

NASA's Physics of the Cosmos Program X-Ray Science Interest Group

Splinter Session at AAS 247


XR SIG co-chairs: Breanna Binder (Cal Poly Pomona), Chien-Ting Chen (USRA/MSFC), Steven Ehlert (MSFC),
Fabio Pacucci (CfA), David Pooley (Trinity / Eureka Sci.)

New website

https://science.nasa.gov/astrophysics/programs/physics-of-the-cosmos/community/xr-sig/

Explore

Search...



News & Events

Multimedia

NASA+ LIVE

... / Physics of the Cosmos Community / X-Ray Science Interes

AboutCommunityOpportunitiesMissionsStudiesNews & EventsResources

Science Interest Group

X-Ray

The X-Ray Science Interest Group (XR SIG) serves as an active communication forum for X-Ray astrophysics. XR SIG is open to the scientific community.

About

Leadership

Documents

Join the X-Ray SIG Email Llst

News & Events

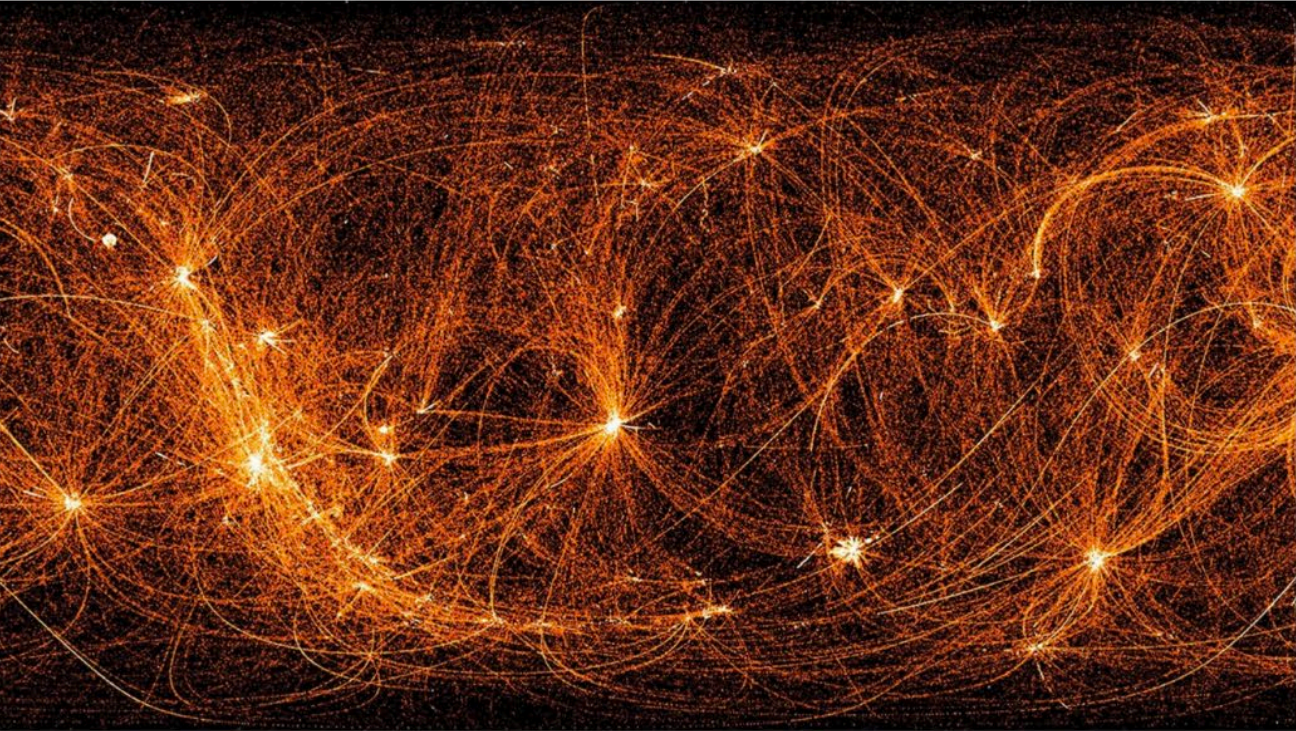
About XR SIG

Supporting Mission Studies and Concept Development for Future X-Ray Observatories

The X-Ray Science Interest Group (XR SIG) will provide quantitative metrics and assessments to NASA with regard to future X-Ray observatories.

XR SIG will track and analyze evolving science goals and requirements in X-Ray astronomy, especially as current hot topics evolve. XR SIG will also analyze technology development and prioritization plans and assist the Physics of the Cosmos Program Analysis Group in determining technology needs.

The X-Ray Sky



This image of the whole sky shows 22 months of X-ray data recorded by NASA's Neutron star Interior Composition Explorer (NICER) payload aboard the International Space Station during its nighttime slews between targets. NICER frequently observes targets best suited to its core mission ("mass-radius" pulsars) and those whose regular pulses are ideal for the Station Explorer for X-ray Timing and Navigation Technology (SEXTANT) experiment. One day they could form the basis of a GPS-like system for navigating the solar system.

Credits: NASA/NICER

Agenda

Focus on SAG Updates & Plans

- Overview / Motivation / History — David Pooley (Trinity University & Eureka Scientific, Inc.)
- BBX SAG — chairs Chien-Ting Chen (USRA/MSFC), Kristin Madsen (GSFC), Daniel Stern (JPL/Caltech)
- Lynx 2030+ SAG — chairs Steven Ehlert (MSFC), Fabio Pacucci (CfA | Harvard & Smithsonian)
- HiReX SAG — chairs Breanna Binder (Cal Poly Pomona), Herman Marshall (MIT), Mark Schattenburg (MIT), Kim Weaver (GSFC)
- Q&A

Motivation / History

ensure a viable and exciting future for X-ray astrophysics

- August 2023: APD Director informs *Chandra* Users' Committee about coming cuts; magnitude uncertain
- February 2024: NASA immediately cuts *Chandra* funding; GO budget reduced by 30%
- March 2024: NASA portion of FY25 PBR effectively cancels *Chandra* mission (confirmed by OPCR)
- August 2024: under Congressional pressure, NASA keeps *Chandra* operating; GO funding eventually restored
- Winter 2024: initial thinking about Astro2030 prep begins; three SAGs envisioned to start in early 2025
- February 2025: NASA PAGs and subsidiary groups (including XR SIG) pause activities; DOGE arrives at NASA
- March 2025: NASA's Astrophysics Advisory Committee (APAC) is abolished (no longer a clear way to start a SAG)
- April 2025: "skinny budget" leaked with proposed 66% cuts to APD (all science in U.S. faces existential threat)
- Summer/Fall 2025: Senate and House approps bills support science in general, APD and *Chandra* in particular
- October 1 to November 12, 2025: longest government shutdown in history
- Now: appropriations bills still not passed; budget uncertainty continues

Throughout 2025: almost no direction from APD on Astro2030 preparations because of uncertainty.

Motivation / History

ensure a viable and exciting future for X-ray astrophysics

- Early in 2025, we realized that we could not afford to wait for clarity; too much time would be lost.
- April 2025: drafted Terms of Reference for three SAGs (despite no APAC)
- Reasoning: without clear direction from APD on whether there would be full STDTs for mission concepts, we realized we could use the framework of the PhysPAG to lay the groundwork for future mission studies.
- The PhysCOS Program Office cannot support a full STDT, but it can support the XR SIG forming focused SAGs.
- These SAGs will deliver reports to the APD Director, and those will help inform APD activities for Astro2030.
- We also began the Future of X-ray Astrophysics online seminar series (roughly biweekly, started 2025 Aug 8)

<https://science.nasa.gov/astrophysics/programs/physics-of-the-cosmos/community/xr-sig/>

Science Interest Group

X-Ray

The X-Ray Science Interest Group (XR SIG) serves as an active communication forum for X-Ray astrophysics. XR SIG is open to the scientific community.

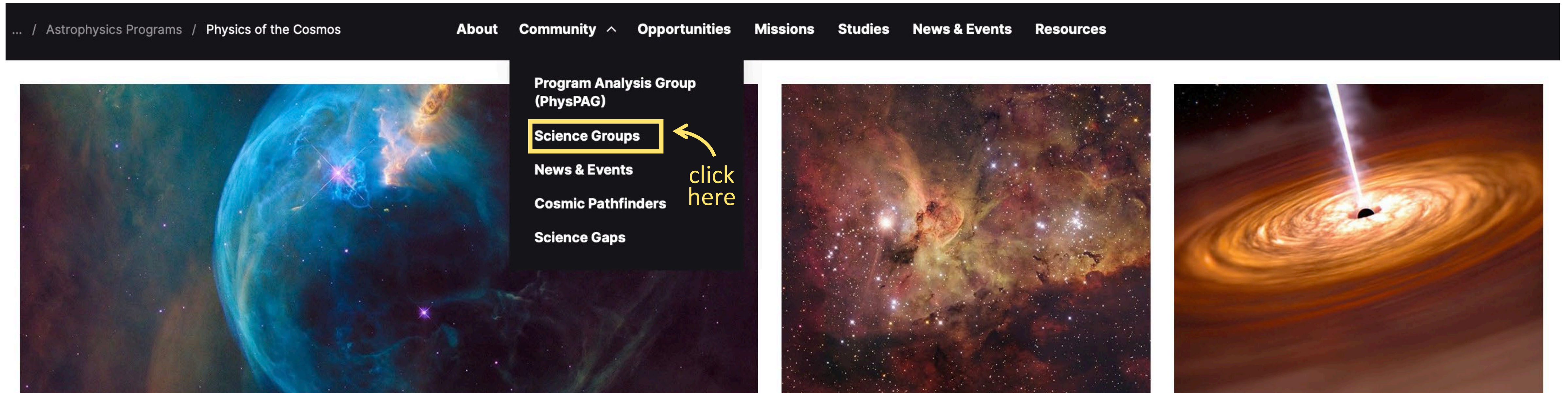
About	↓	Join the X-Ray SIG Email Llist	↓
Leadership	↓	News & Events	↓
Documents	↓		

recordings and
slides here



More Information on SAGs

go to <https://science.nasa.gov/astrophysics/programs/physics-of-the-cosmos/>



Physics of the Cosmos

The Physics of the Cosmos (PhysCOS) Program seeks to answer some of the deepest questions about the universe. How do matter and energy behave in the most extreme corners of the cosmos — near black holes, neutron stars, and the first moments after the Big Bang? What forces set the universe in motion and continue to shape its growth? What are the hidden ingredients — dark matter and dark energy — that make up most of the universe but remain invisible to us? PhysCOS seeks to uncover these mysteries, helping us better understand the cosmos and our place within it.

More Information on SAGs

each SAG page has detailed information, including how to join

Science Analysis Group

Broad-Band X-ray Observatory


The Broad-Band X-ray (BBX) Science Analysis Group (SAG) will focus on identifying the scientific opportunities that require coverage beyond the typical capabilities of focusing soft X-ray facilities like Chandra, XMM-Newton, and Swift/XRT. Membership, including volunteers from the PhysPAG and broader astrophysics and technology communities, is open.

AboutLeadershipDocuments

About BBX SAG

Astrophysics Will Critically Need a High Angular Resolution Broad-Band X-ray Mission

Possibilities to be explored include a flagship-class mission with multiple instruments, or multiple missions operating in tandem.



Can you see the shape of a hand in this new X-ray image? The hand might look like an X-ray from the doctor's office, but it is actually a cloud of material ejected from a star that exploded. NASA's Nuclear Spectroscopic Telescope Array, or NuSTAR, has imaged the structure in high-energy X-rays for the first time, shown in blue. Lower-energy X-ray light previously detected by NASA's Chandra X-ray Observatory is shown in green and red.

Nicknamed the "Hand of God," this object is called a pulsar wind nebula. It's powered by the intense, fast-moving outflow from the spinning, superdense surface of the stellar

Science Analysis Group

Lynx 2030


The Lynx 2030 Science Analysis Group (SAG) will investigate the science case of an updated flagship X-ray observatory concept based heavily on the Lynx mission submitted for the 2020 Decadal Astronomy Study. This SAG has open membership, including volunteers from PhysPAG and the broader astrophysical community.

AboutAgenda for Lynx2030 SAGDocumentsLeadershipWorking Groups

About Lynx 2030 SAG

Lynx 2030 SAG Will Build On the Work of the Lynx Concept Study Report

The Lynx concept study report is an excellent baseline for what the flagship X-ray mission submitted to the 2030 Decadal Survey may look like.



For the first time, astronomers have combined data from NASA's Chandra X-ray Observatory and James Webb Space Telescope to study the well-known supernova remnant Cassiopeia A (Cas A). This work has helped explain an unusual structure in the debris from the destroyed star called the "Green Monster," first discovered in Webb data in April 2023. The area of the Green Monster is outlined in the inset image. This composite image contains X-rays from Chandra (blue), infrared data from Webb (red, green, blue), and optical data from Hubble (red and white). The outer parts of the image also include infrared data from NASA's Spitzer Space Telescope (red, green, and blue). Image and text credit: X-ray: NASA/Chandra X-ray Center (CXC)/Smithsonian Astrophysical Observatory (SAG); Optical: NASA/ESA, ESA/ESA/NASA

Science Analysis Group

High Angular Resolution X-ray Imager

The High Angular Resolution X-ray Imager SAG will address the scientific opportunities enabled by ultra-high angular resolution X-ray imaging across broad scientific categories. Hi-ReX SAG membership is open to the astrophysics and technology communities.

AboutNews & AnnouncementsLeadershipDocuments

About Hi-ReX SAG

Scientific Analysis for an Ultra-High Angular Resolution X-ray Imager Observatory

Recent advances in X-ray optics, precision formation flying, and high-resolution detectors have made it feasible to pursue milli- to micro-arcsecond (mas to μas) imaging in the X-ray band. Such capability would exceed Chandra's angular resolution by more than two orders of magnitude and could enable transformative discoveries across a broad spectrum of high-energy astrophysics.



Star Formation and Evolution The Small Magellanic Cloud (SMC) is one of the Milky Way's closest galactic neighbors. Even though it is a small or so-called dwarf galaxy, the SMC is so bright that it is visible to the unaided eye from the Southern Hemisphere and near the equator. Because the SMC is so close and bright, it offers an opportunity to study phenomena that are difficult to examine in more distant galaxies. New Chandra data of the SMC have provided one such discovery: the first detection of X-ray emission from young stars, with masses similar to our Sun, outside our Milky Way galaxy. In this composite image of the Wing, the Chandra data are shown in purple, optical data from the Hubble Space Telescope are shown in red, green, and blue, and infrared data from the Spitzer Space Telescope are shown in red. Most star formation near the tip of the Wing is occurring in a small region known as NGC 602, which contains a collection of at least three star clusters. One of them, NGC 602a, is similar in

