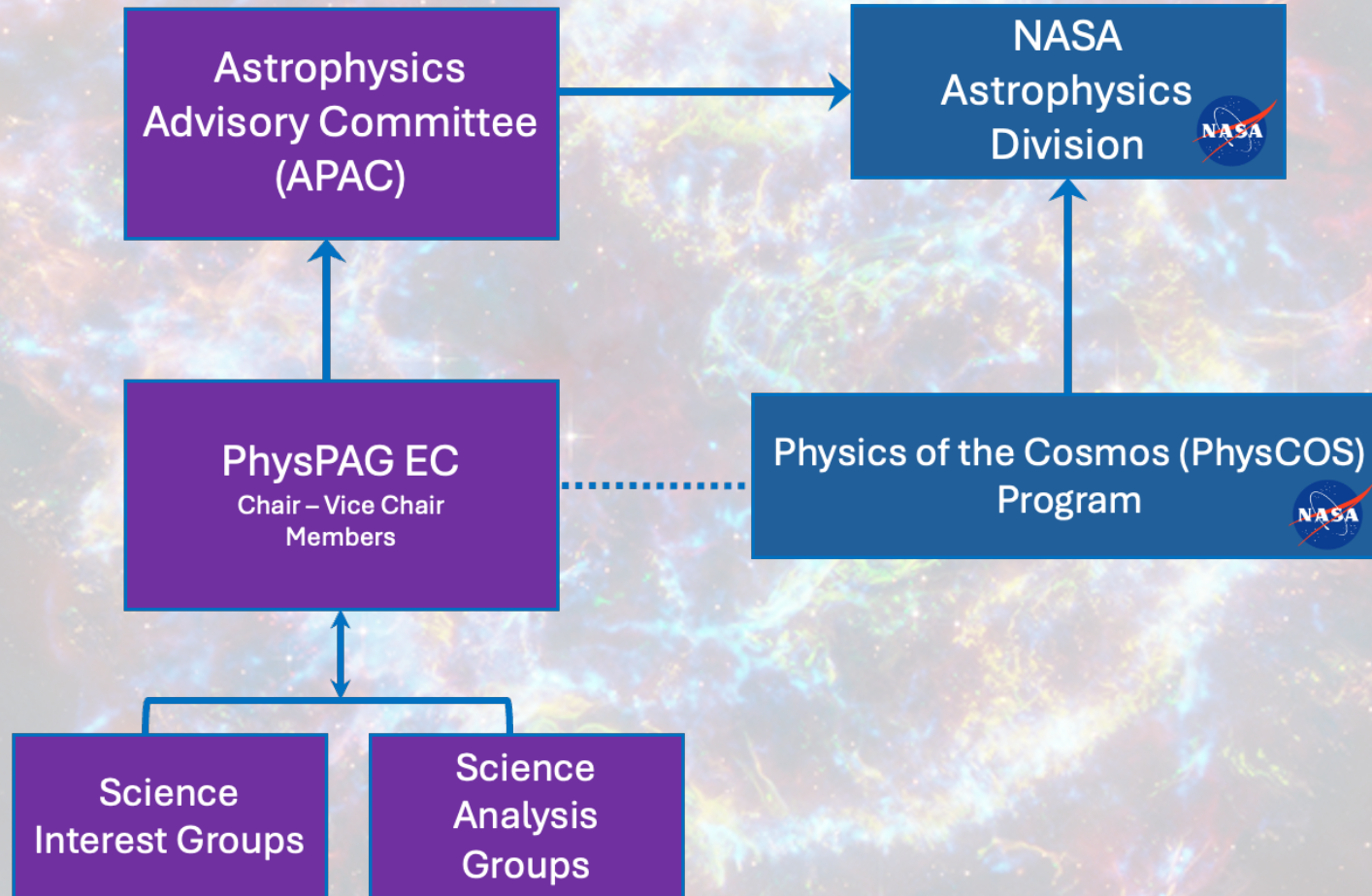
Physics of the Cosmos spans the fields of high-energy astrophysics, cosmology, and fundamental physics, to explore some of the most fundamental questions regarding the physical forces and laws of the universe:

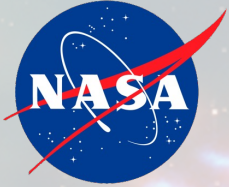


- Manages strategic technology development
- Provides a two-way communication conduit between community & NASA
- Works with sibling program offices: **Cosmic Origins** and **Exoplanet Exploration**

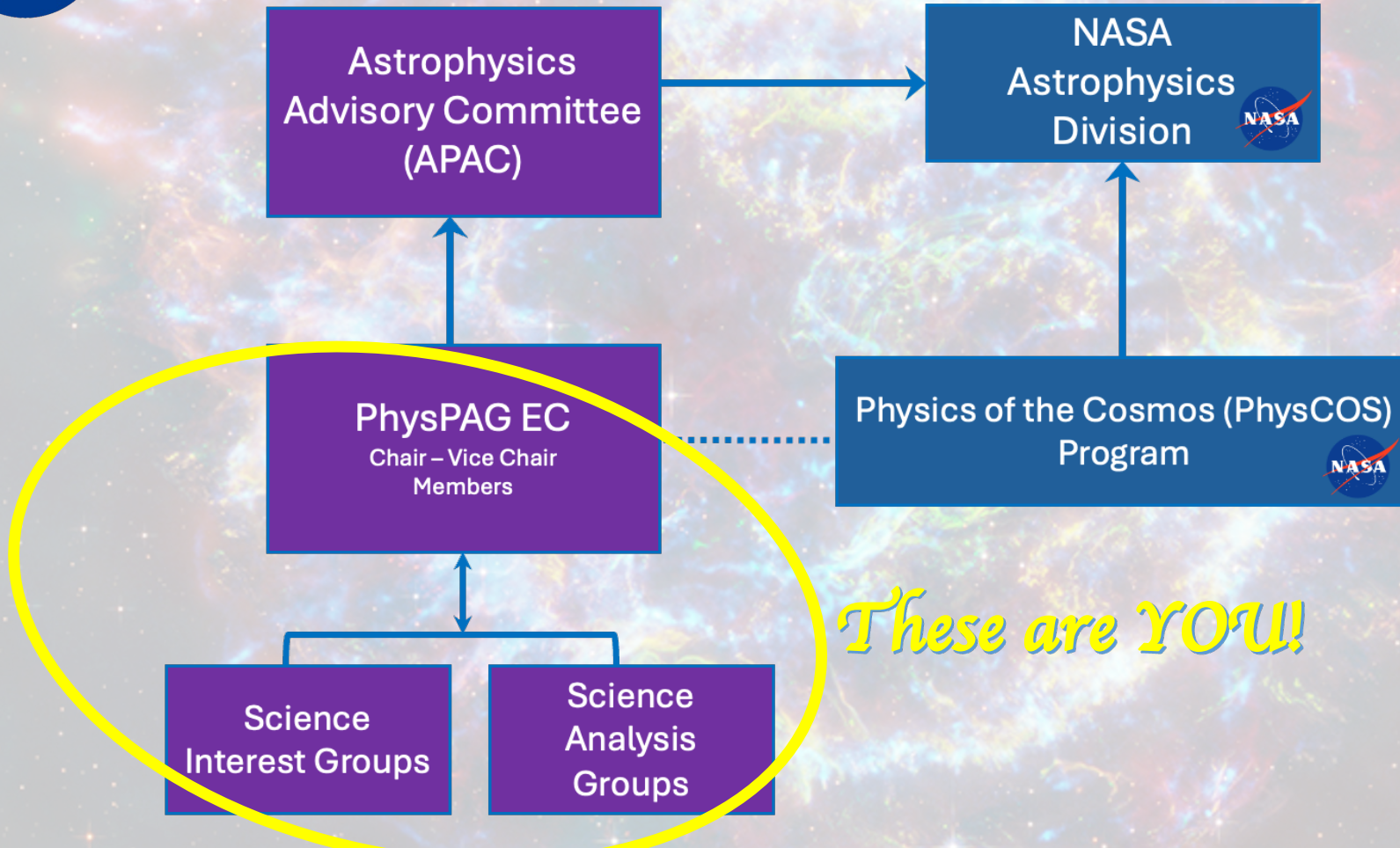


Phys... What?!?





Phys... What?!?



These are YOU!

National Aeronautics and Space Administration

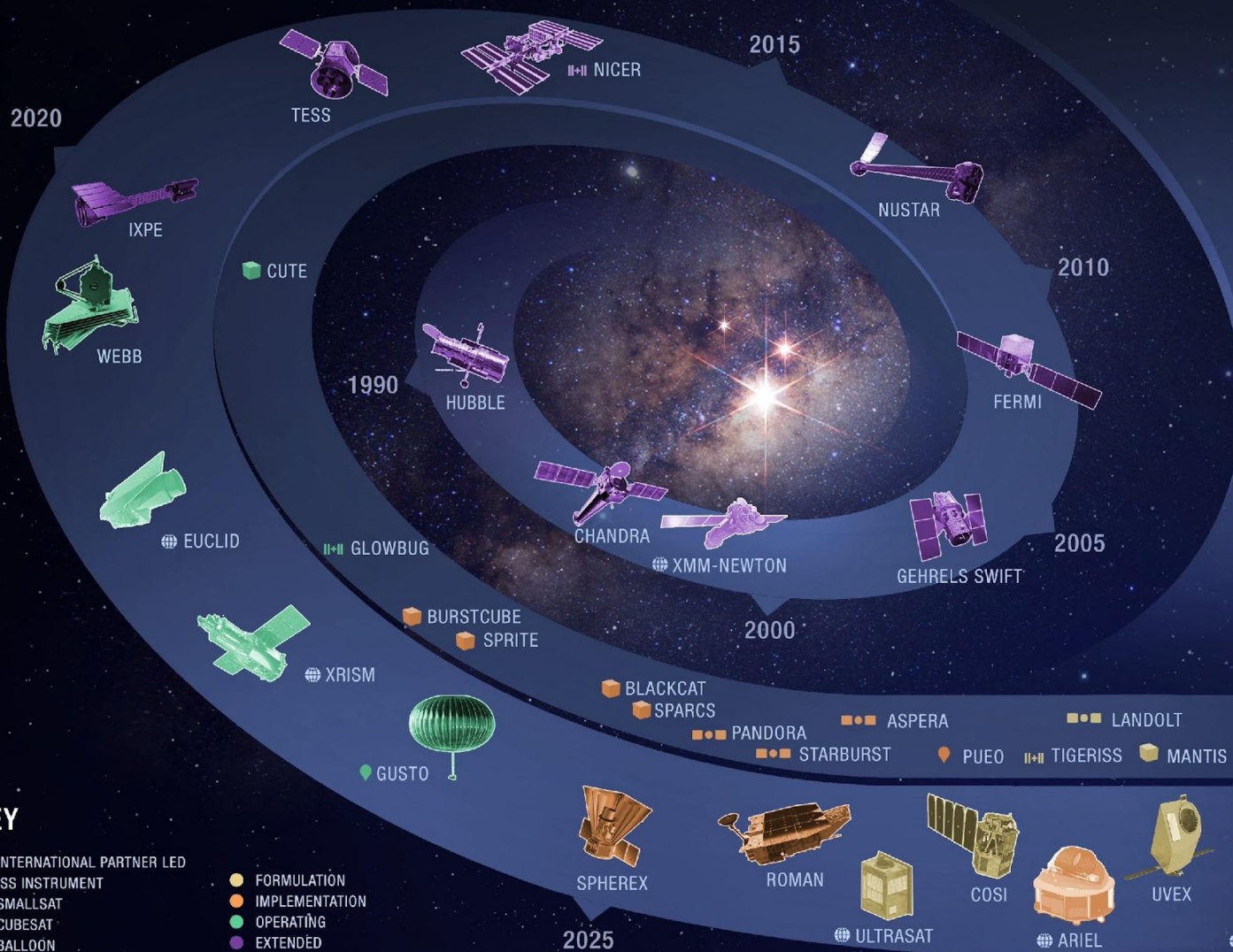


ASTROPHYSICS FLEET

PRE-FORMULATION

PROBE ~2030

ATHENA EARLY 2030s



KEY

- INTERNATIONAL PARTNER LED
- ISS INSTRUMENT
- SMALLSAT
- CUBESAT
- BALLOON

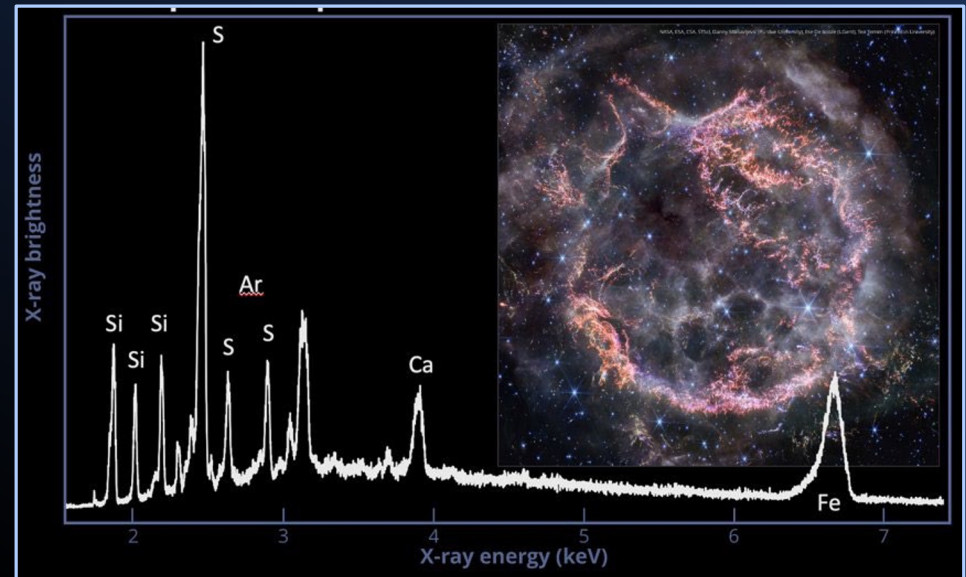
- FORMULATION
- IMPLEMENTATION
- OPERATING
- EXTENDED

VERY SMALL MISSIONS

TRADITIONAL MISSIONS

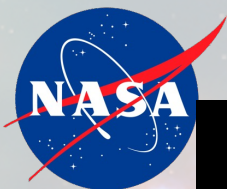
XRISM

- The two instruments are performing exceptionally:
 - Resolve reaching a spectral resolution of 5 eV (exceeding the 7 eV requirement)
 - Xtend performing as expected.
- The XRISM Post Launch Assessment Review (PLAR) was held on February 6, 2024 to mark the satellite transition to nominal operations and the project transition from code 461 to code 662.
- Cycle 1 important dates:
 - April 4:
 - Cycle 1 Type-1 Phase-1 proposals - due at 4:30 p.m. (EDT)
 - Type-2 proposals - due at 11:59 p.m. (EDT)
 - Late June: Cycle 1 peer review
 - August: Cycle 1 observations begin

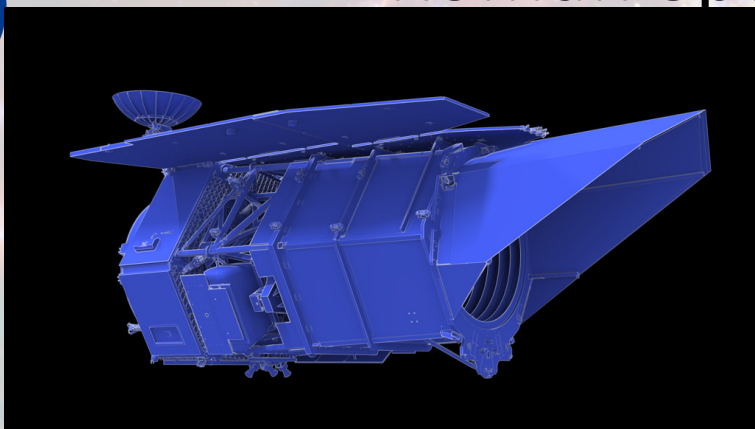


XRISM (X-ray Imaging and Spectroscopy Mission), a partnership with the Japanese Space Agency (JAXA) has released a first look at the supernova remnant CAS-A. The spectrum shows elements produced in the supernova explosion and the extreme velocities of the ejected material. The image of CAS-A is a recent JWST observation.

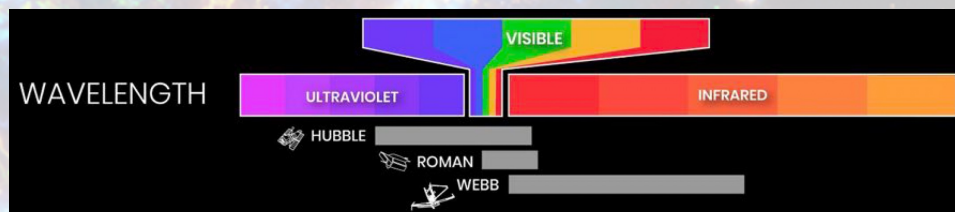
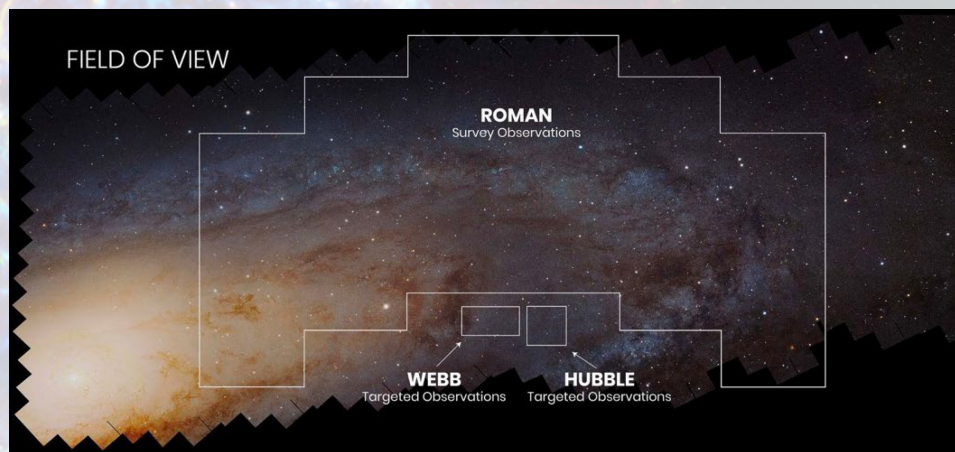
Credit: JAXA/NASA/XRISM



Roman Space Telescope



- NASA's next Great Observatory, a visible/infrared survey mission, to launch in 2026-27.
- Science: exoplanets, cosmology with Type Ia SNe and gravitational lensing, time-domain astrophysics of all kinds
- Get involved:
<https://roman.gsfc.nasa.gov/index.html>



DIVISION

COSI

The Compton Spectrometer and Imager

- The Compton Spectrometer and Imager (COSI) is a space telescope that will study the recent history of star birth, star death, and the formation of chemical elements in the Milky Way.
- The gamma-ray telescope is expected to launch in 2027 as NASA's latest small astrophysics explorer mission.
- Opening a new window on the sky in the 0.2 – 5 MeV band.
- COSI's principal investigator is John Tomsick at the University of California, Berkeley.

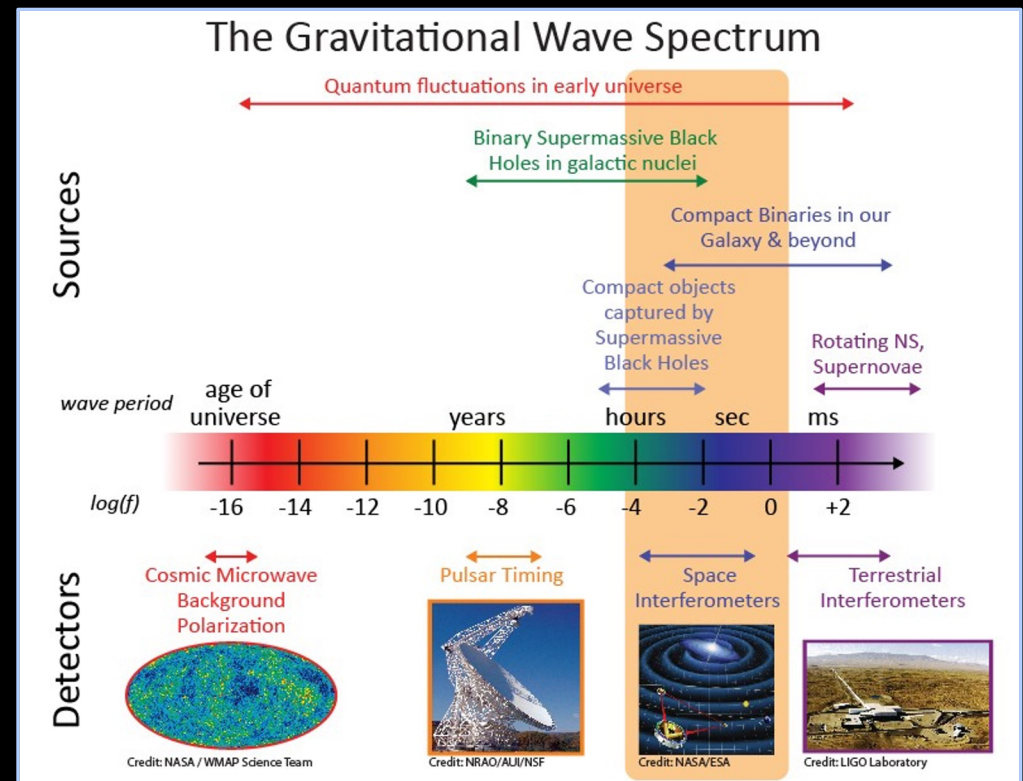
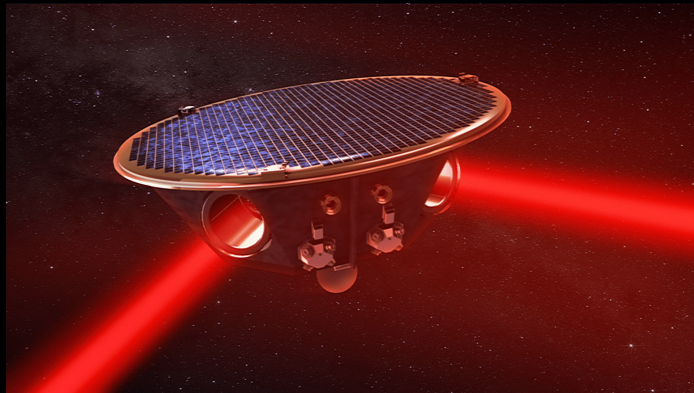


*Image by Jim Willis, courtesy of Northrop Grumman Corporation
1/2 Space Systems; background image courtesy of European
Southern Observatory*

LISA

Laser Interferometer Space Antenna

- LISA will be the first space-based gravitational-wave observatory, launching in 2035.
- NASA is partnering with ESA to provide key technologies and a science center for LISA.



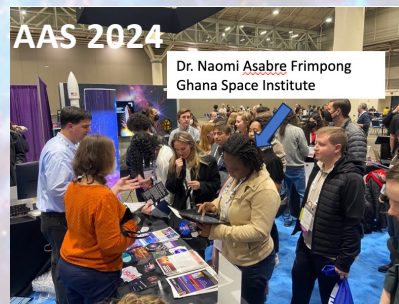
Sources in LISA's mHz band range from white dwarf binaries in our galaxy to merging massive black holes at extreme redshift.



PhysCOS Program Office Activities

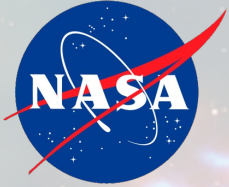


- The program office supports the community by
 - Facilitating the PhysCOS Program Analysis Group (PhysPAG);
 - Supporting the activities of Science Interest and Analysis Groups (SIGs and SAGs)
 - Informing members of upcoming funding and engagement opportunities;
 - Soliciting community-identified science and technology gaps;
 - Managing funded technology projects with benefits to PhysCOS science;
 - Maintaining science cognizance to enable more successful NASA strategic planning;
 - Community engagement: AAS, HEAD, APS, SACNAS, NSBP, ...
 - Supporting mission studies: LISA just went through adoption and NewAthena is returning to the PO.

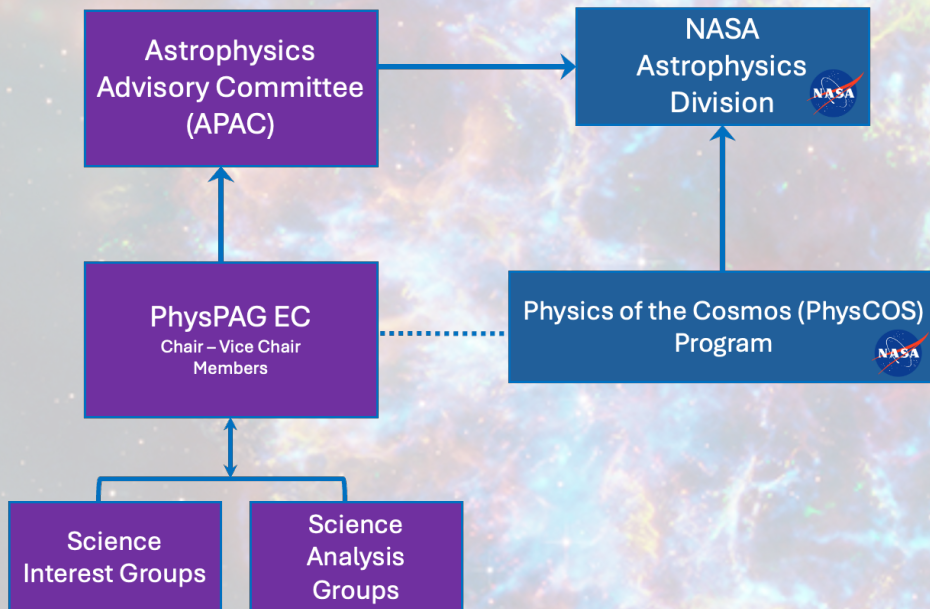


2024 Astrophysics Biennial Technology Report Released:
https://apd440.gsfc.nasa.gov/images/tech/2024_ABTR.pdf

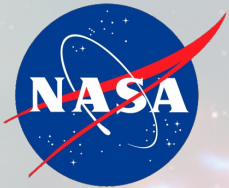




Science Interest Groups & Science Analysis Groups



- **Science Interest Groups** are community-led affinity groups focused on a particular area that are long-term.
 - Meet regularly to discuss science and technology developments, concerns in field
- **Science Analysis Groups** are stood up for a short term (1-2 years) to analyze a specific issue and deliver a report to APAC & Astrophysics Division.
 - Proposed by SIGs or requested by HQ
 - Membership open to any who are interested



Science Interest Groups & Science Analysis Groups



Science Interest Groups (SIGs)

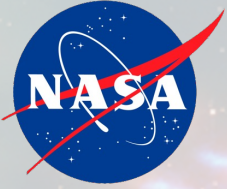
Science Analysis Groups (SAGs)

Cross-PAG



• Science Analysis Groups

- Gamma-ray Transient Network studied future opportunities for localization of Gamma Ray Bursts and Magnetar Giant Flares.
- Future Innovations in Gamma Rays (FIG) SAG is laying out the science and technology priorities for the next generations of gamma-ray telescopes in space.
- Astrophysics With Equity: Surmounting Obstacles to Membership (AWESOM) SAG is studying how to broaden participation in the astrophysics community



Commitment to Diversity, Equity and Inclusion

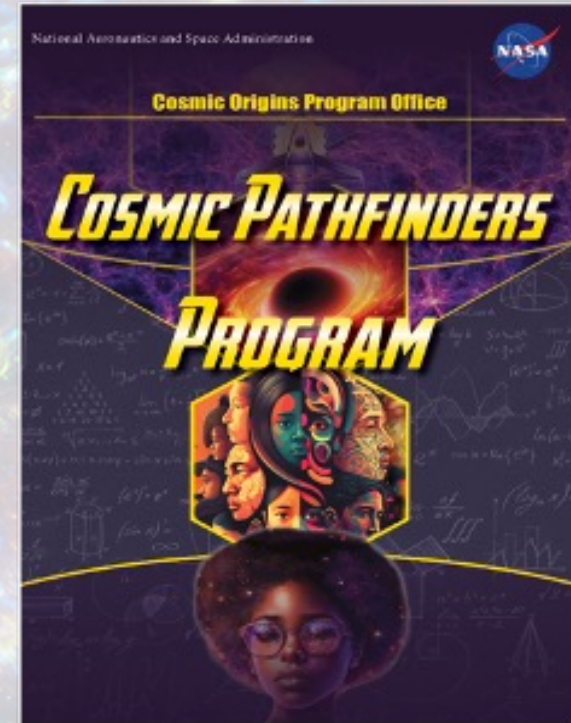
Cosmic Pathfinders Program

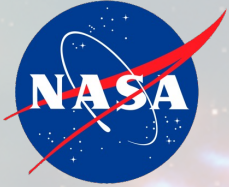
Directed by Ronald Gamble, NASA/GSFC/UMCP

Current student leadership includes:

- Amethyst Barnes (NASA GSFC/CRESST-II Post-Bac, Roman/STScI)
- Jordan Forman (NASA GSFC/CRESST-II Post-Bac, FERMI)
- Gokul Srinivasaragavan (Doctoral Candidate, UMCP Department of Astronomy)
- Isiah Holt (NASA Pathways Intern & Doctoral Candidate, UMCP Department of Astronomy)
- Cosmic Chatter
 - Career Roadmap Discussion — Career pathways for Missions
 - Science Communication Panel — Communication
 - (~12) Student Presentations [March - June] — Engagement
- Hack-a-thons
 - JWST, XRISM, COSI...Roman (?), HWO (?), LISA (?), along with the potential to extend to many others.
- Professional Societies/ Conference Participation & Sessions
 - AAS, APS, NSBP, SACNAS, NSBE, SPIE, Great Minds in STEM
- University Chapters

Current student membership across the Cosmic Pathfinders footprint has eclipsed ~500 students & Early-Careers





<https://pcos.gsfc.nasa.gov>



Site QR Code:



Home PhysPAG Science Interest Groups Science Analysis Groups Mission Studies Resources

Executive Committee
Science Gaps
Cosmic Pathfinders
Meetings
Events Calendar

Physics of the Cosmos

Exploring fundamental questions regarding the physical forces of the universe

PhysPAG Home PhysPAG Chairs Presentations Reports

Physics of the Cosmos Program Analysis Group (PhysPAG)

Objective

The PhysPAG serves as a community-based, interdisciplinary forum for soliciting and coordinating community analysis and input in support of Physics of the Cosmos objectives and of their implications for architecture planning and activity prioritization and for future exploration. It provides findings of analyses to the NASA Astrophysics Division Director.

The PhysPAG enables direct regular communication between NASA and the community, and within the community, through public meetings that give the community opportunities to provide its scientific and programmatic input. Structurally, the PhysPAG Chair and the [PhysPAG Executive Committee \(EC\)](#) are appointed members whose responsibilities include organizing meetings and collecting and summarizing community input with subsequent reporting to the Astrophysics Division Director. The full PhysPAG consists of all members of the community who participate in these open meetings. The PhysPAG has six Science Interest Groups (SIGs), described in more detail at [PhysPAG SIGs](#).

Terms of Reference

For more information on the operation and organization of the PhysPAG, please see the signed PhysPAG Terms of Reference (updated March 2017) [[PDF](#)].

News

2 April 2024
PhysCOS Activities at APS April Meeting
» [Details](#)

Release of the Second COSI Data Challenge and Analysis Tools
» [Details](#)

[More News Articles »](#)

[Subscribe to PhysCOS News »](#)

Mailing List QR Code:





Site QR Code:



<https://pcos.gsfc.nasa.gov>

Physics of the Cosmos
Exploring fundamental questions regarding the physical forces of the universe

Science Interest Groups (SIGs)

Science Interest Groups (SIGs) are standing groups of scientists with interests in a certain area of astrophysics. SIGs provide quantitative metrics and assessments to NASA in regard to current and future needs of the community in that area, and act as a focal point and forum for the community.

Most SIGs operate within one of the three themes of NASA Astrophysics — [Physics of the Cosmos](#), [Cosmic Origins](#), and [Exoplanet Exploration](#) — but some encompass all astrophysics themes.

All PhysCOS SIGs are chaired by one or more members of the [PhysPAG Executive Committee](#). Anyone subscribed to a SIG's mailing list is considered a member of the SIG.

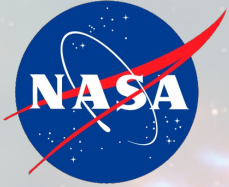
Current SIGs

- [Cosmic Ray](#) (CR SIG) (Chairs: Andrew Romero-Wolf and Athina Meli): Coordinate community activities and preparations for a future cosmic ray astronomy mission.
- [Cosmic Structure](#) (CoS SIG) (Chairs: Vera Gluscevic and Rebekah Hounsell): Coordinate community activities for future space activities concerning the nature of dark energy, dark matter, neutrinos, and tests of inflation, as well as astrophysical galaxy evolution.
- [Gamma Ray](#) (GR SIG) (Chairs: Justin Finke, Eric Burns, and Manel Errando): Coordinate community activities and preparations for a future gamma ray astronomy mission.
- [Gravitational Wave](#) (GW SIG) (Chairs: Chiara Mingarelli and Alessandra Corsi): Coordinate community activities and preparations for a future gravitational wave mission.
- [Inflation Probe](#) (IP SIG) (Chair: Roger O'Brient): Coordinate community activities and preparations for a future cosmic microwave background polarization mission.



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Home PhysPAG Science Interest Groups **Science Analysis Groups** Mission Studies

AWESOM SAG
Future Innovations in Gamma Rays SAG
New Great Observatories SAG
TDAMM Communications SAG
Completed SAGs

Physics of the Cosmos

Exploring fundamental questions regarding the physical forces of the universe

Science Interest Groups Science Analysis Groups

Science Analysis Groups (SAGs)

Science Analysis Groups (SAGs) are groups of scientists convened for a finite period of time (usually one or two years) to address a specific question of interest to NASA astrophysics. The SAG activity aims to produce one or more reports at the end of its term that will be delivered to the Astrophysics Division Director. SAGs can be formed in response to questions that emerge from discussions within a SIG or in response to a request for information from the Astrophysics Division Director.

Many SAGs operate across multiple astrophysics themes, with chairs selected from the community.

Current SAGs

- [Astrophysics With Equity: Surmounting Obstacles to Membership \(AWESOM\)](#) (Cross-PAG). Contact: Ryan Hickox (ryan.c.hickox@dartmouth.edu).
- [Future Innovations in Gamma Rays Science Analysis Group \(FIG SAG\)](#). Contacts: [FIG SAG Chairs](#)
- [New Great Observatories](#) (Cross-PAG) Contacts: the PhysPAG, COPAG, and ExoPAG Chairs (Grant Tremblay: grant.tremblay@cfa.harvard.edu; Janice Lee: janice.lee@noirlab.edu; Ilaria Pascucci: pascucci@arizona.edu, respectively).
- [TDAMM Communications SAG](#) Contacts: Co-Chairs Jamie Kennea (Penn State) and Judy Racusin (NASA GSFC).

2 April 2024
PhysCOS Activit Meeting
» Details

Release of the S Challenge and A
» Details

[More News Article](#)

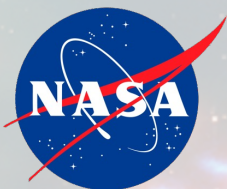
[Subscribe to Phys](#)

<https://pcos.gsfc.nasa.gov/sags/sags.php>



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Summary & How to Get Involved

- Sign up for PhysPAG mailing list and join any Science Interest Groups that are related to your interests.
- Sign up for Cosmic Pathfinders and keep an eye out for upcoming events!

Upcoming PhysPAG events:

- CR SIG virtual forum on future of Ultra High Energy Cosmic Rays –Frank Schroeder, U. Delaware (Monday, October 7th, 1-2pm).
- Early Career Workshop: November 19-21, 1-4pm (virtual), with talks and discussions on science, missions, and careers


If you're attending Winter AAS (National Harbor, MD):

- Come to the PhysPAG session on Sunday, January 12th to see the breadth of activities going on.
- Look out for the Cosmic Pathfinders, FIG SAG, AWESOM SAG and NGO SAG splinter sessions.



Mailing List
QR Code:






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THANK YOU!



Francesca Civano
francesca.m.civano@nasa.gov





Backup

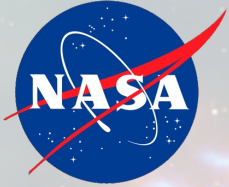
Save the Date!

NASA's Physics of the Cosmos Program Analysis Group

Join us January 12, 2025, 9am-3:30pm at the
245th AAS

Updates and discussion with the PhysCOS
Program Office and the Science Interest Groups:
Gamma Rays, X-rays, Gravitational Waves,
Cosmic Structure, and much more!

Followed by a Joint PAG session 4-6pm

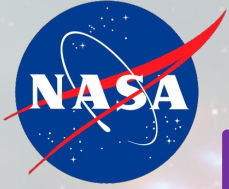


Strategic Technology Development

The Program Office

- Monitors and manages PhysCOS and COR Strategic Astrophysics Technology (SAT), Internal Scientist Funding Model (ISFM), Roman Technology Fellowships (RTF) and other direct-funded technologies;
 - Focuses on Astro2020-related technology development (FGOs, Probes); and
 - Conducts Technological Readiness Level (TRL) assessments.
-
- PhysCOS/COR Technology Website <https://apd440.gsfc.nasa.gov/technology.html>
 - Program Overview, Tech Gaps, Technology Photo Gallery, Publications
 - AstroTech Database <http://www.AstroStrategicTech.us/>
 - Published PI Annual Reports 2023
 - Astrophysics Biennial Technology Report (ABTR) 2024 & Astrophysics Technology Update (ATU)





Compiling Science Gaps



GOAL: produce a list of precursor and preparatory science gaps for PhysCOS-related science as a resource for the community

- Precursor Science informs the mission architecture and trades
 - Needed soon for HWO and over coming years for X-ray/FIR future great observatories
 - Looking for natural gaps, thresholds, and gradients in the science return vs. measurement parameters
- Preparatory Science informs data / interpretation or early operations; potentially from new observations, but needed just before or soon after launch to help inform the best way to conduct investigation
- Started a process similar to the Technology Gaps process:
 - Science Gaps site with link to [google form](#) for submissions
 - Next steps: (1) review and iteration by SIGs and program office; (2) review by HQ; (3) Publish the list on PhysCOS website; (4) annually/biennially update the list

