May 2026

The High Energy Astrophysics Division Semi-annual Newsletter

Editors: Renee M. Ludlam (Wayne State University) and Drew M. Miles (The California Institute of Technology)

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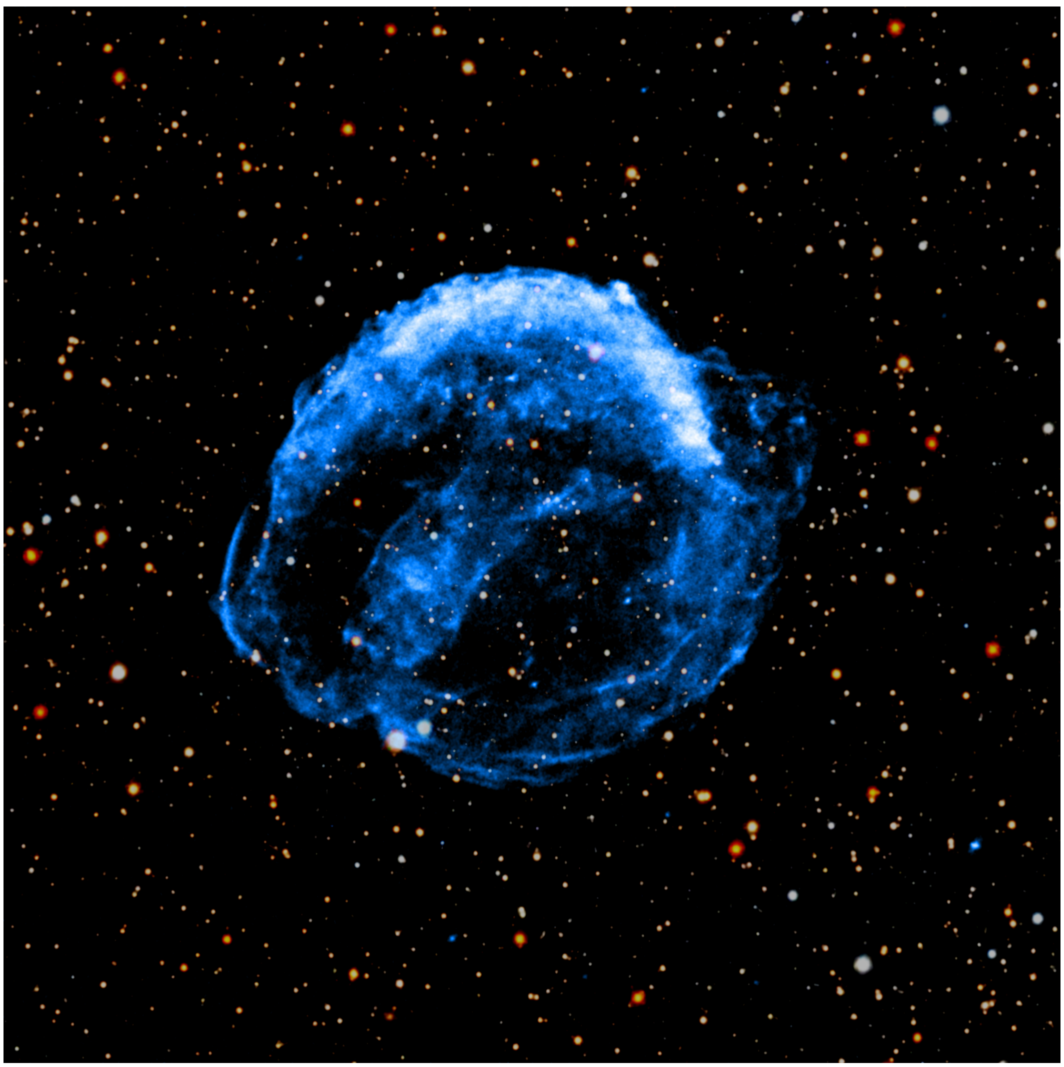


An image of the Kepler supernova remnant combining data from Chandra (primary blue) with optical images from Pan-STARRS (red/green/blue). This image is part of a press release. Credit: X-ray: NASA/CXC/SAO; Optical: Pan-STARRS

The View from the Chair

Colleen Wilson-Hodge (NASA MSFC)

One year ago, the situation in our field was dire. The President's budget request had extreme cuts to astrophysics budgets, both for NASA and NSF. The agencies were initiating cuts to follow the President's budget request. Congress stepped up and restored funding, so high energy missions have continued, although there has already been considerable loss to the community through colleagues who felt pushed to resign or were fired. One year later, now that I am HEAD EC Chair, the President's budget again proposes extreme cuts. The situation seems less dire, because it is not making the news in the same way and the agencies are not reacting immediately. However, our community must remain vigilant and continue reaching out to our representatives to ensure that support continues for high energy astrophysics. I encourage everyone to use the advocacy resources provided by AAS to reach out.

On a lighter note, I am very excited about my first HEAD meeting as Chair. The next HEAD meeting, which the EC has dubbed HEAD 22.5, will be held during the Summer AAS meeting in Pasadena, CA, June 14-18, 2026. This will be a full HEAD meeting, joint with the AAS meeting. The highlight of the meeting will be a plenary session featuring Carolyn Kierans, HEAD Early Career Award winner. We will have morning and afternoon HEAD sessions in parallel in two dedicated HEAD meeting rooms, with a HEAD-dedicated poster area and a HEAD Early Career mixer. Our goal in organizing this meeting was to reduce the time between meetings to give early career members more opportunities to communicate their science, especially in light of the government shutdown during the last HEAD meeting. This meeting format continues our effort to answer the membership's desire for lower cost meetings. This meeting is being held in Pasadena, CA, where hotel and restaurant options are plentiful and much more affordable than within a resort. HEAD members will pay the normal AAS meeting registration fees which are lower than for standalone HEAD meetings, enabling HEAD members to attend both HEAD and AAS sessions if they wish. The HEAD sessions are scheduled to avoid conflict with AAS plenaries.

Finally, I express my deepest thanks to our outgoing EC members. Javier García and Raffela Margutti, and to the past chair, Randall Smith who has served in most of the EC roles during his tenure. I welcome our new EC members, Elizabeth Blanton, Vallia Antoniou, and new vice-chair Jon Miller. I also express my appreciation for Kristen Madsen's work as HEAD EC Chair and her continued support as past chair.

News from the HEAD

Megan Watzke, the HEAD Press Officer (CfA)

The news cycle is obviously dominated by politics and world events – yet news from high-energy astrophysics continues to make its way through into the public consciousness. Keep an eye out for considerable interest in the upcoming attempt to boost the Neil Gehrels Swift Observatory during the early summer. Of course, HEAD missions continue to produce remarkable science discoveries that draw in scientists and members of the public alike. A sample of some recent intriguing results from HEAD missions that have been publicized include:

- December 11, 2025: "Black Hole Eats Star: NASA Missions Discover Record-Setting Blast"
- December 12, 2025: "XMM-Newton Sees Comet 3I/ATLAS in X-ray Light"
- December 18, 2025: "NASA's Fermi Spots Young Star Cluster Blowing Gamma-ray Bubbles"
- January 5, 2026: "NASA's IXPE Measures White Dwarf Star for First Time"
- January 6, 2026: "Supernova Remnant Video from NASA's Chandra is Decades in Making"
- January 21, 2026: "eROSITA Reveals Powerful Black Hole Winds Driving Unexpected X-ray Flickering in Quasars"
- February 11, 2026: "NASA's Swift Mission Transitions Ops to Prep Orbit Boost"
- March 10, 2026: "NASA Discovers Crash of Extreme Stars in Unexpected Site"
- April 16, 2026: "Space Telescope Studies Solar System X-ray Glow"
- April 28, 2026: "NASA Connects Little Red Dots with Chandra, Webb"

XRISM

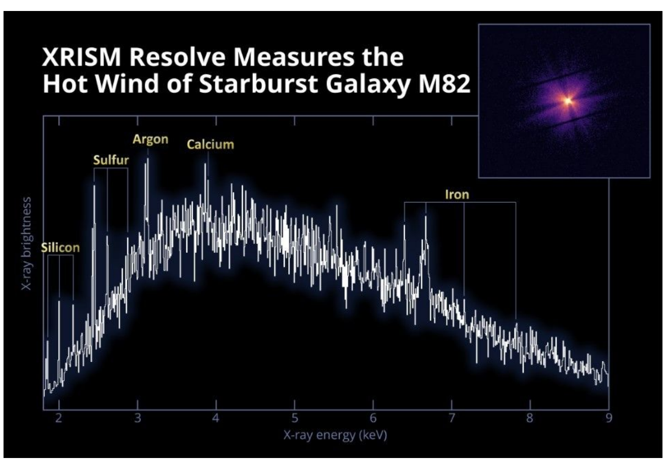
Brian J. Williams & Richard L. Kelley (NASA GSFC)

The X-ray Imaging and Spectroscopy Mission (XRISM), is an international JAXA/NASA collaboration with participation from ESA. XRISM began science operations in February of 2024 and in September 2024, completed the Performance Verification (PV) phase of the mission. All observations taken in the PV phase have been made public and are available in the HEASARC archive. XRISM is in the General Observer (GO) phase of the mission. XRISM retains a 12-month proprietary period for all observations taken in the GO phase, after which the data are populated into the HEASARC archive.

At the time of this writing on May 1st, 2026, the Cycle 3 review panels are meeting in Baltimore, MD, to assess the Cycle 3 proposals from the US and Canada, which were due on February 27th, 2026. Similar meetings are taking place in Japan and Europe, and in mid-May, the results of these three independent processes will be combined via the International Merging Meeting. Results for Cycle 3 should be publicly released by late May or early June. Worldwide, we received approximately 330 proposals for an oversubscription rate of more than 6:1. Cycle 3 marked the return to a full year observing cycle, which we anticipate remaining in for the remainder of the mission. We anticipate a due date for Cycle 4 in the same general time of year as the due date for Cycle 3.

XRISM is continuing to return spectacular scientific results, despite the Resolve aperture door (“gate valve”) remaining closed, limiting the bandpass of Resolve to above 1.7 keV. XRISM now has over 100 refereed papers in the scientific literature, with the rate of publications steadily increasing. Here, we show a recent highlight from a XRISM observation of M82, where astronomers used Resolve to measure the speed of the gas flowing out of the galaxy as a result of extraordinary amounts of star formation.

The 1st International XRISM Symposium took place October 20-24th, 2025, in Kyoto, Japan. Despite the US government shutdown that prevented attendance by NASA scientists, the meeting was a great success, with approximately 300 attendees and a full slate of talks and posters over five days. The XRISM project is planning on hosting the 2nd International meeting in the US in the spring of 2027. Stay tuned for more details, and we hope to see you there!



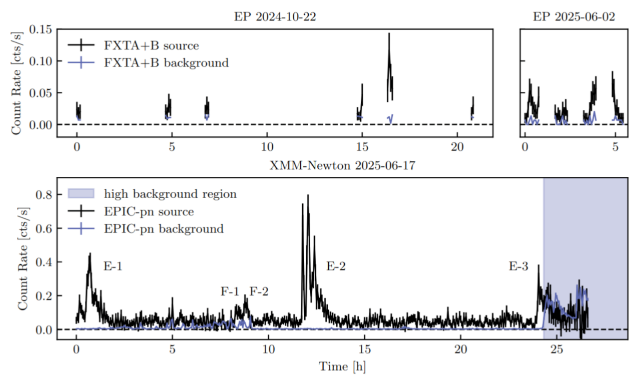
The Resolve instrument aboard the XRISM (X-ray Imaging and Spectroscopy Mission) spacecraft captured data revealing the velocity of the hot wind at the center of starburst galaxy M82. The energy range of iron emission lines show that the gas moves around 2 million miles (about 3 million kilometers) per hour. Inset: XRISM Xtend instrument?s image of M82. Credit: NASA's Goddard Space Flight Center, JAXA/NASA, XRISM Collaboration et al. 2026

The Einstein Probe (Tianguan)

Weimin Yuan & Congying Bao, on behalf of the EP team

Launched in January 2024, the Einstein Probe (EP) – also known as Tianguan in Chinese – has been conducting routine science operations since July 2024. With its wide-field soft X-ray monitor WXT and rapid-response follow-up telescope FXT, EP continues to reveal the dynamic X-ray universe, from stellar flares in our own Galaxy to distant explosive transients.

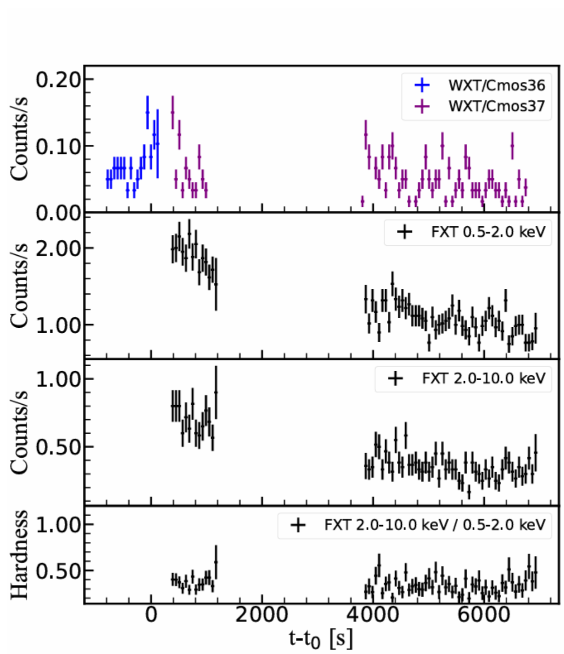
To date, EP has detected over 220 X-ray transients—including approximately 170 fast transients with burst durations spanning from seconds to hours. These detections facilitate studies across various source classes, such as extra-galactic fast X-ray transients (eFXT), gamma-ray bursts (GRBs), tidal disruption events (TDEs), and X-ray binary systems. Below we highlight some notable results from the first quarter of 2026, based on data taken primarily with Einstein Probe.



The Einstein Probe and XMM-Newton X-ray lightcurves of the tidal disruption event eRASSt J234402.9−352640, showing quasi-periodic eruptions. (Image credit: Baldini et al. 2026)

Complex flaring and quasi-periodic eruptions in a tidal disruption event (Baldini et al. 2026): Deep follow-up observations of the galactic nucleus hosting the five-year-old tidal disruption event eRASSt J234402.9−352640 (J2344) have been carried out with EP and XMM-Newton. The combined soft X-ray light curves (see figure above) reveal highly structured variability. Temporal decomposition and time-resolved spectral analysis identify broad, thermal flares recurring every $\sim$12 hours and lasting $\sim$2 hours, consistent with quasi-periodic eruptions (QPEs). Remarkably, these QPEs are accompanied by an unprecedented crest of hotter shorter flares, each lasting between 5 and 30 minutes. These flares are predominantly found in the rising phases of the QPEs, although they also appear throughout the quiescence. These findings establish J2344 as a new member of the QPE emitter population and uncover a previously unobserved phenomenology that challenges current models of QPEs, with possible interpretations within the framework of extreme mass ratio inspirals.

A stellar flare with disappearing Hα emission (Guoying Zhao et al. 2026): On 27 September 2024, EP detected an X-ray flare from the nearby K-type star PM J23221$-$0301 (see figure below). The event exhibited a classic fast-rise-exponential-decay profile, with a peak luminosity of $\sim 1.3 \times 10^{31}$ erg s^{-1} in the 0.5–4.0 keV band and a total energy release of $\sim 9.1 \times 10^{34}$ erg. Optical spectroscopy following the flare showed time-variable features, most notably the complete disappearance of the Hα emission line — a signature of chromospheric heating and subsequent plasma evaporation. These observations, consistent with magnetic reconnection-driven stellar flares, demonstrate EP's capability to study magnetic activity on nearby stars with both X-ray and multiwavelength follow-up.

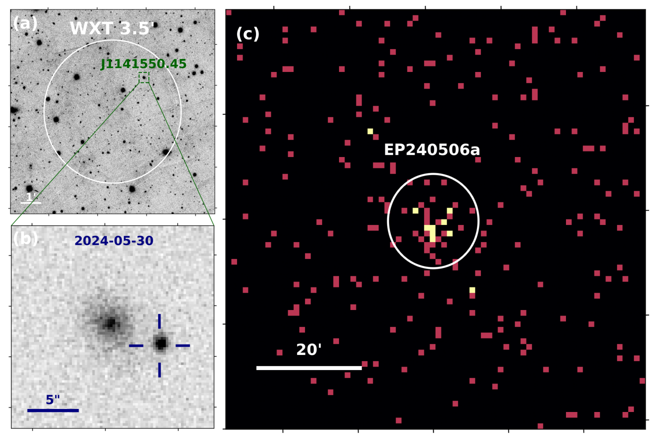


The 60 s time-binned X-ray light curves of the K-type star PM J2322.1$-$0301, as observed by WXT in the 0.5–4.0 keV band and by FXT in two energy bands, along with the hardness ratio defined as $C_{2.0-10\,\mathrm{keV}}/C_{0.5-2.0\,\mathrm{keV}}$ (exhibiting only slight variations). Here, t_0 is the WXT trigger time 2024-09-27T01:03:48 (UTC). (Image credit: Guoying Zhao et al. 2026)

An extragalactic fast X-ray transient associated with core-collapse supernova (Runduo Liang et al. 2026): Extragalactic fast X-ray transients (eFXTs) are a rapidly growing class of high-energy phenomena with poorly understood physical origins. A systematic search for optical counterparts to EP-detected eFXTs using archival optical surveys and transient databases has identified AT 2024ofs at redshift $z = 0.120 \pm 0.002$ as the counterpart of EP240506a. The transient lies on the outskirts of its host galaxy (see figure below), and its luminosity and temporal evolution are consistent with a core-collapse supernova exhibiting an unusual early UV excess. We also estimate the local event-rate density of such events, providing key constraints on progenitor models and highlighting EP's ability to detect prompt high-energy emission from core-collapse supernovae.

In January 2026, the Einstein Probe marked the successful completion of its second year in orbit. The spacecraft and payloads have maintained stable nominal performance, supporting consistent and robust science operations. Building on this steady operational status, the mission will continue to serve the time-domain astronomical community and deliver new insights into cosmic transient phenomena.

More information on the mission can be found at https://ep.bao.ac.cn.

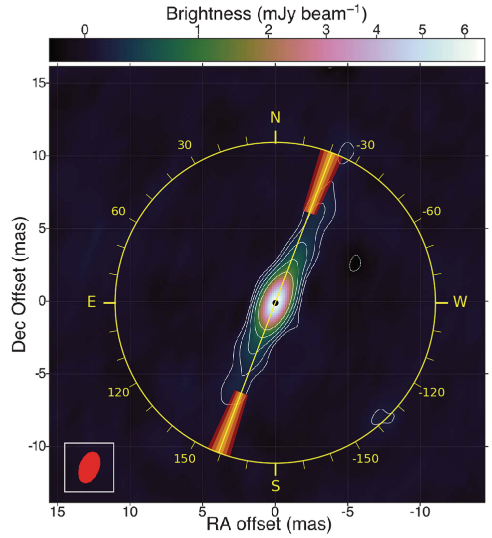


Localization of EP240506a and its optical counterpart AT 2024ofs. (a) The position of the host galaxy J141550.45 (green outline) relative to the WXT localization uncertainty (white circle) in the PS r-band image. (b) The PS w-band science image, where the position of AT 2024ofs is marked by a cross, showing that the transient lies on the outskirts of its host galaxy. (c) The WXT X-ray image obtained from T_0 to $T_0 + 150$ s. The white circle denotes the source extraction region with a radius of $9'$. (Image credit: Runduo Liang et al. 2026)

Imaging X-ray Polarimetry Explorer (IXPE)

Philip Kaaret & Douglas Swartz (NASA/MSFC)

A Friends of IXPE Forum has been established to better inform the science community of IXPE activities. Discussions include analysis techniques and tools, programmatic announcements, and data processing and calibration updates. Participants have opportunities to present their latest scientific results, to ask questions of the IXPE experts, and to exchange ideas among fellow professionals. Meetings are held virtually on the third Thursday of each month at 10:00 AM US Central Time. If you are interested in joining the Friends of IXPE Forum, please register here. If you wish to give a talk, please mention this in your response to the last question on the registration page.



The 2–8 keV polarization angle (yellow line) of Cyg X-1 with 1-σ, 2-σ, and 3-σ confidence regions (orange to red shading). Background is a radio image of the jet. (Image credit: Krawczynski et al. 2022)

As noted in the Fall 2025 HEAD newsletter, IXPE Detector Unit 2 (DU2) experienced an event in April 2025 that changed the readout ASIC pixel gain, pedestals, and noise. This impacted the polarization response at low energies and the spectral response. The IXPE team performed an extensive recalibration campaign with 2.7 Ms of exposure on the bright X-ray binary Cyg X-2 in December 2025 and January 2026. The recalibration has successfully restored the polarization and spectral response of DU2. Data from 17 June 2025 to now have been reprocessed and re-delivered with DU2. Data delivery for new observations will include DU2. More details are available in the IXPE mission and data processing status updates talk presented at the first Friends of IXPE Forum.

The due date for IXPE General Observer (GO) Cycle 4 proposals is expected to be 17 September 2026. The call for Cycle 4 proposal should be announced as an amendment to ROSES-2025. We are planning to hold a pre-proposal workshop on 30 June 2026. Please save the date. Details will be provided via the HEAD and IXPE email lists and, after release of the announcement, on the IXPE Proposals and Tools page. New for Cycle 4 will be a joint IXPE/XMM-Newton observing program via which IXPE will award up to 200 ks of XMM-Newton time per cycle. Starting with AO-25, XMM-Newton will award up to 500 ks of IXPE time per cycle.

The 2026 HEAD Bruno Rossi Prize has been awarded to Prof. Henric Krawczynski, of Washington University in St. Louis, for “pioneering contributions to the theory, instrumentation, and scientific interpretation of X-ray polarimetry, including the first hard X-ray polarization measurements with XL-Calibur and enabling landmark IXPE discoveries; both of which have revolutionized our understanding of black hole accretion and relativistic outflows”. Henric has been involved in important discoveries with IXPE. He has been an IXPE collaborator since selection of the mission and has contributed to many IXPE science results.

Our science highlight for the issue is Henric’s paper on IXPE observations of Cyg X-1 which was IXPE’s first paper on stellar-mass black holes. Cyg X-1 was in the hard/corona-dominated state during the IXPE observations. Polarization was detected in the 2–8 keV band with a degree of $4.01\% \pm 0.20\%$. The high polarization degree suggests that the emitting material is viewed closer to edge-on than the binary orbit. The polarization angle was well aligned with the radio jet, see the figure associated with this contribution. This indicates that the corona is spatially extended in a plane parallel to the accretion disk. This paper, and subsequent confirming results from other systems, significantly advanced our understanding of the geometry of the corona around accreting black holes.

Finally, it is with profound sadness that we convey news of the passing of Martin Weisskopf on Saturday, May 2, 2026, after a brief illness. Martin was a tireless advocate for X-ray polarimetry for decades before leading IXPE through its successful proposal, development, and flight stages. The mission would not exist without Martin’s leadership and many contributions.

The Chandra X-ray Observatory

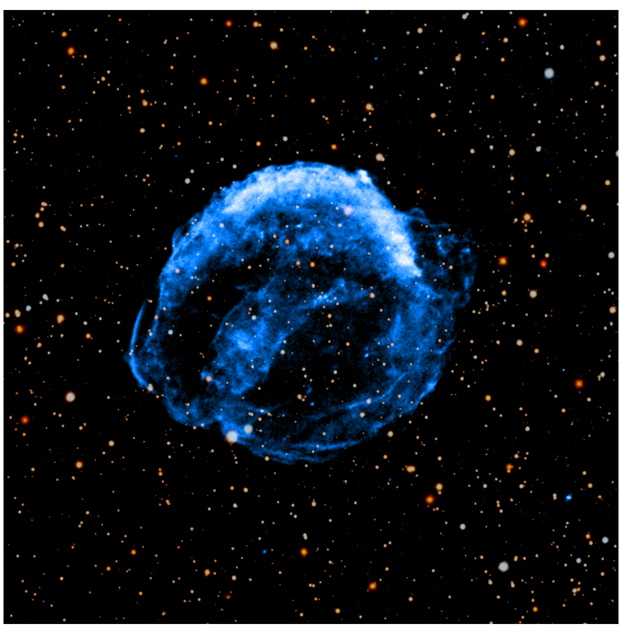
Steven Ehlert (NASA/MSFC), Mark Weber (SAO), & Edward Mattison (SAO)

Now in its 27th year, Chandra continues its highly successful science mission. With its unique capability for sub-arcsecond X-ray imaging, Chandra provides essential information for accomplishing many X-ray and multi-wavelength investigations in current astrophysical research.

Congressional appropriations for the 2026 fiscal year, along with NASA’s careful management of funds, have enabled Chandra to support full science operations and a fully funded GO program. We are grateful to both Congressional chambers for recognizing the importance of NASA’s Astrophysics fleet in general — and Chandra in particular — as a source of public good for the US and global science community, and look forward to their future support for Chandra. The Senate appropriations bill specifically discussed Chandra along with Hubble, stating that these two telescopes “... continue to make transformative discoveries and provide key capabilities that augment and complement the James Webb Space Telescope and help secure U.S. leadership in space and science..." We are confident that Chandra will continue to make vital contributions to astrophysical research for many years.

Chandra observing time continues to be highly valued. Scientists worldwide responded to Chandra’s Cycle 28 call for General Observer (GO) proposals, with 299 observing proposals requesting 72.3 Ms of telescope time, which corresponds to an overall oversubscription factor of 5.0. Demand for Large Programs, Very Large Programs, and Target of Opportunity Programs remains especially high, with an oversubscription rate of 9.2 during Cycle 28. As in Cycle 27, the Cycle 28 proposals will be reviewed and recommended using a Distributed Peer Review (DPR) process in lieu of traditional panel review. The Chandra Director's Office recently gave a presentation at NASA Headquarters to the Astrophysics Division about the DPR process. We are thrilled to see the Chandra team recognized as pioneers in this innovative method of selecting targets in light of its high oversubscription rate.

The long lifetime of Chandra enables it to perform unique scientific tests that were not possible earlier in the mission. The most recent example of a Chandra analysis that leverages this long mission duration was a recent press release video of Kepler's supernova remnant. By combining observations of this supernova remnant taken between 2000 and 2025, scientists were able to measure the expansion speed of the shock front across the perimeter. They found that the blast wave's expansion velocity varied significantly between the northern and southern edges. The northern front expands at at a speed $\sim 1/3$ that of the southern edge, which itself moves at a speed of $0.02c$. These differences in speed are attributed to density differences in the ambient medium. Measuring this expansion speed required both the long mission duration as well as Chandra's exquisite and stable angular resolution.



An image of the Kepler supernova remnant combining data from Chandra (primary blue) with optical images from Pan-STARRS (red/green/blue). This image is part of a press release. Credit: X-ray: NASA/CXC/SAO; Optical: Pan-STARRS

We finally wish to acknowledge the Chandra Communications & Public Engagement (CPE) team for their internationally recognized effort with the AstrOlympics project. Launched for the Winter Games in Cortina-Milan, the AstrOlympics project connected the physics of the Olympics to the wonders of high-energy astrophysics and multiwavelength NASA data. Through a robust international collaboration with NASA informal learning programs, the US State Department's "American Spaces" program, the US Embassy in Rome, and the Italian National Institute for Astrophysics, the program reached over 240 locations worldwide — from a library in Oklahoma to a US Embassy in Fiji.

The program featured educational posters in English, Italian, French, and Spanish along with videos, workbooks and interactive activities. Estimates indicate the initiative reached approximately 200,000 people in person and millions more through digital campaigns. Building on this project, the team is developing "Cosmic Pitch" for summer 2026, which will explore the science of soccer in time for the World Cup. Meanwhile, the Chandra Press Office has also been very active in issuing image releases, science press releases, and other communications of Chandra research results. A complete listing is available at http://chandra.harvard.edu/press. Additional information about the Chandra Observatory and the Chandra X-ray Center can be found at https://cxc.harvard.edu/.

Finally, it is with profound sadness that we convey news of the passing of Martin Weisskopf on Saturday, May 2, 2026, after a brief illness. Martin was one of the driving forces behind the Chandra X-ray Observatory since he took on the role of Project Scientist in 1977 until he re-tired from the role in 2022. During his tenure he led nearly every aspect of the mission's development, testing, launch, and operations. His advocacy for X-ray astronomy in general and Chandra in particular can even be found in his obituary, where it is written:

"In lieu of flowers, the family requests that letters of support be directed to efforts sustaining NASA's Chandra X-ray Observatory, which has provided decades of critical data on high-energy cosmic phenomena including black holes, supernovae, and the large-scale structure of the universe."

Martin's leadership and vision have been foundational to all of Chandra's success, and we are proud to continue observations with the extraordinary telescope he built.

XMM-Newton

LYNNE VALENCIC (JHU/NASA) AND KIM WEAVER (NASA)

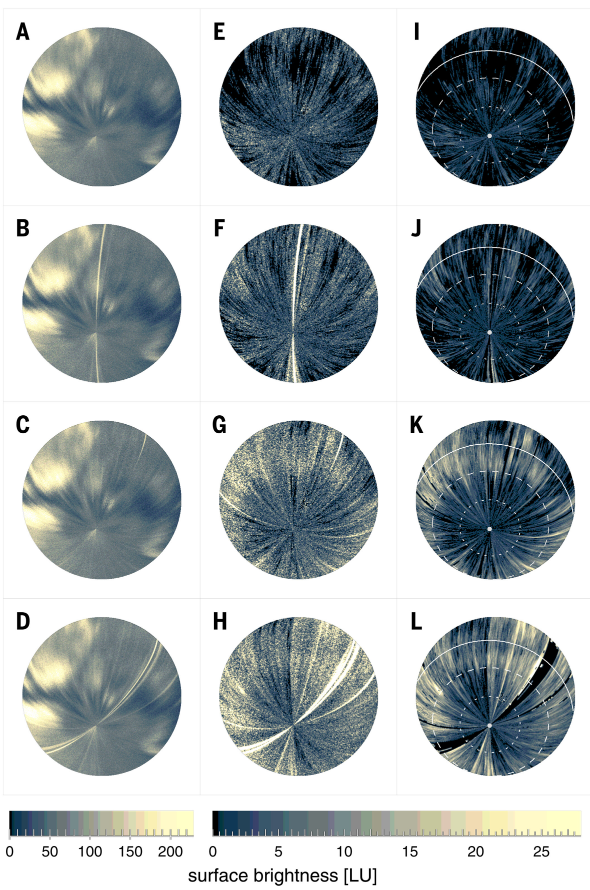
Successful submissions from the Twenty-fifth Call for Proposals for XMM-Newton were announced in December 2025, and observations will begin in May. U.S. PIs with A or B ranked targets were invited to submit a budget proposal; results will be announced in June.

We are currently examining our options for holding an XMM-Newton conference in the Baltimore-Washington area in spring 2027. As we make decisions, we will update the community through this newsletter and at our GOF website.

The SOC is holding the seventh symposium in their X-Ray Universe series June 8-11 in Elche, Spain. Registration is open through June 5. This conference series covers a broad range of high-energy astrophysics topics, from solar system studies to cosmology, and highlights discoveries from a variety of current missions. The scientific potential of future missions and the evolution of the data analysis landscape will also be discussed. More information can be found here.

SRG/eROSITA/ART-XC

A. Merloni (MPE), A. Lutovinov (IKI), P. Predehl (MPE), & S. Sazonov (IKI)



Extracting Solar Wind Change Exchange signal: All panels show 0.27- to 0.69-keV maps of the western Galactic hemisphere in Lambert zenithal equal area projection, with the Galactic Center at the left edge and the Galactic plane running horizontally, at different processing steps. **A** *to* **D** *are maps obtained from eRASS 1 to eRASS 4 (respectively), used to derive the dark sky map.* **E** *to* **H***: Corresponding maps after subtracting the dark sky map, on a different color scale.* **I** *to* **L***: Final maps after masking out periods of enhanced particle background and smoothing along the scan direction. They clearly show the brightening and latitudinal expansion of the SWCX emission during the rising part of the solar activity cycle. Ecliptic latitudes 0°, -30°, -60°, and -90° are marked by solid, dashed, and dotted lines and a dot, respectively. (Image credit: Dennerl et al. 2026)*

On 28 December 2025, the Mikhail Pavlinsky ART-XC telescope aboard the SRG observatory finished its 8th full all-sky survey, in line with plans, and entered an extended program of pointed observations. The targets for this new phase of the SRG mission were selected based on proposals submitted by scientists from different Russian institutions. These include Galactic and extragalactic objects of various types, with a focus on X-ray sources discovered during the ART-XC all-sky survey. As these new data are being accumulated, the ART-XC team is also busy analyzing the information collected during the preceding all-sky and Galactic plane surveys and working on the catalogs of detected sources. Another key milestone for the SRG mission was celebrated on 13 January 2026, when it exceeded its planned 6.5-year lifetime in orbit.

Using data from the SRG/eROSITA space telescope, MPE scientists have been able to disentangle the X-ray glow originating in our Solar System from galactic and extragalactic backgrounds. The four independent all-sky maps (eRASS1-4) obtained between 2019 and 2021 from a vantage point of the halo L2 orbit, $\sim$1.5 million km from Earth, enabled the extraction of solar-wind charge exchange (SWCX) emission and the determination of its time evolution across the solar cycle.

The X-ray glow from SWCX arises when highly charged solar wind ions like carbon and oxygen capture electrons from neutral atoms, which are present in Earth's upper atmosphere (the so-called geocorona) and in the whole Solar System (the heliosphere). The result is a ubiquitous foreground signal that affects virtually every study of the diffuse soft X-ray sky, from the hot plasma surrounding the solar neighbourhood (the Local Hot Bubble) and the halo of our Milky Way to the outskirts of distant galaxy clusters, where it can skew temperature and density measurements, key data for cosmological models. An accurate determination of the SWCX glow is therefore critical, and until now has been only partly successful. The new analysis of the eROSITA all-sky survey data delivered the clearest view to date of the soft X-ray sky (below 1 keV). It also redefines the SWCX glow, previously considered just a signal interference, as an observational tool that enables studies of the heavy ion content of the solar wind across all latitudes, its variation with solar activity, and its interaction with the interstellar medium.

The accompanying figure illustrates how the SWCX component can be teased out from each eRASS, leaving a clear imprint of the variable SWCX, which brightens and expands latitudinally as the solar activity increases across the solar cycle. The results were published in Dennerl et al. (2026).

At the end of July this year the German eROSITA Consortium will publish the second release of the eROSITA all-sky survey data. This will focus on catalogues of X-ray sources, and their multi-wavelength counterparts, extracted from the combined first three passes of the survey (eRASS1-3).

NICER

KEITH GENDREAU & ZAVEN ARZOUMANIAN (NASA/GSFC)

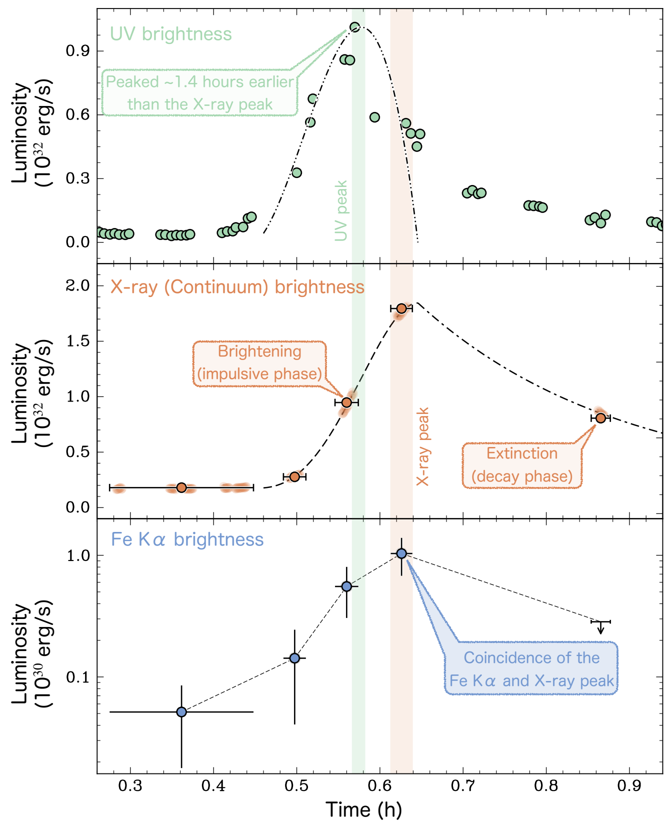
NICER science operations remain suspended following a hardware anomaly in the payload's pointing system, and the NICER team is focusing its efforts on stowing the X-ray Timing Instrument, in coordination with International Space Station technical and program management teams.

With the selection of 25 proposals for investigations based on archived data, Cycle 8 of NICER's Guest Investigator program is underway. We anticipate that a Cycle 9 opportunity, also dedicated to archival-data analysis, will be offered to the community, including—for the first time—an "applied astrophysics" category of investigations that support NASA's exploration goals. Potential areas of research in this category could include, for example, spacecraft navigation referred to observations of pulsars as beacons, or space-weather studies to elucidate interactions between the solar wind and Earth's upper atmosphere as they vary with time and geomagnetic conditions. Proposals in this category will be evaluated by peer-review panels consisting of subject-matter experts, separately from proposals for purely astrophysical investigations. All users are encouraged to explore the rich trove of data resulting from 8 years of continuous NICER operations, with observations often made in rapid response to transient phenomena. As improved calibration, background models, and filtering algorithms enable gains in sensitivity and expand the reach of existing data, we anticipate many new discoveries will be possible through archival investigations.

NICER data analysis software is distributed through the HEASoft package; the latest release, 6.36, incorporates NICERDAS 15, which offers tools and calibration products that accommodate the upgraded detector readout configuration (and content of data files) implemented during March and April 2025 to address the consequences of the May 2023 "light leak" and its repair, to recover as much scientific utility as possible. End-to-end analysis threads, tools, and documentation are available for the generation of spectra, lightcurves, and background estimates based on the sophisticated SCORPEON model. Feedback on NICERDAS performance is welcome through the HEASARC helpdesk system.

Recent NICER science results include:

- Insight into the origin of iron Kα emission in stellar flares (S. Inoue et al. 2026). Coordinated simultaneous observations with NICER and JAXA's *Hisaki* UV telescope of a superflare from UX Arietis support the hypothesis that the Fe line arises by photoionization, as X-ray photons from hot plasma in the flare illuminate atoms in the photosphere, rather than by collisional ionization from high-energy electrons. With the UV emission peaking earlier than the X-ray emission, the key finding is that the Fe Kα line coincides with the peak in the X-ray, not UV, lightcurve.



UV (top panel, from Hisaki) and X-ray (NICER) lightcurves of a superflare from UX Ari in Nov 2018; the middle panel is the continuum X-ray brightness, while the bottom panel shows the intensity of the spectral line from highly ionized iron atoms. The coincidence of the continuum and Fe X-ray peaks provides strong evidence for the photoionization hypothesis of the origin of the iron line emission. (Image credit: S. Inoue et al. 2026)

- Evidence for mutually exclusive disk-wind and jet ejections in a Galactic black-hole binary (Z. Zhang et al. 2026). In coordinated observations of 4U 1630−472 with NICER and MeerKAT across three outbursts, only one type of outflow is detected at a time, even while overall accretion properties remain consistent with a disk-dominated soft state.

- A second instance of pulse-peak migration during a magnetar outburst (G. Younes et al. 2025). Biweekly NICER monitoring of 1E 1841−045 provided a valuable baseline when its latest outburst began in August 2024. While pulse timing indicated an archetypal spin glitch, a notable change to the pulse profile was the emergence of a new, narrow, nonthermal component, which drifted in pulse phase over the ensuing weeks to eventually merge with the pre-outburst pulse peaks. The drift rate was similar to that seen in magnetar

SGR 1830−0645, the only previously known example of pulse-peak migration, but with the intriguing difference that the outburst-triggered component in the latter had a thermal spectrum. Untwisting of magnetic field bundles, associated surface hot spots, and possible plastic motion of the stellar crust may all play a role in the appearance and migration of pulse components, a puzzle that can be resolved as additional examples of the phenomenon are uncovered.

Neil Gehrels Swift Observatory

S. Bradley Cenko (NASA/GSFC)

Since the time of the last HEAD Newsletter, the primary priority of the Swift team has been maximizing orbital altitude, in order to provide the best chance of success of capture and boost by the upcoming mission by Katalyst Space Technologies.

In late 2025 and early 2026, we attempted to reduce the rate of altitude decay by orienting the Swift spacecraft in a manner to minimize drag over the part of each orbit where the atmospheric density is at a maximum. While this had a positive impact on orbital altitude (and had only a modest impact on science), increased solar activity and refined altitude predictions in mid-February both indicated an increasing risk of Swift not maintaining sufficient altitude for the Katalyst capture attempt.

After careful consideration, we opted to transition Swift full-time to an operations mode where the top priority is to prolong its orbital lifetime. While this necessitated suspension of pointed observations with the XRT and UVOT, it has been quite successful in prolonging orbital lifetime by reducing atmospheric drag. At the time (mid-February), our best estimate of the 90% confidence (no-earlier-than) 300-km crossing date was early June - if we continue to execute our reduced drag pointings as we have been doing for the two months, we now anticipate 300-km crossing no-earlier-than mid-August. It goes without saying we have missed out on many exciting science opportunities in the last two months. But thanks to the hard work and ingenuity of our operations team, this change has had a significant positive impact on the likelihood of success of the boost effort.

In mid-February we were still in the process of recovering the BAT from an unanticipated power cycle in late January. This process was completed on 11 March, and BAT data collection returned to nominal at that time. However, we identified that we could further increase orbital lifetime by reducing the total observatory power draw - reduced power allows us to point the solar panels further away from the Sun, particularly when the Swift orbital plane is close to parallel to the Earth-Sun vector. Since the BAT detectors are the largest non-essential power draw, we decided to also cease science data collection with the BAT, beginning 7 April.

The Katalyst team continues to make excellent progress towards assembly and testing of their Link spacecraft, working around the clock to launch as soon as feasible. Several important milestones are ongoing/anticipated in the coming weeks: environmental testing was completed successfully on 3 May at Goddard's Greenbelt campus, and launch vehicle integration at Wallops Flight Facility will follow soon. As you can probably imagine, launch date selection for the Swift boost mission is a complex trade between ground testing, orbital decay, and range availability. As that process is refined in the coming weeks, Katalyst will provide further updates.

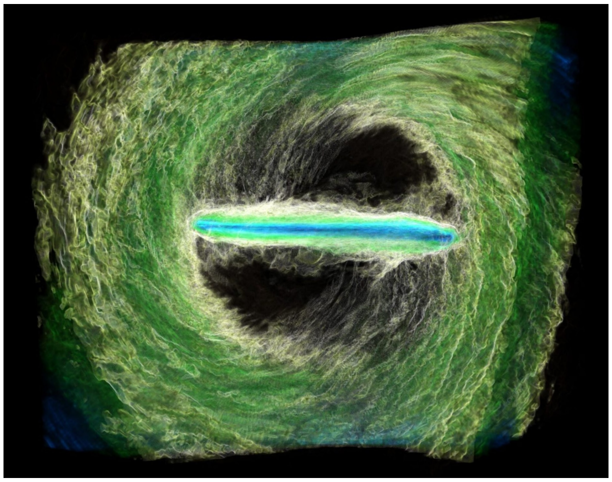
We realize the loss of observations with the XRT, UVOT, and now BAT has had a significant impact on the community, and we'd like to ask your help to document lost opportunities. If you would have benefited from Swift observations in the last two months that were not able to be obtained, please fill out the following webform: https://forms.gle/cJcbCWa4yDgKeCvy5.

While obviously contingent upon the outcome of the reboost, Cycle 22 Guest Investigator proposal evaluation has been completed, and we anticipate community notification of the results in the coming weeks. At the moment our plan is to postpone the start of Cycle 22 to October 2026, with a corresponding delay of 6 months to the Cycle 23 GI deadline (March 2027). As these dates are further refined, we will be sure to update the community.

NuSTAR

Hannah Earnshaw & Karl Forster (Caltech); Daniel Stern (JPL)

The selection of NuSTAR Cycle 12 targets was released on April 28. Overall, the Cycle had the second highest number of proposals received, the most since 2017, and continues the trend over the past few cycles of increasing numbers of proposals per year. Cycle 12 introduced joint observations with XRISM, in addition to continuing opportunities for joint observations with XMM-Newton and Swift. NuSTAR time is also available through the annual Chandra, IXPE, Swift, XRISM, and XMM-Newton announcements of opportunity. Over-subscriptions for regular observations and the various coordinated opportunities ranged between $3.1\times$ and $5.4\times$. Also this Cycle, NuSTAR officially offered the new, quicker automated Target-of-Opportunity (ToO) response which enables NuSTAR to be on-target within six hours of receiving a ToO trigger. There were 73 Cycle 12 ToO proposals submitted, corresponding to a $5.6\times$ over-subscription. Overall, NuSTAR is executing approximately 130 proposals per year, with >50% of observations coordinated with other observatories and >75% having time constraints. Cycle 12 NuSTAR observations will officially begin in June, though some coordinated observations have begun already.



A snapshot of a simulation showing how a supermassive black hole's accretion disk can rip into multiple misaligned sub-disks. This kind of disk tearing could be a possible cause of ultrafast inflows as matter drops away from the disk directly towards the black hole. (Image credit: Nick Kaaz/Northwestern University)

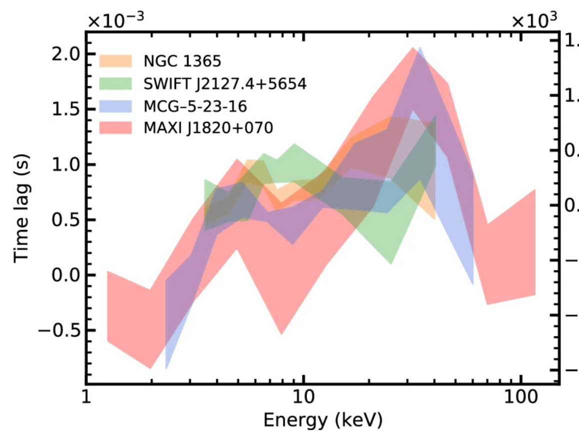
On the science front, one highlight since the previous HEAD newsletter is the discovery of ultrafast inflows around an active galaxy. While we are used to the powerful central engine of accreting supermassive black holes blowing gas into the host galaxy in an outflowing wind—sometimes at significant fractions of the speed of light—reports of inflowing material are less common in the literature. However, recent results from a NuSTAR study of the galaxy ESP 39607 show evidence of this latter phenomenon—an ultrafast inflow of gas falling towards the black hole at nearly 20% the speed of light. The results appear in Peca et al. (2025; ApJ, 898, 84). Detections of this kind of event are incredibly rare, so it is particularly valuable to have a NuSTAR detection in two observations separated by over a year of an absorption line in the AGN spectrum which indicates the presence of this inflow. There are several different mechanisms that could cause an ultrafast inflow. One is accretion disk tearing, in which a warped disk, misaligned with the black hole's rotation, breaks apart in places, causing gas to skip the disk and fall directly towards the black hole. Another is a failed outflow, in which gas blown out by the black hole only gets so far before rapidly falling back again. It is likely that the picture of black hole accretion is complex, involving both inflows and outflows in different parts of the system at different times. These NuSTAR data, and data from follow-up observations of this source by other missions, will be invaluable for refining our understanding of the dynamics of the extreme, chaotic environment around supermassive black holes.

Insight-HXMT

Shijie Zheng & Shuang-Nan Zhang (IHEP, CAS)

Insight-Hard X-ray Modulation Telescope (*Insight*-HXMT) continued observations of black holes and neutron stars from 1–250 keV and GRBs from 80–2000 keV. Data out of proprietary period can be downloaded freely from the *Insight*-HXMT official website. The *Insight*-HXMT Data Analysis Software (HXMTDAS) and the CALDB have been regularly updated and the latest versions are V2.07 and V2.08, respectively. More information about the progress, user support and results of *Insight*-HXMT can be found at the www.hxmt.cn (in English and Chinese).

Some new important results have been published recently with *Insight*-HXMT data. Notably, using the high-energy coverage of *Insight*-HXMT, the first detection of Compton hump reverberation lag peaking at $\sim$30 keV in the stellar-mass black hole binary MAXI J1820+070 is reported (You et al. 2026), together with a 6.4 keV iron K reverberation signal. As shown in the accompanying Figure, the lag-energy spectrum closely matches that of active galactic nuclei after mass scaling, providing direct evidence that accretion processes are universal across stellar-mass and supermassive black holes, and revealing rapid coronal expansion from $17\ R_g$ to $50\ R_g$ during the hard-state rise.



Comparison of the high-frequency lag-energy spectra between the stellar-mass black hole X-ray binary MAXI J1820+070 (red shaded region) and three typical active galactic nuclei (AGNs, right axis). (Image credit: You et al. 2026)

In the neutron star X-ray binary 4U 0614+09, a long-tailed thermonuclear X-ray burst reveals accretion disk retreating from the neutron star (Chen et al. 2025). In the black hole X-ray binary MAXI J1348−630, the simultaneous existence and competitive interplay between Type B and Type C QPOs are detected, revising the traditional transition picture of QPO evolution (Wang et al. 2026). For the accreting pulsar Vela X-1, long-term monitoring shows that the secular decay of the harmonic cyclotron line has ended, accompanied by a transient enhancement in cyclotron energy, revealing rapid changes in the magnetic field and accretion column geometry (Du et al. 2026). In the black hole X-ray binary Swift J1727.8−1613, broadband high-frequency humps of coronal origin are measured up to 100 keV, and the relativistic procession model yields a low black hole spin independent from spectral reflection results (Li et al. 2026). Meanwhile, multi-wavelength variability studies of black hole X-ray binaries provide new constraints on corona evolution and jet–disk coupling (Yang et al. 2026, Chand et al. 2026), and broad-band X-ray spectral analyses further improve measurements of continuum emission and reflection components (Xue et al. 2026). Finally, the ultra-long gamma-ray transient GRB 250702B is confirmed as an ultra-long GRB with a precursor and four distinct episodes, whose X-ray light curve follows the canonical $t^{-5/3}$ fallback decay and supports a supergiant collapsar origin (Zhang et al. 2026).

AO-08 of *Insight*-HXMT will be finished on Aug. 31, 2026, and the Cycle-9 Guest Observation Program will be fully open to the whole international scientific community. To date, approximately 5.7 Ms non-ToO observations have been carried out during Cycle 8, 5 pre-approved and 28 *ad hoc* ToO observations have been triggered and completed with a total exposure duration of 4.7 Ms. In particular, some Galactic plane scans have been performed for joint HXMT-EP observations. See the long-term and short-term plans, and list of observed sources for more information about Insight-HXMT observation plan. Finally, *ad hoc* ToO observations can be proposed by anyone at anytime (www.hxmt.cn), and the data are normally open immediately unless special request is made and approved by the PI.

The Fermi Gamma-ray Space Telescope

Elizabeth Hays, Andrea Prestwich, Judy Racusin, Dave Thompson (GSFC); & Lynn Cominsky (Sonoma State)

The Fermi scientific instruments, Gamma-ray Burst Monitor (GBM) and Large Area Telescope (LAT), continue to survey the entire gamma-ray sky.

For the first time, astronomers using Fermi Gamma-ray Space Telescope have traced a budding outflow of gas from a cluster of young stars in our galaxy. The particles that produce the gamma rays carry a large amount of the energy released within clusters. They could help drive galactic winds, regulate star formation, and distribute chemical elements within the galaxy. See:

A fleet of NASA missions, including Fermi, has likely uncovered a collision between two ultradense stars in a tiny galaxy buried in a huge stream of gas. Astronomers have never seen this type of explosive event in an environment like this before — and it may help solve two outstanding cosmic mysteries. The first puzzle this unprecedented location for a neutron star collision may explain is the fact that gamma-ray bursts (GRBs), which can be produced by the collapse of two neutron stars, sometimes do not appear within the core of a galaxy, or any galaxy at all.The other question this result could address is how elements like gold and platinum have been found in stars located at large distances from the centers of galaxies.

In February, the LAT released the FL16Y source list, an early version of the upcoming 5FGL catalog of LAT sources based on 16 years of data from 50 MeV-1 TeV. Beyond adding newly detected sources, the new list provides increased precision on source locations. This list uses twice the data of the 4FGL catalog, the most recent catalog that updated positions for all sources.

Fermi is now accepting TOO requests from the community using newly restored capability. Proposed observations with a strong science justification and measurable improvement from the observation will be considered.

During the LIGO/Virgo/KAGRA O4 runs, given the very wide fields-of-view of both instruments and their sensitivity to gamma-ray bursts, the GBM and LAT prioritized high uptime for gravitational wave counterpart observations. The instruments provided alerts to the community about possible counterparts through GCN Notices and Circulars. The emphasis on uptime and informing the community about observations promptly will continue during the LVK Intermediate Run 1 planned for later this year. Automatic reports from the LAT team for O3 and O4 are available.

The Fermi instruments continue to make improvements to enhance community science. The GBM completed a 2-year test of an onboard trigger configuration that increased the rate of immediate alert notifications for short gamma-ray bursts, typically generated by binary neutron star mergers, by about 10%. Previously, these bursts would have been found in ground analysis with reports coming out hours later.

The LAT just completed a large multi-year effort to migrate the data processing pipeline to the high-reliability, high-throughput S3DF facility at SLAC. The final step required a pause of data processing for the full switchover. That was completed in less than two weeks to minimize the impact on the science community. The new facility has measurably improved delivery of the LAT data.

Fermi software and documentation are available through the Fermi Science Support Center. For instructions on how to install the tools, release notes, troubleshooting, error reporting, and other related documentation see the Fermitools Wiki. The latest release of the GBM Data Tools is available on GitHub as a package in the Gamma-ray Data Tools.

Find details about the Guest Investigator program at the Fermi Science Support Center. The Cycle 19 proposal selection is underway and will be announced in the coming weeks.

The 2026 Fermi Summer School is planned for May 26 to June 5, 2026. More information about the annual event for graduate students and early post docs can be found on our website.

If you have job/research/degree opportunities relevant to the gamma-ray community, the LAT Collaboration has an Opportunity Board where those can be posted.

INTEGRAL Legacy User Validation & Feedback Exercise June 22, 2026

Jan-Uwe Ness (ESA), Steven Sturner (NASA-GSFC, UMBC), Guillaume Belanger (ESA), Matthias Ehle (ESA)

The final phases of development of the INTEGRAL Legacy Archive (ISLA) are well underway, and representatives of the scientific community will convene on June 22, 2026 10:30–12:00 CEST for an online presentation of the archive with an opportunity to advise on usability and user friendliness. The presentations may inspire ideas on how the external user community can help, e.g., contributions of community products that will be available here.

Members of the public are welcome, anyone wishing to join the meeting, please send an email to the INTEGRAL Project Scientist, Jan-Uwe Ness at jan.uwe.ness @ esa.int.

The main features of the user interface planned for ISLA have been implemented. They include 4 primary and 3 secondary portals:

- Primary portals:
  - Data: searching for data to be downloaded or connected to ESA datalabs for analysis
  - Sources: high level products like time series, spectra and mosaics
  - All-Sky Maps: to view within the ESA Sky embedded widget exposure maps and other all-sky maps
  - Catalogs: to explore official catalogs available in the standard OSA format
- Secondary portals:
  - GRB: to view within the ESA sky embedded widget the IBAS-detected GRBs and display their metadata
  - Community: where community members can provide links to their products
  - User Guides: where the documentation related to ISLA can be browsed.

What remains to be included by the end of 2026, i.e. the end of the post-operations phase, are additional products. Those currently planned for are:

- OMC catalog and long term time series of detected high-energy sources
- SPI published maps in all-sky viewer
- SPI catalog and spectra of detected sources
- JEM-X catalog of detected sources
- Uncertain: Updated IBIS catalog of detected sources
- Uncertain: Reprocessed IBIS products with final calibration

In addition, for the preservation of the ability to process consolidated INTEGRAL data using OSA, we plan to provide through ESA Datalabs (EDL) the OSA software together with a collection of Jupyter notebooks that provide templates and examples of how to run the core aspects of the analysis for IBIS and JEM-X, and possibly for SPI and OMC depending on time and support from collaborators.

IceCube

Alisa King-Klemperer (UW-Madison)

Group photo of IceCube Upgrade team with the drill tower, hose reel and IceCube Lab in the background. (Credit: Colton Hill, IceCube/NSF)

In 2019, the U.S. National Science Foundation, together with US institutional and international partners, approved funding of the IceCube Upgrade project, an improvement that would significantly push the scientific capabilities of the IceCube Neutrino Observatory. Seven years later, the IceCube Upgrade has now been successfully deployed, marking the first significant expansion of IceCube since its completion 15 years ago.

Located at NSF's Amundsen-Scott South Pole Station, IceCube uses one cubic kilometer of Antarctic ice to detect nearly massless particles called neutrinos that travel through outer space. Because they rarely interact with matter, neutrinos can provide a lens into otherwise obscured extreme cosmic environments, carrying valuable information about their sources. Thus far, IceCube has discovered astrophysical neutrinos, identified two galaxies as neutrino sources, and observed neutrinos from our own Milky Way galaxy.

"The successful deployment of the IceCube Upgrade project is a feat of U.S. engineering that demonstrates significant logistical capabilities in Antarctica," says Marion Dierickx, NSF program director for IceCube. "This upgrade will secure the nation's continued leadership in neutrino physics for years to come, paving the way for new cosmic discoveries."

IceCube uses more than 5,000 light sensors to capture the faint light emitted by secondary charged particles produced by neutrino interactions in the ice. The pristine quality of the Antarctic ice makes it an ideal medium for detecting this light. The IceCube Collaboration, with over 450 scientists from around the world, then takes these light patterns to reconstruct the energy and direction of the neutrino in order to determine its origin.

For IceCube, the Upgrade will allow more precise measurements of neutrino properties like neutrino oscillations, a phenomenon where atmospheric neutrinos can morph into different types or "flavors"—electron, muon, and tau. With these improvements, IceCube will be the premier neutrino experiment for long-baseline oscillation measurements using atmospheric neutrinos.

Using the enhanced devices deployed in the ice, scientists will be able to better characterize the surrounding ice, leading to improved reconstruction of neutrinos and a reanalysis of 15 years of archived data. The Upgrade will also improve the scientists' ability to determine the cosmic ray composition and measure neutrinos from galactic supernovae.

The Upgrade consists of five more closely spaced and more densely instrumented cables, or strings, of light sensors at the bottom center of the 86 existing strings, adding more than 600 new and enhanced light sensors and calibration instruments to the ones already embedded in the ice.

Years of preparation and international coordination for the Upgrade were condensed into three consecutive 10-week field seasons (2023–2026) for construction, with drilling and installation completed in the most recent season. The equipment used to drill five holes a mile and a half deep into the Antarctic ice was fabricated in the US and shipped to the South Pole. The first two field seasons were spent refurbishing, testing, and winterizing (i.e., storing sensitive components in a special heated area to survive the cold) all of the systems and equipment and setting up the drill camp.

A team of IceCube engineers and scientists and additional engineers from the US, Sweden, Thailand, New Zealand, Taiwan, Germany, Australia and Japan, in coordination with the Antarctic Support Contract, overcame numerous challenges and the harsh working conditions at the South Pole to complete the Upgrade. During the third and final field season, a 5-megawatt hot water drill system, the largest such system in the world, was used to drill the five holes for the Upgrade. The drill team worked around the clock, with each hole taking approximately three days to complete.

"The successful completion of the IceCube Upgrade relied on the critical support of the South Pole station and Antarctic service contractors," says Vivian O'Dell, the project director for the IceCube Upgrade. "Their essential contributions allowed us to complete the entire installation in one drilling season despite extreme weather conditions and logistical constraints, for which I am deeply grateful."

As soon as each hole was drilled, the installation team went to work deploying the Upgrade's higher performing light sensors. Two new types of light sensors, the multi-PMT digital optical module (mDOM) and the "Dual optical sensors in an Ellipsoid Glass for Gen2," (D-Egg), boast two to three times more sensitivity than the sensors that make up the current detector.

Major contributions came from international institutions in Germany and Japan, which contributed the light sensors, and Sweden, which contributed the surface cables. The US provided the main cables and played a central role in project coordination, logistics, drilling, and sensor construction and testing.

In addition to the mDOMs and D-Eggs, teams based in the US, Germany, Sweden, and Korea contributed precision calibration devices and special modules, such as cameras and prototype sensors for the proposed extension of IceCube, IceCube-Gen2.

"Designing, assembling, and testing the diverse set of photosensors and calibration devices across many institutions and countries is a testament to the collective expertise and commitment that make IceCube successful," says Erin O'Sullivan, an associate professor of physics at Uppsala University and IceCube spokesperson.

The Upgrade also presented an opportunity to support other scientific endeavors along the way. In collaboration with the U.S. Geological Survey, the crew installed two seismometers beneath the Antarctic ice. These seismometers are the deepest in the world and will help scientists monitor earthquakes with unprecedented clarity. The team has also collected water samples for microbiologists in the US who are looking for signs of life in the deep ice.

"Seeing the refurbished drill come back to life again 15 years after IceCube's original completion is truly remarkable," says Albrecht Karle, principal investigator of the IceCube Upgrade. "The team's around-the-clock effort to deploy the Upgrade is an extraordinary accomplishment. By placing new optical sensors into the clearest ice on Earth, we will measure neutrino properties and observe transient astronomy with a level of precision not previously possible."

Now that the Upgrade is finished, commissioning will continue to be the top priority in order to verify functionality of the newly deployed devices. The Upgrade, a stepping stone to the proposed IceCube-Gen2, which, if realized, would be eight times the instrumented volume of its predecessor, will ensure that IceCube remains at the forefront of neutrino astronomy for years to come.

VERITAS

WYSTAN BENBOW (SAO)

The VERITAS collaboration strives to recognize early-career scientists for outstanding work. During the past semester, Dr. Deivid Ribeiro (University of Minnesota) and Samantha Wong (McGill University) received the 2025 Trevor Weekes (post-doctoral) and Simon Swordy (graduate student) Outstanding VERITAS Contribution Awards, respectively. Both winners were recognized for a variety of service tasks performed for the collaboration that are summarized on the Collaboration website.

The VERITAS awards were presented at the semi-annual VERITAS collaboration meeting in Tucson, AZ in January 2026. Approximately 55 scientists attended this face-to-face meeting (a hybrid-format event), hosted by the Project Office near the observatory. The conference included ≈50 oral presentations, a poster session, hands-on working sessions, and a joint CTAO workshop. During the meeting, John Quinn (University College Dublin) was re-elected as VERITAS Executive Committee Chair, and he will serve another two-year term.

As of May 2026, VERITAS has completed ≈80% of its nineteenth season of full-scale operations. Although the weather in southern Arizona has generally been challenging, the observing yields for this season are typical. This is in part because the hardware systems continue to perform very well and is also due to a very strong start to the season in Fall 2025. The continued success of VERITAS operations enables a suite of Galactic and extragalactic gamma-ray studies, path-finding intensity interferometry studies, and significant multi-messenger collaboration. One highlight of these recent observations is the VERITAS detection of an exceptional flare from the well-known VHE (very high energy; E>100 GeV) blazar Mrk 421 in January 2026 (see ATel #17594). This flare coincided with a long-lasting period of VHE activity and was fortuitous since VERITAS conducted a major season-long campaign on Mrk 421, including significant coordinated observations with IXPE in April 2026.

Observatory operations are currently funded through Summer 2026, and the Project Office is working to secure the necessary financial support to extend VERITAS site operations.

Since Fall 2025, the VERITAS Collaboration has published five journal articles. The first article describes constraints on axion-like particles from observations of a flaring radio galaxy (arXiv:2510.19010). The second manuscript reports a measurement of the oblateness of a stellar photosphere via intensity interferometry (arXiv:2506.15027). The third article details a probe of the origin of astrophysical neutrinos and cosmic rays using VERITAS and Fermi-LAT observations of TXS 0506+056 (arXiv:2511.06116). The fourth article reports limits from prompt searches for VHE counterparts to IceCube astrophysical neutrino alerts (arXiv:2512.16562). The fifth article describes dark matter limits from a multi-wavelength study of dwarf spheroidal galaxies including Fermi-LAT, HAWC, and VERITAS (arXiv:2508.20229). The collaboration also has two manuscripts that are in press and another three that are undergoing review at the journal.

Cherenkov Telescope Array Observatory (CTAO)

DAVID WILLIAMS (UCSC) & ALBA FERNÁNDEZ-BARRAL (CTAO)

On December 17, 2025, representatives from the CTAO, the European Southern Observatory (ESO), and governmental authorities gathered to celebrate the official groundbreaking of the CTAO's southern site, CTAO-South. After years of successful site preparations, the event marked the beginning of construction on the telescope foundations, paving the way for the first telescopes to be completed by the end of 2026. The CTAO will be the world's largest and most powerful observatory for gamma-ray astronomy. With it, the CTAO will open a new observational window, exploring the Universe at the highest energies, in particular with the high-energy coverage of the Small-Sized Telescopes (SSTs).

Following a ceremony at ESO's Paranal Observatory, participants moved to the CTAO-South site, located 10 kilometers southeast in the Atacama Desert, for a symbolic onsite celebration, where a time capsule was buried. The capsule included elements from Chile and partner countries around the world, as well as scientific items representing the ultimate goal of the telescopes currently under construction: to advance our understanding of the Universe and expand human knowledge.

CTAO, ESO and Chilean authorities during the CTAO-South Groundbreaking event. (Credit: ESO/CHEPOX)

On December 2–3, the CTAO Central Organisation's Telescope team visited the facilities of the Italian company Dal Ben S.p.A, located in the Veneto region, to conduct the Test Readiness Review (TRR) for the electromechanical structure of the SSTs. The CTAO SST Collaboration completed the integration of the first SST telescope at the facility, which included a mechanical and electrical model of the camera, and, with the positive TRR outcome, the team immediately could proceed to factory testing. In April, at the same factory, experts from the CTAO Central Organisation and the SST Collaboration successfully established the first direct communication between the telescope structure and the Array Control and Data Acquisition (ACADA) software. As the central system that will eventually send commands to operate both CTAO telescope arrays, conducting integration tests between ACADA and the telescope is a critical pre-shipment milestone to minimize potential compatibility risks before the SSTs are delivered to the remote CTAO-South site in Chile.

SST during the ACADA integration test at the factory. (Credit: Vanessa Montes, CTAO)

Because only the mechanical structure is currently available at the Dal Ben S.p.A. factory, the SST camera team developed a simulation of the camera instrument. This allowed the teams to run the camera's integration tests with ACADA, as well, ensuring a highly realistic, end-to-end testing environment. Teams in the U.S., led by Washington University in St. Louis and the University of Wisconsin–Madison, are involved in building and installing ten cameras for the SSTs thanks to a $3.9 million grant from the National Science Foundation (NSF), awarded in 2025.

Development of the novel Schwarzschild-Couder Telescope (SCT) design for medium-sized CTAO telescopes, a continuing effort led by U.S. CTAO groups, achieved an important milestone in April 2026. The first twenty-two modules (1,408 pixels) of the camera upgrade (funded by a grant from the U.S. NSF and by INFN in Italy) were installed in the prototype (pSCT) at the Fred Lawrence Whipple Observatory in Arizona. They were installed in an off-axis sector of the camera and recorded shower images more than 2.5 degrees from the center of the field of view, demonstrating for the first time the off-axis performance, which is a key feature of the SCT design. When complete, the upgraded camera will have the full 11,328 pixels covering the $\sim 8°$-diameter field of view and will have better photosensors and lower electronic noise than the original 1,600 pixel, 2.5°-diameter pSCT camera. Commissioning of the upgraded camera is continuing, and additional modules will be installed over the next several months as they are completed.

COSI: Compton Spectrometer and Imager

John Tomsick & Andreas Zoglauer (UC Berkeley/Space Sciences Laboratory)

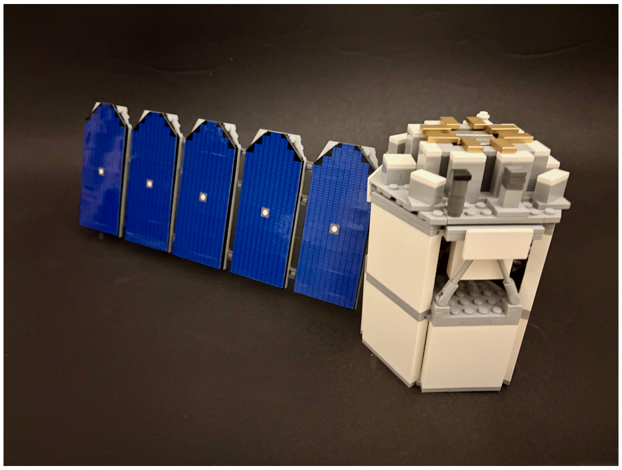
COSI is a NASA Small Explorer gamma-ray mission planned for launch into low-Earth orbit in 2027. Using an array of 16 germanium detectors, COSI covers the 0.2-5 MeV energy band with high spectral resolution along with wide-field imaging. These capabilities allow for advances in studies of the electron-positron annihilation line at 511 keV and nuclear lines across the Galaxy. COSI measures gamma-ray polarization, and this capability will be used to study accreting black holes (Galactic and AGN/Blazars), gamma-ray bursts (GRBs), and possibly magnetar flares. COSI will also provide rapid reports of GRB positions for time domain and multimessenger (TDAMM) science.

A great way to get involved in COSI is through participation in the COSI Data Challenges. DC4 is planned for release in May 2026 (DC).

In addition to DC4 and Lego COSI (see figure and note that Lego sets are available for purchase by contacting the mission PI), we would like to highlight the following COSI-related publications that members of the COSI Science Team have completed since the last HEAD newsletter:

- Gallego et al., ApJ, 997, 284, Preflight Background Estimates for COSI
- Parmiggiani et al., ApJ, 997, 135, COSI Short Gamma-Ray Burst Localization using BGO Shield Data
- Rogers et al., NIM A, 1086, 171332, Depth Calibration of Double-Sided Strip Germanium Detectors for COSI

- Watanabe et al., JHEP, Sub-GeV Dark Matter and MeV Gamma-Ray Detection with COSI
- Rizzo et al., Astronomy & Computing, Comparing Classical and Quantum Deep Learning Techniques for Anomaly Detection of Short-Duration Gamma-Ray Signals



Lego COSI (Photo credit - John Tomsick; Design credit - John Grinold).

NewAthena

ANDY PTAK & KRISTIN MADSEN (NASA/GSFC)

The New Advanced Telescope for High-ENergy Astrophysics (NewAthena) project is currently in Pre-Phase A with a planned Launch Readiness Date of 2037. The project is managed by Goddard Space Flight Center with Andrew Ptak serving as Project Scientist and Kristin Madsen as Deputy, while Tim Beach and Barbara Grofic (Acting) serve as Study Managers.

The NewAthena mission consists of two main instruments: the Wide-Field Imager (WFI) and the X-ray Integral Field Unit (X-IFU). The WFI will simultaneously provide imaging over a wide field (40x40 arcmin) with time-resolved photon counting and moderate-resolution spectroscopy. The WFI sensor is a DEPFET (depleted p-channel field effect transistor) with a pixel size of 2.2 arcsec and an energy resolution of $\leq$170 eV at 7 keV. The X-IFU is an X-ray calorimeter that combines high spectral resolution with high-quality imaging. It has an approximate field of view of 4 arcmin, a pixel size of 5 arcsec, and an energy resolution at 7 keV of $\leq$4 eV. A mirror with a diameter of 2.3 m that is populated by SiliconPore Optic (SPO) modules and capable of achieving more than 1 m^2 of effective area at 1 keV focuses at 12 meters onto one of the two instruments at a time. The mirror shifts between the two focal planes by a hexapod upon which it is mounted. The spatial resolution goal is 9" (HPD) with mirror technology development continuing.

NASA's contributions to this ESA-led mission focus on several key hardware components: the X-ray Integral Field Unit (X-IFU) detector systems, cryocooler, and Wide Field Imager (WFI) components. Recent technical accomplishments include thermal, vibration, and electrostatic discharge testing of X-IFU detectors and SQUID multiplexers conducted by GSFC experts, along with ongoing reassessment of detector calibration plans, qualification testing for detector aging, and design work on silicon carriers for SQUID multiplexers. For the WFI component, the Application Specific Integrated Circuit (ASIC) characterization and testing has concluded successfully and is ready to be combined with DEPFET detectors for further testing, while the Background Analysis Module (BAM) team continues work on background modeling, transient analysis, and AI approaches to background reduction. All NASA NewAthena contributions have been proceeding well and on schedule. The NASA NewAthena project science team is participating in planning for the NewAthena science ground segment (SGS), where NASA plans to compete an NASA NewAthena partner science center in the early 2030s. More information on the US contribution can be seen here.

The NewAthena Science Study Team (NASST; list of members) is tasked with confirming that the current instrument design meets these scientific requirements. It is also the responsibility of the NASST to compile the 'Red Book', which is the document that describes the science case to the ESA Science Program Committee during the Mission Adoption Review, starting in the fall of 2026 and concluding in the summer of 2027. The Athena Community Office (ACO) issued a call to the community on behalf of the NASST for a community-contributed special Journal issue, which will include 70 papers covering the full breath of the science goals, to lay the foundations for the Red Book. These papers are due for review at the end of the summer with publication aimed for later Fall 2026.

You can keep up-to-date with NewAthena via the NewAthena community website, or through the X handle @AthenaXobs and via Facebook. To find out more about the science enabled by the instruments and the technology, explore the NewAthena ScienceNuggets and Tech Nuggets.

LIGO-Virgo-KAGRA Collaboration

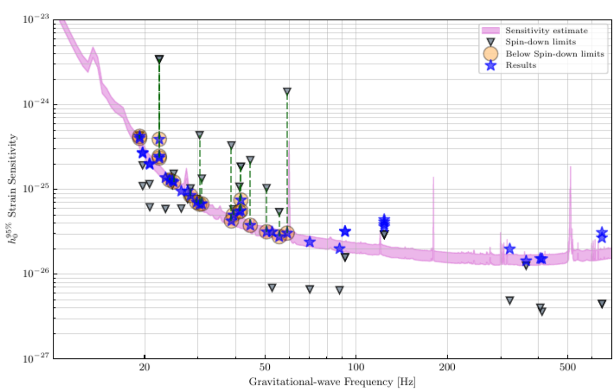
S. FAIRHURST (CARDIFF UNIVERSITY) & P. SHAWHAN (UNIVERSITY OF MARYLAND)

The LIGO-Virgo-KAGRA Collaboration (LVK) continues to release observational results based on data collected in the fourth observing run (O4), which ran from May 2023 to November 2025. Last August, the LVK released the GW strain data from the first part of the fourth observing run (O4a) through the Gravitational Wave Open Science Center (GWOSC) along with the GWTC-4.0 catalog update, which includes over 200 confidently observed binary merger events observed from O1 to the end of O4a. More recently, the LVK has completed detailed analyses of those events to search for gravitational lensing signatures and to test General Relativity in several different ways (papers I, II, III). Despite hints in a few tests, no convincing deviation has been found.

The strain data from the second part of O4 (O4b), which ran from April 2024 to January 2025, will be released through GWOSC on May 26, 2026. The GWTC-5.0 catalog, incorporating GW events identified in the O4b data, will also be released at that time and the GWOSC event portal will be updated.

In addition to binary black hole and neutron star binary mergers, the LVK searches for other potential GW signals including unmodelled transients, continuous GW signals originating from asymmetric neutron stars, and stochastic GW backgrounds of cosmological or astrophysical origin. The full list of LVK papers is maintained in an online table. Recently, the LVK has released results of several searches for gravitational waves emitted by neutron stars:

We have searched for GW signals associated with the April 29, 2024 glitch of the Vela pulsar, one of the closest and most prolific glitching pulsars known. This included searches for short-duration unmodelled GW bursts and long-duration quasi-monochromatic transients at twice the pulsar's orbital frequency lasting several months. None of our searches found evidence for a gravitational wave signal associated with the Vela glitch. This allowed us to place constraints on the GW emission which, for the first time, constrained the energy release in GWs to be less than the full energy of the glitch.



From https://arxiv.org/abs/2603.25938: 95% CL upper limits (blue stars) on GW signal amplitude for 34 known pulsars. Upper limits which are below the spin-down limits (triangles) are highlighted with orange circles. The shaded pink band indicates the expected sensitivity of this search given the noise level in the GW detectors and the search duration.

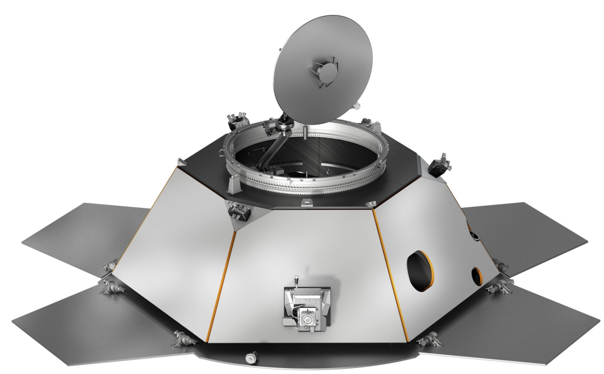
We have performed all-sky searches for continuous GW signals from isolated neutron stars in the range 20–2000 Hz, considering spin-down rates as high as 10^{-8} Hz/s, and from neutron stars in binary systems in the range 100–350 Hz. No credible gravitational wave signals have been identified in either case. From the isolated search we place upper limits on the possible GW signal amplitudes, with the most stringent population-averaged strain limits reaching a level of $\sim 10^{-25}$.

We also used O4 data to carry out robust searches for continuous GW signals from known pulsars and from unseen neutron stars in supernova remnants. The accompanying Figure shows our upper limits on gravitational-wave emission from known pulsars using data from O4a and O4b. Of the 34 pulsars used in this analysis, we obtain upper limits below the theoretical spin-down limit for 20 pulsars. Our tightest constraint is for the Crab pulsar, where the upper limit on the GW amplitude is $\lesssim 2\%$ of the spin-down limit. This corresponds to no more than 0.04% of the energy associated with the pulsar spin-down being emitted in gravitational waves.

The LVK continues to prepare for a six-month observing run, to be called IR1, beginning between late October and mid-November 2026. Up-to-date plans for future observing runs are summarized at this link.

Laser Interferometer Space Antenna

THE COMMUNICATIONS WORKING GROUP OF THE LISA SCIENCE TEAM



Rendering of a LISA spacecraft under development by OHB System AG under contract to ESA. Solar panels are deployed around the base. In addition to providing power, the solar array will keep the rest of the spacecraft in permanent shadow, providing a stable thermal environment for LISA's ultra-sensitive instruments. (Credit: OHB)

The LISA mission implementation phase continues! At ESA, LISA has passed an important milestone with the signature of the prime contract with OHB System AG in June 2025 and the kick-off of industrial activities. An article describing this important step can be found here. The project is now in the Preliminary Definition Phase, working closely with the Prime Contractor while in parallel conducting Preliminary Design Reviews of the individual payload elements. This phase will culminate in the Mission Preliminary Design Review, scheduled to start at the end of this year and conclude in early 2027.

At NASA, LISA was included as a line-item in the fiscal year 2026 appropriations bill, a significant step in stabilizing LISA funding in the US. The NASA Project completed Key Decision Point B (KDP-B), formally advancing the NASA effort to Phase B. The next major Project milestones are the NASA Preliminary Design Review (PDR) and KDP-C planned for mid-2027. NASA has secured the contract for the final pre-flight telescope delivery, is making significant progress on the laser sub-elements, and is proceeding with system-level testing of the Charge Management Device.

The LISA Consortium is also making progress as an international collaboration of scientists interested in preparing for the science of LISA. Following its recent reorganization, the Consortium welcomes both community members, who will receive information about the science and progress of the mission, and core members who want to get involved in collaborative projects with other members of the Consortium. For more information please contact comm@lisamission.org.

The LISA Science Team (LST) is now established as a group of European and American experts working with ESA and NASA to provide scientific guidance to the mission. The LST has established Working Groups to address specific aspects of mission planning. The Alerts, Catalogs, and Figures of Merit Working Groups are perhaps of most interest to the astrophysical community. Each of these groups is busy producing a requirements document that will inform the mission implementation teams. The Catalogs Working Group's prerogative is to determine the content and format of the science catalog of gravitational wave candidates, with a primary goal being easy accessibility for scientists without gravitational wave specialities. The Figures of Merit (FoM) are a set of metrics designed to quantify the mission's ability to meet its science goals, creating a direct link from instrument specifications to science objectives. The FoM Working Group is currently reviewing, updating, and streamlining the existing FoMs prepared during earlier stages of the mission definition by the LISA Consortium. The Alerts Working Group is directed to create inputs for developing a pipeline for issuing detection alerts, when and how to operate this pipeline and issue alerts, and connect with communities outside LISA to ensure awareness and leadtime needed for triggered observations.

The LST Communications Working Group is establishing interfaces with the broader community through regular interaction with the LISA Consortium and involvement in scientific conferences. We are excited to report that an official e-mail address has been established for the LST: AskLISA@cosmos.esa.int.

HEASARC

M. F. Corcoran (CUA & NASA/GSFC), T. Jaffe, A. Ptak (NASA/GSFC)

The HEASARC continues to ingest and archive data from CALET, IXPE, AMS-02, MAXI, NuSTAR, Swift, XL-Calibur, and the XRISM missions, and will soon have data from the balloon-borne PUEO neutrino mission led by the University of Chicago and BlackCAT, a cubesat designed to detect and study gamma-ray bursts led by Penn State. INTEGRAL ended science operations in February 2025 and the final archive is being completed. Chandra, eROSITA, Fermi, and XMM-Newton data are also mirrored at HEASARC. Mission proposal teams interested in using the HEASARC as their main data and/or software archive should request support at the HEASARC Archive Request page.

The HEASARC will present a workshop at the HEAD mini-meeting which will take place during the 248th AAS meeting this summer in Pasadena, CA. This workshop will be aimed at any researchers interested in high-energy astrophysics data. We will show the best ways to access HEASARC data, describe cloud resources where you can access and analyze data, provide a sneak peak at the development version of the new HEASARC browser data portal as well as a development version of the FITS viewer Fv that works entirely within your browser and includes many DS9 functions. This will be a great opportunity to ask HEASARC staff for in-person help with your analysis. It is also a great way to give us feedback on future developments you'd like to see.

Fornax is the new NASA science platform which is currently in beta release. Fornax is a collaboration among the NASA Astrophysics archives and combines resources from HEASARC, IRSA, and MAST. Fornax can serve as your go-to analysis platform — archival data from the three archives, along with analysis software, is available on the platform, and Fornax provides users with access to significant computing resources as well. Please see the Fornax website for more detailed information, including links to sign-up for your very own Fornax account, along with documentation and use cases. There will be a workshop featuring Fornax at the HEAD+AAS meeting as well. All three archives are continuing to add to our AWS cloud data holdings that will be very fast to access from Fornax. Come to the workshop to find out how best to use this powerful new system and give us feedback.

We are also soliciting input from the community on areas of future development for the HEASARC via the HEASARC "Brainstorming" form. We're looking for suggested improvements to existing capabilities, and/or ideas for totally new features or capabilities. All ideas will be considered! Maybe you saw something somebody else is doing that looks cool and useful. Maybe you have always had a particular annoyance with some aspect of the HEASARC and have suggested remedies. Please let us know how we can make the HEASARC an even better service for your scientific data analysis!

Physics of the COSMOS

Francesca Civano, Brian Humensky, & Bernard Kelly (NASA/GSFC)

NASA's Physics of the Cosmos (PhysCOS) is one of three thematic programs that encompass NASA Astrophysics, and seeks to answer the enduring question "How does our Universe work?". The PhysCOS Program Office, along with our counterparts in Cosmic Origins (COR) and Exoplanet Exploration (ExEP), will continue to engage with NASA HQ to implement Astro2020's broad vision of the next decade in astronomy.

The PhysCOS Program Analysis Group (PhysPAG) includes everyone interested in the PhysCOS program via eight Science Interest Groups (SIGs); this probably means you! Many of the SIGs have activities ramping up, including the Cosmic Ray and Neutrino (CRN), Gamma Ray (GR), Gravitational Wave (GW), X-ray (XR), Inflation Probe (IP), Cosmic Structure (CoS), Time Domain and Multi-Messenger Astrophysics (TDAMM), and Habitable World Observatory (HWO) SIGs – please see linked articles for many of those SIGs in this newsletter for details. The HWO SIG is the newest of the cross-PAG SIGs and two of the six co-chairs represent PhysCOS science, namely Fabio Pacucci and Richard Massey. A new Science and Technology Interest Group (STIG) focused on Astrophysics from the Moon, Mars, and Beyond (AMMB STIG) has just started: please join their new mailing list if you are interested in discussion about utilizing the Moon as an astrophysics platform and fostering the growing community of astrophysicists interested in this area.

The PhysPAG provides a way for the PhysCOS community to regularly engage with the Program Office. The PhysPAG is led by an Executive Commmittee (EC), and provides insight and leadership, steering the PhysCOS community in support of NASA's mission. The EC organizes meetings, collects and summarizes community inputs, and reports to the NASA Astrophysics Division Director. There are currently 16 members in the PhysPAG EC, 11 of whom began their terms at the start of 2026: Igor Andreoni, Veronica Dexheimer, Philip von Doetinchem, Tom Essinger-Hileman, Francois Foucart, Michael Katz, Tiffany Lewis, Nivedita Mahesh, Dida Markovic, Fabio Pacucci, and Scott Randall. We would like to thank the outgoing EC members for their service: Alessandra Corsi, Brian Grefenstette, Rebekah Hounsell, Athina Meli, Chiara Mingarelli, Vivian Miranda, and Roger O'Brient. We appreciate the ongoing contributions of Manel Errando (chair), Dave Pooley (chair emeritus), Chien-Ting Chen (vice chair), Jeremy Perkins, and Stephanie Wissel.

Beyond the ongoing SIG activities, PhysCOS currently has 5 active Science Analysis Groups (SAGs) working on answering questions for the NASA Astrophysics Division: the Future Innovations in Gamma Rays (FIG) SAG (focusing on identifying future science drivers, necessary capabilities, and priorities for the future of gamma-ray astronomy); three new X-ray SAGs focusing on the future of X-ray astronomy and a newly formed Cosmic Microwave Background (CMB) SAG to discuss significant recent developments compelling a critical re-evaluation of the role of a CMB probe. Two new SAGs were just approved for activities: one focused on the origin of the isotopes (Isotopes SAG), and one analyzing future large gamma-ray mission concepts (FLAG SAG).

PhysCOS has had a substantial presence at major conferences so far in 2026. At the 247th Meeting of the American Astronomical Society (AAS 247) (4-8 January 2026, Phoenix, AZ), we supported in-person meetings of the PhysPAG and of members of all three PAGs. This year we conducted a brainstorming session; splinter sessions for the X-Ray SIG, the AI/ML STIG, the ACROSS and Cosmic Pathfinders programs, and planning for the next Astrophysics Decadal (Astro 2030); as well as participating in the NASA booth in the Exhibition Hall. A full listing of our AAS activities can be found on our dedicated meeting webpage.

PhysCOS Chief Scientist Francesca Civano and LISA Deputy Project Scientist Ann Hornschemeier Cardiff staffing the PhysCOS table at the 247th AAS Meeting in Phoenix, AZ. (Credit: NASA Science Support Office)

At the American Physical Society's (APS) Global Physics Summit (15-20 March 2026, Denver CO), PhysCOS organized a Focus session, with an opening address by the NASA Astrophysics Division Director, and covering PhysCOS and SIG and SAG activities. PhysCOS also staffed a booth in the April Meeting area to engage with physicists working in PhysCOS-adjacent science.

We look forward to seeing you at AAS 248 / HEAD in Pasadena, CA 14-18 June. Be sure to check out our dedicated meeting webpage for a list of all the events we are supporting and look for us in the exhibit hall.

PhysCOS has also been working on ways to involve early-career scientists and provide them with insights about the fascinating work done in the Physics of the Cosmos Program, including exposing them to missions, opportunities, funding, and available tools for research. Following the great success of our Second Annual Early Career Workshop, we have arranged for the student presentations (talks and posters) from both the First and Second ECWs to be indexed by the ADS Science eXplorer (SciX).

ASTRA Initiative logo. (Credit: Jen Brill)

PhysCOS, together with the other two Astrophysics Programs, has been engaged in the newly announced Astrophysics Strategic Technology & Research Accelerator (ASTRA) Initiative (see our new logo in the associated Figure), aiming to reduce the total cost, time-to-science, and schedule risk of future strategic astrophysics missions, aligning with guidance from the Astro2020 Decadal Survey, the Large Strategic Science Missions (LSSM) Report, and the Government Accountability Office's Assessment of Major Projects (AMP). With the Cosmic Origins and Exoplanet Exploration program offices, PhysCOS is planning a three-day Community Science (Ad ASTRA) Workshop in early September 2026. Structured over three thematic areas, Science, Capabilities, and Missions, the workshop provides a comprehensive framework to connect scientific priorities with technological capabilities and mission concepts. Across all three days, plenaries, panels, breakout sessions, and poster contributions are designed to maximize community input. Please check the block agenda and consider submitting a presentation.

The Astrophysics Cross-Observatory Science Support (ACROSS) initiative is a NASA PhysCOS Program initiative with the goal of providing critical infrastructure and coordination services that enable astronomers to leverage NASA's fleet alongside ground-based facilities and international observatories in a cohesive, responsive network for groundbreaking TDAMM research. To do so, ACROSS is developing publicly available software tools to facilitate community-wide TDAMM research efforts. These include APIs and Python tools to provide standardized mission observation schedules, target visibility calculators, and coincident observation overlap calculators. These tools are available from the ACROSS website and GitHub page.

The PhysCOS program office is always eager to hear how we can assist the community in developing and carrying out your science. Feel free to reach out to the Chief Scientists by email, ask us about PhysCOS, and look for us at upcoming meetings.

We encourage anyone interested in PhysCOS science to join our email list, where we regularly highlight items of interest to the PhysCOS community, including workshop announcements and funding or employment/internship opportunities.

The Cosmic Ray and Neutrino Science Interest Group

STEPHANIE WISSEL (PENNSYLVANIA STATE U.) & TSUGUO ARAMAKI (NORTHEASTERN U.) & PHILIP VON DOETINCHEM (U. OF HAWAII) & PRIYARSHINI GHOSH (UMBC/NASA GSFC) & KEITH MCBRIDE (U. OF CHICAGO)

The Cosmic Ray and Neutrino Science Interest Group (CRN SIG) is a forum for scientists to share research ideas and priorities, which then propagate to the NASA PhysCOS program. The group aims to promote discussions regarding the direction of cosmic ray and high-energy neutrino science. The CRN SIG is open to all scientists interested in cosmic rays and neutrinos, and we encourage you to contribute by sharing your comments, questions, and research.

The CRN SIG hosted two webinars this past spring. In March, a webinar was held on the role of cosmic rays and neutrinos in time-domain and multimessenger astrophysics (TDAMM), and the other at the end of April centered around NASA's Astrophysics Strategic Technology & Research Accelerator (ASTRA) initiative. In the first webinar, three experts highlighted the impact that new cosmic-ray and neutrino measurements would have on our understanding of the high-energy universe, and a second set of three speakers presented the multi-messenger science impact of their ongoing NASA missions: PUEO, TIGERISS, and PBR/POEMMA. The second webinar focused on the ASTRA initiative, which is a new NASA program that aims to accelerate the development of technologies for astrophysics missions. There was lively discussion on the avenues for future cosmic ray and neutrino missions, from low-energy antinuclei searches to ultra high-energy cosmic ray measurements, while prioritizing the different technologies such as high-temperature superconducting magnets and Silicon Photomultipliers (SiPMs) on a variety of space-based platforms. We encourage you to watch the webinar recordings, which can be found online. The CRN SIG will host a follow-up webinar in a few weeks to continue this discussion on mission concepts and the technologies that enable them.

The CRN SIG congratulates NASA, CSBF, NSF & ASC, and the teams of GAPS and PUEO that have successfully launched and recovered their payloads during the most recent Antarctic long-duration balloon campaign. Looking ahead, ADAPT is slated for launch from Antarctica this austral summer, and the TIGERISS instrument is scheduled to be installed on the ISS at the Columbus SOX location in September of 2027.

At the upcoming COSPAR and AAS meetings, the CRN SIG will host dedicated discussion sessions to engage the community. We encourage all interested scientists to attend and contribute. At APS, the CRN SIG presented an overview of its goals and recent activities. As part of the CRN SIG efforts like these, a new Science Analysis Group (SAG) is forming with input from other SIGs on the necessity of new high-precision nuclear cross-section measurements. The current data in this area does not reach the required precision, hindering our understanding of high-energy processes across the universe. The CRN SIG will continue to host webinars and other events to promote collaboration and elevate the concerns of the cosmic ray and neutrino science community.

The Gamma-ray Science Interest Group

Manel Errando (WashU at St. Louis), Cori Fletcher (MSFC/USRA), Tiffany Lewis (MTU), Sylvain Guiriec (GWU), & Jeremy S. Perkins (GSFC)

The Future Innovations in Gamma-rays Science Analysis Group (FIG SAG), lead by Michelle Hui (MSFC), Chris Fryer (LANL), Tiffany Lewis (Michigan Tech), Zorawar Wadiasingh (GSFC/UMD), Milena Crnogorčević (Stockholm U), and Paolo Coppi (Yale), has been collecting community inputs on key science drivers and necessary capabilities for the future of gamma-ray astrophysics, and a report is in draft. The executive summary outlining the leading science priorities that is uniquely address by gamma-ray observations and the capabilities needed for breakthroughs in the next two decades is available on the FIG SAG webpage. An open PowerPoint slide deck, discussing these key science questions, the current state of the art, and the next steps, is also available for the community to use and support individual science interests.

The Future Large Gamma-ray (FLAG) Mission Concepts Working Group is being led by Liz Hays (GSFC) and Henric Krawczynski (WashU). They are continuing to work to collect and synthesize community input about future Probe-class and flagship-class gamma-ray observatories. Here, the gamma-ray energy range is defined to extend from $\sim$100 keV to MeV or GeV energies. The group solicited community input about the technological capabilities enabling pivotal new discoveries. So far, 17 submissions have been received from 15 contributors. The submissions cover a broad range of capabilities and mission architectures ranging from technologies offering large field-of-view detection capabilities based on monolithic instruments and satellite fleets or swarms to technologies for pointed instruments with narrow fields of view. The missions can deliver transformational results about a broad range of astrophysical phenomena ranging from probing the astrophysics of high energy gamma-ray sources, using these sources to probe physics laws, and searching for and characterizing diffuse emission, to leveraging gamma-ray detection capabilities for multi-messenger observations.

The next steps include identifying input for the NASA's Astrophysics Strategic Technology & Research Accelerator (ASTRA) initiative, holding video conference discussions, compiling a draft report, summarizing the mission concepts, presenting approaches that address high priority astrophysics science, and laying out a path for additional future development needs. Additional opportunities for joint discussions will be the hybrid splinter session at the AAS 248 meeting in Pasadena, CA, on Monday, June 15 from 10 – 11:30 AM PDT, and the Fermi Gamma-ray Astrophysics AAS Special Session on Monday, June 15 from 2 – 3 PM PDT.

We are still accepting additional input from the community. Interested colleagues are encouraged to use a web form web form for submissions. The web site will remain open through the month of May.

The Gamma-ray Science Interest Group (GR-SIG) has recently hosted many webinars open to anyone interested in learning about Gamma-ray astronomy. Our webinars aim to have a presentation from a GR-SIG community member as well as give updates on the Future LArge Gamma-ray mission concepts (FLAG) Working Group activities and any pertinent information that they gamma-ray astronomy community may find useful.

Our recent webinars are:

- April 17th: Todd Thompson (OSU) presented his perspective on how gamma-ray missions can impact the broader astrophysics landscape.
- March 27th: Brian David Metzger presented on r-Process Decay MeV Signals in Magnetar Flares.
- January 23rd: Updates from the FIG SAG and review of the Decadal planning process.

Gravitational Wave Science Interest Group

Tingting Liu (Georgia State University), Michael Katz (Jet Propulsion Laboratory) & Simon Barke (University of Florida)

The Gravitational-Wave Science Interest Group (GW SIG) serves the GW community across the frequency spectrum, from ground- and space-based detectors to pulsar timing arrays. In January, the GW SIG welcomed three new co-chairs – Simon Barke, Michael Katz, and Tingting Liu. The GW SIG would like to thank the former co-chairs, Alessandra Corsi and Chiara Mingarelli, for their service.

In April, the GW SIG launched a new virtual seminar series on the status of current and future gravitational-wave detectors. Recent virtual seminars held by the GW SIG include:

- April 14: Update on the LISA Consortium. Speaker: Niels Warburton, University College Dublin.
- April 28: LIGO: Status and Plans. Speaker: Peter Fritschel, MIT LIGO Lab.

Stay tuned for future talks in this seminar series.

Starting in May, the GW SIG, in coordination with the PhysPAG, will be organizing SIG-based discussions on GW and EM mission concepts, in response to the ASTRA Initiative announcement.

To learn more about the GW SIG and to sign up to receive notifications about future seminars and other updates, please visit our webpage.

The X-ray Science Interest Group

David Pooley (Trinity U., Eureka Sci.), Chien-Ting Chen (USRA, NASA MSFC), Breanna Binder (Cal Poly Pomona), Steven Ehlert (MSFC), Fabio Pacucci, & Scott Randall (CfA)

The X-ray Science Interest Group (XR SIG) serves as a vital bridge for communication between NASA PhysCOS and the X-ray science community. Please join us in welcoming Scott Randall as the new co-chair of the XR SIG. The XR SIG website can be found within the NASA PhysCOS pages at https://science.nasa.gov/astrophysics/programs/physics-of-the-cosmos/community/xr-sig/.

XR SIG is currently coordinating several Science Analysis Groups (SAGs) to ensure the community is strategically positioned for the 2030 Decadal Survey. These community-led activities have taken on renewed importance following the recent NASA ASTRA (Astrophysics Strategic Technology & Research Accelerator) announcement. ASTRA provides a structured framework for maturing large strategic mission concepts and long-lead technologies, explicitly identifying future strategic X-ray missions as a priority. Our ongoing SAGs are the primary vehicles for defining the science cases that will benefit from this accelerated development path.

SAG Updates:

- Broad Band X-ray Science Analysis Group (BBX-SAG): The BBX-SAG is defining the scope of community white papers articulating the science and technology needs for the next generation of broadband X-ray missions. We are holding weekly telecons on Thursdays at 12pm Eastern through the end of May to refine these goals and ensure alignment with ASTRA maturation pathways. Meeting information can be found at the BBX-SAG website. Join the mailing list by sending an email to BBX-SAG-join@lists.nasa.gov with "Join" in the subject line.
- Lynx2030: The Lynx2030-SAG is focused on updating the Lynx mission architecture to reflect the science and technology priorities of the coming decade. Building on the original Lynx concept, the group is incorporating new observational drivers emerging from recent facilities, particularly JWST, and reassessing requirements in light of advances in instrumentation and mission design. The effort is organized into dedicated working groups spanning key areas, including angular resolution, energy bandpass, microcalorimetry, survey grasp, time-domain science, and new capabilities. We are holding telecons every three weeks on Fridays at 11 am Eastern Time among the co-chairs of the working groups to coordinate progress, refine science objectives, and ensure coherence across different mission components. A central goal of the SAG is to align priorities with the evolving landscape shaped by the ASTRA initiative and the potential formation of a Science and Technology Definition Team (STDT) for a future X-ray flagship mission. The Lynx2030-SAG is co-chaired by Steven Ehlert (MSFC) and Fabio Pacucci (CfA). To join the mailing list, send an email to Lynx2030-SAG-join@lists.nasa.gov with "Join" in the subject line.
- The Hi-ReX SAG is defining key science drivers and technology needs for a next-generation, ultra–high angular resolution (micro- to milliarcsecond) X-ray mission concept. Such capability would surpass Chandra's angular resolution by more than two orders of magnitude and could enable transformative discoveries across a wide range of high-energy astrophysics. The SAG is organized into working groups spanning Galactic astrophysics, extragalactic and black hole physics, fundamental physics and cosmology, and stellar astrophysics. These groups meet approximately bi-weekly to develop mission-enabling science cases and contribute to drafting the final SAG report. The Hi-ReX SAG is co-chaired by Kim Weaver (NASA/GSFC), Herman Marshall (MIT), Mark Schattenburg (MIT), and Breanna Binder (Cal Poly Pomona). To join the mailing list, send an email to Hi-ReX-SAG-join@lists.nasa.gov with "Join" in the subject line.
- X-ray Timing: The Timing-SAG is in the process of officially forming, and is focused on defining the needs for high-throughput time domain science that stretch across the full range of timescales in astrophysics (from milliseconds to years) and the technology gaps for making this happen. It is being co-chaired by Zaven Arzoumanian (NASA GSFC), Krista Lynne Smith (Texas A&M), and Tom Maccarone (Texas Tech). We will begin holding

telecons on Tuesdays at least through the end of May at 12 noon Eastern. To join the mailing list, send an email to XR-Timing-SAG-join@lists.nasa.gov with "Join" in the subject line.

We recently held a productive XR SIG Town Hall to discuss these efforts. The conversation focused on the rapid turnaround timeline for the ASTRA initiative and the anticipated X-ray flagship study expected to form following the upcoming Probe selection results.

Looking ahead, we invite you to join us at the Summer AAS Meeting (AAS 248) in Pasadena (June 14–18, 2026). We will be hosting a Special Session, "Toward the 2030 Decadal: Science Cases for Potential Future X-ray Mission Concepts," which will feature a deep dive into the ASTRA implementation plan with updates from each SAG. This session will provide a forum for the community to shape these mission concepts collaboratively.

We encourage the entire X-ray community to join the XR SIG mailing list to stay informed on SAG progress and future opportunities to present at AAS or HEAD meetings. To subscribe, please send an email to XRSAG-join@lists.nasa.gov with "Join" as the subject line.

Cosmic Structure Science Interest Group

Dida Markovic (Jet Propulsion Laboratory), Johannes U. Lange (American University), & Pam Marcum (Ames Research Center)

The Cosmic Structure Science Interest Group (CoS SIG) supports research communities studying the three-dimensional large-scale structure of the universe. Studies of cosmic structure can shed light on the nature of dark matter and dark energy, probe inflationary theories, constrain the neutrino properties, and illuminate galaxy formation.

The planned launch of the Nancy Grace Roman Space Telescope in 2026 is of particular importance for our community. To support the community, we will have a month-long seminar series on science and infrastructure for the Roman Space Telescope, starting at the end of May. We will hear talks from the Roman High Latitude Imaging Survey (HLIS) and the Roman Galaxy Redshift Survey (GRS) Project Infrastructure Teams (PITs), among others.

Most recently, we had a town hall on the Astrophysics Strategic Technology & Research Accelerator (ASTRA) initiative. At the town hall, we heard about the motivation behind ASTRA, the anticipated timeline, and summaries of relevant reports such as Astro2020. We then discussed potential mission concepts brought forward by members of the cosmic-structure community.

To stay connected with CoS SIG, please visit our website and consider joining our mailing list.

Time-Domain and Multimessenger Astronomy Science Interest Group

Brad Cenko (NASA/GSFC), Rebekah Hounsell (UMBC/NASA GSFC), Christos Panagiotou (MIT), Igor Andreoni (UNC), Lauren Alderoty (UMBC/NASA GSFC), & Francois Foucart (UNH)

The Time-Domain And MultiMessenger (TDAMM) Science Interest Group (SIG) is a partnership across the NASA Astrophysics programs, being led by Physics of the Cosmos with involvement from Cosmic Origins and ExoPAG. The goals of the SIG include making the community aware of NASA missions and initiatives of relevance, and soliciting input from the community back to NASA for scientific, technical, or programmatic priorities in the TDAMM umbrella.

This year, we presented the findings of the fourth TDAMM workshop during a joint PAG session at the winter AAS 247. The TDAMM workshop was organized by NASA's new Astrophysics Cross-Observatory Science Support (ACROSS) initiative. A white paper on the topic(s) of the meeting is expected late 2026.

The TDAMM SIG continues to host virtual meetings on topics of interest to the community. On May 11th, Griffin Hosseinzadeh and Judy Racusin will discuss the Multimessenger Treasure TROVE tool and the General Coordinates Network alert system, respectively.

To learn more about the TDAMM please visit our webpage and get involved!

The Habitable World Observatory Science Interest Group

Fabio Pacucci (CfA) & Richard Massey (Durham)

A new SIG has been started for the flagship Habitable Worlds Observatory (HWO) mission, as a point of contact between the astrophysics community and HWO project office, and to enable continued participation in the mission by the community. HWO is, first of all, a general astrophysics mission. Hence, it has very broad science goals, beyond what its name suggests, so the SIG is a similarly broad venture, with another goal to encourage cross-disciplinary interactions spanning the Exoplanet Exploration, Cosmic Origins, and Physics of the Cosmos Program Analysis Groups (ExoPAG, COPAG and PhysPAG).

Our major goal is to confirm that broad science cases are indeed being fed into the design process, and to enable that to continue, so that the optimised mission will be able to achieve transformational astrophysics at all redshifts. That means all science cases must be compelling and visible, and that the broad, international astrophysics community is aware of all the variety of goals, to enable understanding as science objectives are inevitably tensioned against each other.

The HWO project emerged from an open 2024/25 START/GOMAP phase where community interaction was broad and encouraged by NASA HQ. This culminated in March 2026 with the publication of more than 600 pages of community-led science goals. The documents include a flowdown to telescope and observing requirements for 11 goals in exoplanet science, 22 goals in Solar system science, and 26 goals in extragalactic astrophysics – plus more that didn't get converted to LaTeX in time (Scowen et al. 2025).

Taking a moment to consolidate the science goals, identify which would drive telescope characteristics, and to design a mission concept satisfying as many as possible, the HWO project office has since become more introspective. The HWO Community Science and Instrument Team (CSIT) formed to carry out a design optimization. It includes representation solicited from across the US, as well as ESA, CSA and JAXA.

HWO SIG has now hosted three virtual seminars and talks at the AAS meeting, each including updates from the project office and CSIT that have been much appreciated during the quiet period. We have heard updates to science cases, requirements on telescope performance, and more ideas for instrument design from a broad international community. Discussions have ranged on what Science Analysis Groups might propagate and communicate common wishes, and what would be used by and most useful to CSIT.

Broad, very active community activities will resume soon. Instrument design studies have begun in Europe, and will be kickstarted by a May 4/5 workshop in Washington DC, shortly followed by a NASA solicitation for proposals to carry out substantially funded instrument-concept studies. This process is intended to (re)form teams executing science, engineering, and technology investigations. There is much to build on, combining the long heritage of LUVOIR and HabEx studies, new 'exploratory analytic concept' designs from HWO project office, and all the community-led science cases. HWO has been excluded from the ASTRA initiative to study future mission concepts, because it has moved beyond a concept, to be now well-founded as the next flagship mission. Exciting times!

HEAPoetry Corner

CURATED BY ADI FOORD (UMBC)

Birches (Excerpt)

...
I'd like to get away from earth awhile
And then come back to it and begin over.
May no fate willfully misunderstand me
And half grant what I wish and snatch me away
Not to return. Earth's the right place for love:
I don't know where it's likely to go better.
— Robert Frost