AMERICAN ASTRONOMICAL SOCIETY
HIGH ENERGY ASTROPHYSICS DIVISION

NEWSLETTER

November 2014

HEAD Division & Meeting News

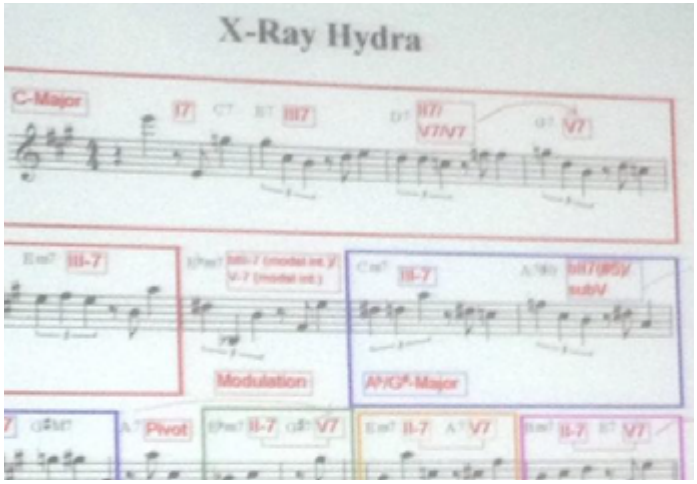
Nick White (HEAD Chair)

The 14th HEAD meeting in Chicago was productive and stimulating. The new format of longer talks, a public lecture and "Art is Science" session were well received. This meeting was well timed to hear the results of the NuSTAR prime mission, which has clearly demonstrated the cutting edge science that is possible on a relatively modest Small Explorer budget. The call is out for the next SMEX and hopefully a high energy astrophysics mission will be selected! At the HEAD meeting we announced a new prize to recognize individual accomplishments for scientists in their mid-careers – this prize will be awarded at future HEAD meetings. We also have now instituted the new affiliate membership, which allows members of other professional societies to join HEAD without having to become full AAS members. This year marks the 15th anniversary of the launch of Chandra and XMM-Newton. These "great observatories" have produced breakthrough science and are still extremely productive. The HEAD special sessions at the AAS Seattle meeting are dedicated to celebrating the 100 year anniversary of Einstein publishing his special theory of relativity, both looking back on the success of this theory and looking forward to future tests – please make time to attend these sessions and the business meeting on the Tuesday evening. As we look forward to the Astro-H, Spektrum-XG, NICER, Athena, CTA and a gravitational wave observatory, the future looks solid for the high energy astrophysics field. But in these times of highly constrained budgets we must as a community continue to advocate the great science and future potential of high energy missions of all types. The HEAD executive remains committed to supporting these efforts both through its meetings and working with the AAS public policy office. Please let me know if you wish to participate in these efforts.

News from the Secretary

Randall Smith (HEAD Secretary)

I'm happy to report that HEAD member (as well as past EC member and HEAD press officer) Dr. Lynn Cominsky of Sonoma State received the **Aerospace Awareness Award** on October 29, 2014 from the Women in AeroSpace professional organization. Cominsky was nominated by Dr. Hashima Hasan of the NASA headquarters and was chosen for her "excellent leadership and sustained dedication to aerospace education and for her tenacious advocacy for girls and young women in aerospace." Congratulations to Lynn on a well-deserved award!



Music of the X-ray spheres composed by Volkmar Studtrucker and presented at the "Art in Science" session by Gerhard Sonnert. Picture from @AAS_HEAD tweet - consider following us!

Affiliate membership in HEAD, mentioned by our Chair above, provides discounts to HEAD meeting registration as well as access to the ever-popular HEAD bulletins and newsletters. We are in the process of developing the application procedure for the next year's memberships, and soon there will be an option listed on the AAS and HEAD websites. Please suggest it to potentially interested colleagues.

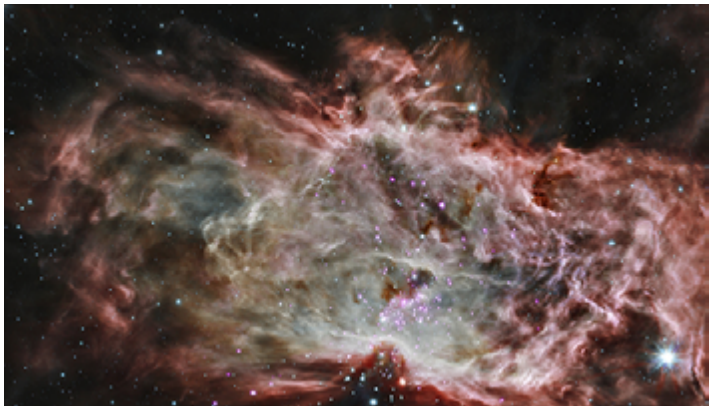
Contents

HEAD in the News

Megan Watzke, HEAD Press Officer

From black holes to comets, HEAD missions continue to make news around the globe. In fact, just before the deadline for this newsletter, scientists held a press conference to announce NuSTAR's discovery of the brightest pulsar ever recorded. A day later, Comet Siding Spring's upcoming close approach to Mars and coverage by telescopes on the ground and in space – including HEAD missions -- were featured in NASA televised briefing. In July, Chandra celebrated its 15th anniversary of operations in space with the release of four new spectacular images of supernova remnants. These are just a sample of breadth of science that HEAD missions investigate, and the popularity that these topics hold with the public. Listed below are some of the press releases from various HEAD missions in the past six months that helped spread the word about the latest exciting results.

- October 8, 2014, "NASA's NuSTAR Telescope Discovers Shockingly Bright Dead Star", http://www.nasa.gov/press/2014/october/nasa-s-nustar-telescope-discovers-shockingly-bright-dead-star/
- September 30, 2014, "NASA's Swift Mission Observes Mega Flares from a Mini Star", http://www.nasa.gov/content/goddard/nasas-swift-mission-observes-mega-flares-from-a-mini-star/
- September 16, 2014, "NASA's Chandra X-ray Observatory Finds Planet That Makes Star Act Deceptively Old", http://www.chandra.si.edu/press/14_releases/press_091614.html
- September 1, 2014, "Magnetar Discovered Close to Supernova Remnant Kesteven 79", http://www.esa.int/spaceinimages/Images/2014/08/Magnetar_discovered_close_to_supernova_remnant_Kesteven_79
- August 14, 2014, "NASA's Chandra Observatory Searches for Trigger of Nearby Supernova", http://www.chandra.si.edu/press/14_releases/press_081414.html
- July 31, 2014, "NASA's Fermi Space Telescope Reveals New Source of Gamma Rays", http://www.nasa.gov/press/2014/july/nasas-fermi-space-telescope-reveals-new-source-of-gamma-rays/



A new study of the stellar clusters NGC 2024 and the Orion Nebula show stars on the outskirts of these clusters are older than those in the middle (Chandra May 7, 2014 press release.)

- July 22, 2014, "NASA's Fermi Finds a 'Transformer' Pulsar", http://www.nasa.gov/content/goddard/nasas-fermi-finds-a-transformer-pulsar/
- July 22, 2014, "NASA's Chandra X-ray Observatory Celebrates 15th Anniversary", http://www.chandra.si.edu/press/14_releases/press_072214.html
- July 11, 2014, "Out of an Hours-long Explosion, A Stand-in For the First Stars", http://www.nasa.gov/content/goddard/out-of-an-hours-long-explosion-a-stand-in-for-the-first-stars/
- June 24, 2014, "Mysterious X-ray Signal Intrigues Astronomers", http://www.chandra.si.edu/press/14_releases/press_062414.html
- June 19, 2014, "NASA's Swift Satellite Tallies Water Production of Mars-bound Comet", http://www.nasa.gov/content/goddard/nasas-swift-satellite-tallies-water-production-of-mars-bound-comet/
- June 6, 2014, "Cosmic Collision in the Bullet Group", http://sci.esa.int/xmm-newton/54116-cosmic-collision-in-the-bullet-group/
- June 3, 2014, "Pulsating X-rays Allow XMM-Newton to Unmask a Mysterious Star", http://sci.esa.int/xmm-newton/54101-pulsating-x-rays-allow-xmm-newton-to-unmask-a-mysterious-star/
- June 3, 2014, "Black Hole 'Batteries' Keep Blazars Going and Going", http://www.nasa.gov/content/goddard/black-hole-batteries-keep-blazars-going-and-going/
- May 7, 2014, "NASA's Chandra Delivers New Insight into Formation of Star Clusters", http://www.chandra.si.edu/press/14_releases/press_050714.html
- April 22, 2014, "Unique Pair of Hidden Black Holes Discovered by XMM-Newton", http://sci.esa.int/xmm-newton/53980-unique-pair-of-hidden-black-holes-discovered-by-xmm-newton/

XMM-Newton Mission News

Steve Snowden & Lynne Valencic (GSFC)

The 14th Call for Proposals for XMM-Newton closed October 10, 2014; successful submissions will be announced in late December. As a result of the last Senior Review, some funds will be available for A and B level proposals with U.S. PIs. Eligible PIs will be notified in early 2015.

In June, the XMM-Newton Science Operations Centre (SOC) hosted "The X-Ray Universe Symposium" in Dublin. The presentations are now available online at http://xmm.esac.esa.int/external/xmm_science/workshops/2014symposium/.

An XMM-Newton Science Workshop is being planned for June 2015, to be held in Spain. The meeting will focus on the extremes of black hole accretion regions, particularly the structure of accretion flow on the smallest scales and its relation to relativistic jets. More information can be found at http://xmm.esac.esa.int/external/xmm_science/workshops/2015_science/.

Chandra X-ray Observatory Report

Roger Brissenden (SAO) & Martin C. Weisskopf (MSFC)

Chandra has carried out more than 15 years of highly successful and productive science operations. The Chandra X-ray Observatory is unique in its capability for producing the sub-arcsecond X-ray images that are essential to accomplish the science goals of many key X-ray and multi-wavelength investigations in current astrophysical research. A symposium, *15 Years of Science with Chandra*, will be held in Boston in November to highlight current Chandra science results. Astronauts who served on STS-93, the Space Shuttle Columbia flight that launched Chandra, will participate, and the symposium will feature a special session focusing on how Chandra might address some of the high priority science objectives identified by the science panels in the New Worlds, New Horizons decadal study.

The committee that reviewed the Chandra program as part of NASA's biennial Senior Review of operating missions provided its report in the spring. The committee strongly supported Chandra's scientific productivity and continued operation, writing, "Chandra X-ray Observatory (CXO) is one of NASA's Great Observatories. It has a large community of users who continue to produce groundbreaking scientific results. Chandra is the most powerful facility for X-Ray astrophysics, and its unique capabilities have no likely successor in the foreseeable future. The science of Chandra addresses themes of Physics of the Cosmos, Cosmic Origins and Exoplanet Exploration that were identified as priorities by the 2010 'New Worlds New Horizons' Decadal Survey, NASA's 2010 Science Plan and are the focus of the Astrophysics Division. The prospects for further compelling science return in the future are excellent. This panel enthusiastically endorses the extension of the Chandra mission." The committee made several programmatic and budgetary recommendations to which the Chandra Project is in the process of responding.

The Observatory continues to operate with only minor incremental changes in performance, due primarily to the gradual accumulation of molecular contamination on the UV filter that protects the ACIS detector, and to slow degradation of the spacecraft's thermal insulation. Condensation on the filter reduces the detection of low-energy x-rays by ACIS (but not by the HRC), while the decline in insulation effectiveness requires extra effort in scheduling observations and the use of special strategies to ensure continued safe operation in the thermal environment. In addition, two systems – the Fine Sun Sensor, and the thrusters that are used to unload accumulated angular momentum – have been swapped to their duplicate backup systems to mitigate non-impacting declines in performance. Science data processing, archiving, and distribution proceed smoothly, with average time from observation to data delivery to observers remaining at about a day.

A recently completed study indicates that we can expect all Chandra hardware and consumables to last for at least 25 years of mission activity. No potential life-limiting issues have been identified that are not already being actively managed by the flight operations team.

Chandra's overall observing efficiency is near the highest level of the mission, due to the evolution of Chandra's orbit, which has reduced the non-observing time spent in Earth's radiation belts. For observing cycles 13–16 this has led to a significant increase in the amount of observing time available. Beginning in Cycle 13 (2012) we took advantage of the increased observing time to introduce the X-ray Visionary Program (XVP). XVPs are observing programs of 5-6 Ms intended to address major questions in astrophysics and to produce data sets of lasting value that can only be accomplished with such long observing times. However, as the orbit continues to evolve, the observing efficiency is beginning to decline toward prior levels. For the upcoming Cycle 16, approximately 22 Ms of observing time was allocated, compared with an average of 18.3 Ms per cycle for the entire mission. The Cycle 16 peer review, held in June, approved 192 proposals of 637 submitted by scientists worldwide, who requested 4.8 times more observing time than was available. Twenty-one of the approved proposals were for archive or theory research, and five received observing time for monitoring campaigns that will be distributed over Cycles 16, 17 and 18. Some time in Cycle 17 was allocated to provide sufficient time for the XVPs approved in Cycle 16, so there will be no XVP call in Cycle 17.

The Chandra Press Office has been 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. Information about the Chandra Observatory and the Chandra X-ray Center can be found at http://cxc.harvard.edu/.

NuSTAR Mission News

Fiona Harrison (Caltech) & Daniel Stern (JPL)

The NuSTAR mission has been approved for a two year extended mission that includes a dedicated Guest Observer Program as well as time allocated through the XMM and Chandra Time Allocation Committees. Proposals for dedicated NuSTAR time in Cycle 1 are due November 25, with funding available for successful proposals from US PIs. The recent XMM A0-14 received 61 requests for joint NuSTAR-XMM observing programs that will begin early in Calendar Year 2015.

In addition to the Guest Investigator programs, NuSTAR will continue extragalactic and Galactic surveys as part of its Legacy Science program. These surveys will be chosen with input from the community and the data will have no proprietary period. Input on the design of the legacy surveys will be solicited in a special session of the 2015 Seattle AAS Meeting.

The Fermi Gamma-Ray Telescope

Julie McEnery, Chris Shrader, Dave Thompson,
Liz Hays (GSFC) & Lynn Cominsky (Sonoma State)

The Fermi Gamma-ray Space Telescope continues to operate nominally. The all-sky observing strategy with a concentration on the Galactic Center region continues to be the primary observing mode, with Target of Opportunity requests welcome for interesting phenomena.

At the NASA Senior Review, Fermi was approved for at least two more years of operation, with plans to complete the envisaged 10-year mission or more.

The *Fifth Fermi Symposium* was held in Nagoya, Japan, from October 16-20, with over 200 participants reviewing the latest results from Fermi and other high-energy astrophysics missions.

Recent Fermi Highlights

In late June 2013, an exceptional binary containing a pulsar underwent a dramatic change in behavior never before observed. The pulsar's radio beacon vanished, while at the same time the system brightened fivefold in gamma rays. For more information, go to http://www.nasa.gov/content/goddard/nasas-fermi-finds-a-transformer-pulsar/.

Studies of Flat Spectrum Radio Quasars and BL Lac Objects monitored by Fermi have found evidence that they represent different sides of the same cosmic coin. By unraveling how these blazars are distributed throughout the universe, the scientists suggest that apparently distinctive properties defining each class more likely reflect a change in the way the galaxies extract energy from their central black holes. See http://www.nasa.gov/content/goddard/black-hole-batteries-keep-blazars-going-and-going/.

Observations by Fermi's Large Area Telescope of several novae firmly establish that these relatively common outbursts almost always produce gamma rays. See http://www.nasa.gov/press/2014/july/nasas-fermi-space-telescope-reveals-new-source-of-gamma-rays/.

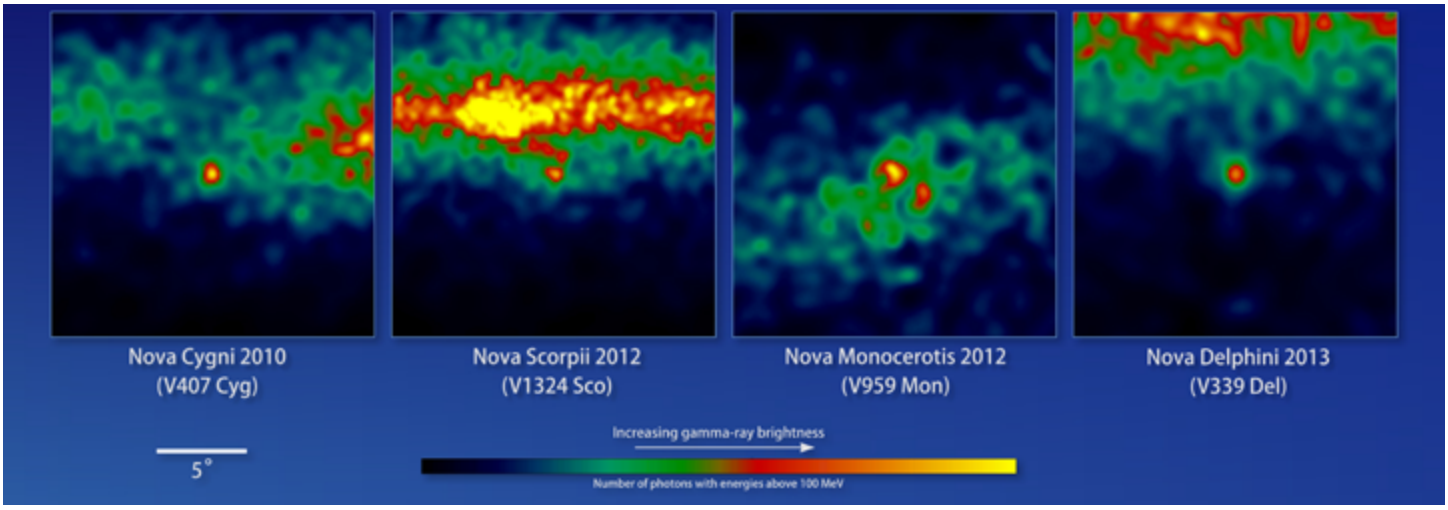
Fermi Guest Investigator Program

A total of 224 Guest Investigator proposals were received in response to the Cycle 7 solicitation. Proposals were peer reviewed in late April, with selections announced by NASA Headquarters in early June. See http://fermi.gsfc.nasa.gov/ssc/proposals/cycle7/ApprovedPrograms.pdf

Proposals to participate in the Cycle 8 program will be due in mid-January, 2015. There will be a few minor changes to the program, and prospective proposers should refer to Appendix D.6 of the 2014 ROSES NRA for details. It is anticipated that a new joint observation program will be initiated in Cycle 8, through which proposers to the Fermi program can obtain open program observations with INTEGRAL in support of Fermi related science.

Fermi E/PO News

The Fermi-sponsored "Big Ideas in Cosmology" college curriculum was offered for two college courses at Sonoma State University in spring 2014 semester, and again as purely online courses during the summer 2014 intersession. Marketing efforts are underway for a roll out of this immersive research-based curriculum for adoptions for Fall 2015. Contact Lynn Cominsky (lynnc@universe.sonoma.edu) if you are interested in field testing or adopting the general education-level curriculum: the material is suitable for either Introductory Astronomy or a second-semester course with a stronger focus on galaxies and cosmology.



These images show Fermi data centered on each of four gamma-ray novae observed by the LAT. Colors indicate the number of detected gamma rays with energies greater than 100 million electron volts (blue indicates lowest, yellow highest).
Image Credit: NASA/DOE/Fermi LAT Collaboration

Gravitational-wave news

Ira Thorpe (NASA/GSFC), Guido Mueller (U-Florida), Michele Vallisneri (CalTech)

LISA Pathfinder on track for launch

Anticipation is building among enthusiasts of space-based gravitational-wave observatories for the launch of the LISA Pathfinder (LPF) mission, now less than a year away. LPF, an ESA mission with payload contributions from European research institutions and NASA, is a dedicated technology demonstration mission for future LISA-like gravitational-wave observatories. LPF shrinks one of the LISA arms to 30cm to test drag-free control and local interferometry. All flight components for both the European science payload, known as the LISA Technology Package (LTP), and the NASA science payload, known as the Space Technology 7 Disturbance Reduction System (ST7-DRS), have been delivered and are undergoing integration. Final delivery of the LTP is anticipated later this year. In parallel, the LPF spacecraft is being fitted with a cold-gas micro thruster system based on the design successfully operating on board the GAIA spacecraft. Once the LTP is delivered, it will be integrated into the LPF spacecraft so that final system testing and the launch campaign can begin.

Preparations for LPF science operations are also building up steam. An international team of scientists has been conducting a series of exercises designed to mimic the operational environment and validate analysis tools. The most recent simulations have included effects such as the handover between multiple data-analysis teams and simulated instrument anomalies. LPF's short duration demands that data analysis be performed quickly and accurately, so that the mission time can be used with maximum effectiveness. The LPF launch is tentatively scheduled for July 31st, 2015, after which the spacecraft will take approximately 90 days to reach its operational orbit around the Earth-Sun Lagrange point (L1). After 90 days of LTP operations followed by 90 days of DRS operations, LPF will have completed its prime mission, paving the way for a space-based observatory of gravitational waves in the milliHertz band. An extended mission may be proposed to further explore the unique technological capabilities of this spacecraft.

Advanced LIGO surpasses Initial-LIGO sensitivity; electromagnetic follow-up of candidate events

Advanced LIGO (aLIGO) is the highly anticipated upgrade of the Laser Interferometer Gravitational Wave Observatories in Livingston, Louisiana, and Hanford, Washington State. These 4-km long Michelson interferometers target gravitational waves in the 10-Hz to few-kHz range. Gravitational waves are distortions of spacetime that change the light travel time or distance between freely falling objects. In Advanced LIGO, these objects are massive mirrors suspended by a multi-stage suspension system from seismically isolated platforms. In the frequency band of interest the residual motion of these mirrors will be in the 10^{-19} to 10^{-20} m/Hz$^{1/2}$ range and will be sensed at this level by ultra-sensitive laser interferometers. This astonishing sensitivity is required to see gravitational waves from, for example, compact binaries such as neutron-star or black-hole binaries at cosmological distances. Other potential sources include supernova explosions and signals from non-spherical pulsars.

The aLIGO lasers produce up to 200 W of single-frequency laser light. This laser beam has to be prepared and filtered before up to 150 W are injected into the main interferometer. The mirrors and beam splitters inside the interferometer form a complex Michelson interferometer with optical cavities in each of its 4-km-long arms, a power-recycling cavity to increase the power to up to 700 kW inside the arms, and a signal-recycling cavity to coherently enhance any potential gravitational-wave signal. The signal field is then filtered by an output mode cleaner before it is detected as a change in measured power by a low-noise photo detector. The installation and initial integration phase of the 4-km long interferometer at the LIGO Livingston Observatory (LLO) is complete; its counterpart at the LIGO Hanford Observatory (LHO) will be completed well before the end of 2014. The last step is to ensure that all components and subsystems work together flawlessly to reach the necessary sensitivity and finally detect the first gravitational waves. One measure of progress is the sensitivity of the interferometer. The science community uses the expected gravitational waves from 1.4-solar-mass neutron-star mergers as their standard candle, and expresses the overall sensitivity of the detectors by the range, averaged over all directions and orientations, over which these mergers could be detected. The first generation of LIGO was sensitive enough to probe out to nearly 20 Mpc; but it took seven years from initial installation to reach that final sensitivity.

The first sensitivity measurement at LLO on June 1st, 2014 corresponded to a range of 0.58 Mpc. Progress since then has been nothing short of dramatic (and very encouraging): on July 30th, aLIGO reached a range of 20.14 Mpc, surpassing the sensitivity of Initial-LIGO detectors. At the time of writing the range is consistently above 30 Mpc. LHO must catch up, and the rate of glitches that may resemble real signals is still too high. However, we feel comfortable that we can reach 50 Mpc next year and start the first aLIGO observing run in the summer or fall of 2015. During that inaugural run, Advanced LIGO will share alerts of gravitational-wave candidates with partners from the astronomical community, for follow up in the electromagnetic spectrum (see http://arxiv.org/abs/1304.0670 and http://www.ligo.org/science/GWEMalerts.php). There are now more than 50 agreements in progress or already in place with the science teams of more than 150 instruments, covering the entire electromagnetic spectrum. A second call for groups to receive alerts will be issued in 2015. We expect two or three years of further commissioning before we reach the ultimate goal of range greater than 150 Mpc. Sensitivity must also

improve at low frequencies, where heavier compact mergers involving black holes emit most of their energy. While we cannot *promise* a detection because event rates are uncertain, we believe that the LIGO instruments can deliver sensitivities that will enable regular detections by 2018.

LIGO releases two years of science data

The LIGO Laboratory and the LIGO Scientific Collaboration (LSC) have publicly released two years of science data taken by LIGO's three gravitational-wave detectors during its fifth science run ("S5"), which occurred from November 2005 to October 2007, and during which the detectors reached their design sensitivity. The release comes with detailed metadata, tutorials, web services, and software tools; it is meant to promote broad participation in the advancement of gravitational-wave physics and astrophysics from professional and amateur scientists, graduate students, undergraduates and secondary students. Users of the data are invited to help improve the quality of LIGO's scientific results, and to verify results already produced by the LSC.

The S5 data have already been analyzed by the LSC, and no gravitational-wave candidate signals were found. However, LIGO will continue to release more data sets in future years, including data from Advanced-LIGO detectors; the releases will include any gravitational-wave signals that have been identified by the LSC. Once regular gravitational-wave detections begin to occur, public participation in LIGO data analysis will add an exciting dimension to gravitational-wave astronomy. Numerical relativists, relativity theorists, astrophysicists, and other non-LIGO scientists will be able to use LIGO data to probe the origins and properties of gravitational-wave sources and the dynamics of strongly curved spacetime. Please visit the LIGO Open Science Center (LOSC) portal at http://losc.ligo.org and register on the LOSC email list to be notified of future updates.

In related news, the Director of Science and Robotic Exploration (D/SRE) at the European Space Agency (ESA) established a Gravitational Observatory Advisory Team (GOAT) to advise on the scientific and technological approaches for a gravitational wave observatory with a planned launch date in 2034. See http://www.cosmos.esa.int/web/GOAT for more details.

Spektrum Roentgen Gamma Update

A. Merloni, M. Pavlinski, P. Predehl, S. Sazonov

The SRG launch from Baikonour is scheduled for March 26, 2016.

eROSITA

The tests with the eROSITA Technological Model performed at Lavochkin Association (LA) last October were successful. eROSITA and the S/C were able to communicate as required.

After the final recommendations of an independent review panel (see last HEAD newsletter), the new design and manufacturing of the SRG radio-complex is underway. The medium-gain antenna will have a fixed mount and a much-increased reliability. This will enforce a change in the SRG all-sky scanning law, which will also affect the thermal profile of the telescopes, due to increased sun-avoidance angles during certain phases of the spacecraft orbit. The slight modification of the eROSITA telescope structure is underway. All other mechanical and optical subsystems are either ready or at least close to being ready.

The final calibration of the eight fully integrated Mirror Assemblies (MA) will resume early next year with the flight module cameras, immediately followed by the final integration of the MA into the telescope structure. In the meantime, the CCD-Modules are being assembled, and the progress is steady. The first Flight Model CCD (FM1) has already undergone a successful test. Most of the work now concentrates on the manufacturing and testing of the electronics: The Qualification Module of the Camera Electronics is ready and in test, the production of the FM boards has been started.

The end-to-end test of the fully integrated eROSITA telescope is scheduled for June 2015, followed by shipment to Russia.

ART-XC

At the LA, also the connection tests of the ART-XC Engineering Model with the Navigator platform are continuing.

Integration of the ART-XC qualification model (QM) is in progress. The assembly of 7 QM Mirror systems, each containing 28 shells, was completed in July 2014. Test integration and alignment of ART-XC QM has started, using a special mount enabling a quasi-parallel laser beam with a diameter of 600 mm and divergence of 5 arcseconds.

Disassembled tests of ART-XC QM started in October. Qualification tests of all telescope subsystems are to be completed in November 2014.

Modification of the telescope's carbon-fiber structure has been done in order to reduce background illumination through it, and the structure is now ready. The detector platform was also redesigned in order to improve thermal balance of the detectors.

The first four ART-XC flight model (FM) mirror systems produced by MSFC/NASA were delivered to Moscow in late August 2014. Delivery of the remaining three FM mirror systems is expected in November 2014. Production of the ART-XC FM subsystems is in progress. The telescope's combined ^{55}Fe+^{241}Am calibration sources have been ordered.

Swift Mission News

Eleonora Troja (UMCP/GSFC),
Lynn Cominsky (Sonoma State), & Neil Gehrels (GSFC)

The Swift mission continues to operate flawlessly. The mission was ranked number one in the 2014 Senior Review of NASA operating astrophysics missions (excluding Chandra and HST). The mission continues to support about 3 Target of Opportunity requests per day in addition to observing gamma-ray bursts (GRBs) and Guest Investigator targets. Below is an update on recent science findings, GI program and news from the EPO program.

Swift: Ten years of discovery

This meeting will celebrate 10 years of Swift successes and will provide the opportunity to review recent advances on our knowledge of the high-energy transient Universe both from the observational and theoretical sides. The conference will be held from December 2-5, 2014 at La Sapienza University in Rome, Italy. See http://www.brera.inaf.it/Swift10/Welcome.html

Swift observes giant flares from a red dwarf star

On April 23, NASA's Swift satellite detected the strongest, hottest, and longest-lasting sequence of stellar flares ever seen from a nearby red dwarf star. The "superflares" came from one of the stars in a close binary system known as DG Canum Venaticorum (DG CVn), located about 60 light-years away. The initial blast from this record-setting series of explosions was as much as 10,000 times more powerful than the largest solar flare ever recorded. Three hours after the initial outburst, the system exploded with another flare nearly as intense as the first. The star took a total of 20 days to settle back to its normal level of X-ray emission.

Swift helps scientists to find hundreds of new clusters

A new catalog of more than 250 X-ray clusters of galaxies will be released by the Swift-XRT Cluster Survey (SWXCS), exploiting at best the Swift/XRT archive. Scientists found that XRT images provide an excellent mean to find serendipitous X-ray clusters, allowing them to characterize the cluster properties (e.g. X-ray redshift, Intra Cluster Medium temperature, luminosity). The new SWXCS sample represents a useful tool to investigate cluster population and cosmology over a wide redshift range.

Swift Guest Investigator Program

The deadline for submitting scientific/technical proposals for the Swift Cycle 11 GI program was September 25. NASA received 165 proposals for Swift Cycle 11, requesting a total observing time of 14.1 Ms and $5.3M in funds for 1,044 targets. Additional 40 proposals were received through the Swift GI joint programs.

The Swift Cycle 11 Peer Review will be held in December to evaluate the merits of submitted proposals and choose those that are recommended for funding and observing time. The accepted targets will shape the science program for Swift's next year. Cycle 11 observations will commence on or around April 1, 2015, and will last 12 months.

Swift E/PO News

Swift communications and public outreach will be showcased at the upcoming "Swift: Ten Years of Discovery" conference in Rome, Italy in December 2014. In May 2014, Lynn Cominsky gave a talk entitled "Blazing galaxies, Exploding Stars and Monstrous Black Holes: High-energy visions of the Universe" that included Fermi, Swift, XMM and NuSTAR images to about 500 seniors at the Oakmont Evening Symposium.

Suzaku Mission News

Koji Mukai (GSFC / CRESST)

The spacecraft has experienced several additional episodes of safe holds within the last several months due to the aging of the on-board power system. As of late October, 2014, guest observer (GO) and TOO observations with Suzaku continue, mostly just using XIS, although the use of HXD is not completely excluded under favorable circumstances. We anticipate a few months delay in completing the priority A & B AO-9 observations, which were originally scheduled to be completed by March 31, 2015.

Presently we are assessing the power-system status and the observation modes available at the end of AO-9 observations. We will defer any announcement for Cycle 10 GO program until after we have a better understanding of the situation.

In addition, there are a couple of updates regarding the Suzaku instruments that GOs and archival users should be aware of. First, the HXD team has released an updated (version 2.2) PIN "tuned" background model for observations taken in 2012 August and later, as the earlier (version 2.0) version was found to be gradually underestimating the true background level by up to 3-4% in 2013 December. Second, the XIS team has noted that the charge leakage area of XIS0 had expanded since some time between 2014-05-15 and 2014-06-02. They have therefore enlarged the area discrimination region starting on 2014-10-01. Because of this, the script "aepipeline" needs an updated version of the configuration file, "aexisconf.list," for use with recent observations. While the new version will be included in the next FTOOLS release, users must download and install it in the "refdata" area of FTOOLS in the meantime. Further details (and a link to the new aexisconf.list file) are available through the "Things to Watch Out For" page of the Suzaku GOF web site.

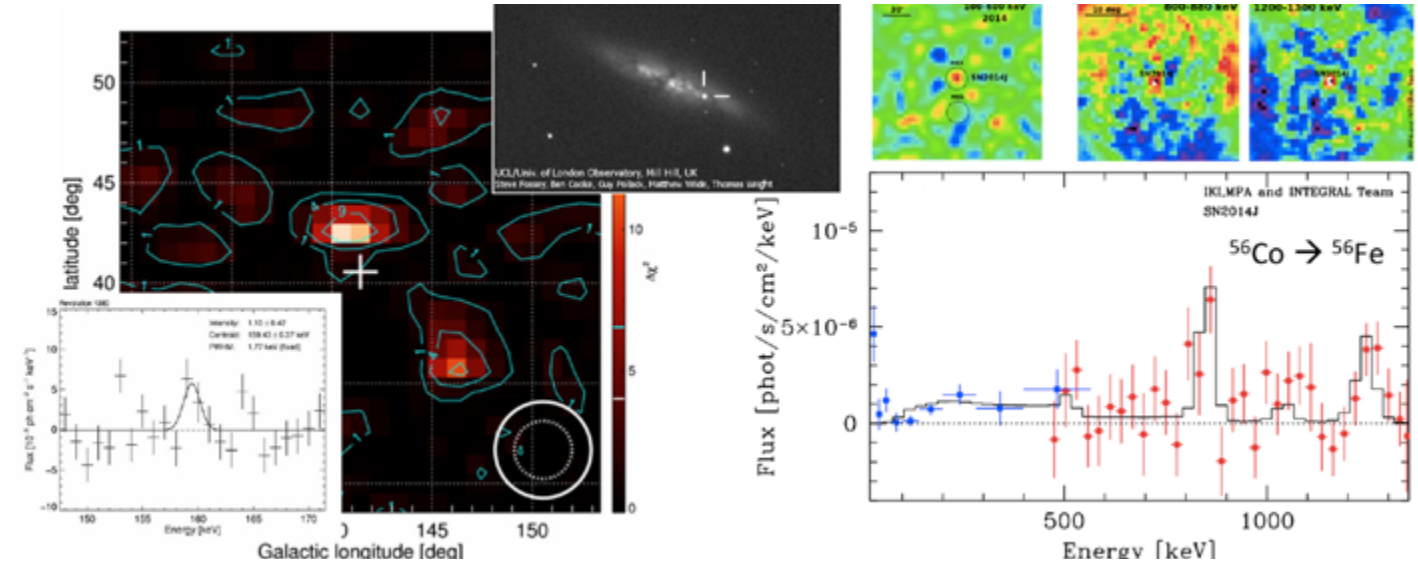
INTEGRAL Mission News

Erik Kuulkers (ESA) & Steven Sturner (UMBC/GSFC)

One of the holy grails for INTEGRAL this year was SN2014J. INTEGRAL almost exclusively observed SN2014J from end of January to end of June. Supernovae (SNe) of Type Ia are used as "standard candles" in cosmology. A physical understanding of this type of explosion was up to now not yet obtained. Several models were discussed for such SNe, all involving white dwarfs. In all cases, nuclear fusion of carbon to heavy nuclei create a large mass of radio-active ^{56}Ni. The decay of these radioactive nuclei create the energy that makes the SN shine for many months. The nuclear decay also produces gamma-ray lines, from the ^{56}Ni decay chain through ^{56}Co to ^{56}Fe. For the first time, INTEGRAL detected these ^{56}Ni decay lines at 158 and 812 keV (R. Diehl et al. 2014, Science 345, 1162-1165), some two weeks after the explosion in January of SN2014J in M82, the closest (~3.5 Mpc) Type Ia SN discovered since 4 decades. Also for the first time, the ^{56}Co decay gamma-ray lines at 847 and 1238 keV were seen, over the period 50-100 days after the explosion (E. Churazov et al. 2014, Nature 512, 406-408). INTEGRAL thus confirms by direct measurement of the primary gamma-ray lines the ^{56}Ni origins of SN light, as well as the white dwarf origin. These observations will help to refine models on how in fact these explosions do occur, because the explosion details affect how much new nuclei are created, and how they move and interact with the remainder of the exploding star. ESA Press coverage on the results from SN2014J was released on 27 Aug: "INTEGRAL catches dead star exploding in a blaze of glory", and did get some nice international press coverage.

The INTEGRAL User Group (IUG) met during meeting #16 on 13 & 14 May 2014 at ESTEC, The Netherlands. This meeting was focused on finalizing the science case for the fall 2014 ESA mission confirmation/extension exercise. On 1 July Peter von Ballmoos took over the position as IUG Chair from Angela Bazzano; he is appointed for 4 years. We thank Angela for her devotion to INTEGRAL during her term. The Mission Extension Operation Review for INTEGRAL took place on June 3. Overall, the INTEGRAL case was well received. Scenarios for disposal were presented; technically INTEGRAL could continue operations well into the 2020s and even have reserves for a relatively safe disposal. Currently, preparations are underway for a proposed series of maneuvres mainly in January 2015, but formally this still needs to be approved. The science case and accompanying Appendix for the mission confirmation/extension exercise have been delivered to ESA's Astronomy Working Group (AWG), and are available from the ISOC webpage. The AWG met on 13/14 October 2014.

The Target Allocation Committee (TAC) completed the review of the 12th Announcement of Opportunity (AO-12) for observing proposals in May 2014. It recommended again a scientifically healthy programme, which presents an excellent balance across scientific disciplines. The TAC selected 46 proposals, including 22 Target of Opportunity (ToO) follow-up observations, and 4 GRB observations which do not request observing time. Drawing on existing agreements, 40 ksec of XMM-Newton and 68 ksec of Swift observing time was awarded. The programme was approved by D/SRE on June 12; the PIs have been informed and the programme has been released to the public. AO-12 runs from 1 January to 31



The top middle image shows the optical discovery image of the supernova SN2014J in M82 on 21 January 2014. The INTEGRAL/SPI spectrum of SN2014J with the detection of the 56Ni decay line around 158 keV, about 2 weeks after the explosion, is shown in the lower left. The origin of the signal agrees within the measurement error with the position of the supernova (indicated by the cross in the map of the observed sky region). Right: the bottom part shows the INTEGRAL/SPI spectrum (red points) over the period 50-100 days after the explosion. The 56Co decay lines at 847 and 1238 keV are seen. Blue points show IBIS/ISGRI data for the same period. This gamma-ray emission is coincident with SN2014J (top right). The flux below ~60 keV is dominated by the emission of M82 itself. The black curve shows a fiducial model of the supernova spectrum for day 75 after the explosion.

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December, 2015, and the long-term plan for the period is now in preparation. The next call for observing proposals (AO-13) is currently expected to run from 9 March to 17 April, 2015.

The spacecraft, payload and ground segment are performing nominally. The SPI detectors underwent their 23rd annealing from 28 August to 12 September. First indications are that the results are (again) promising.

Scientific observations of the AO-11 cycle up to June 2014 were governed by the ToO observations of SN2014J. During the rest of the reporting period, scientific observations were performed as per AO-11 long-term plan. Further ToO observations were performed on the bursting pulsar GRO J1744-28 (April), the gamma-ray binary pulsar PSR B1259-63 (July), and the blazar Mkn 501 (August). During the reporting period, three Gamma-Ray Bursts (GRBs) were detected in the FOV of the high-energy instruments (GRB 140710B, GRB 140815A, and GRB 141004A).

The 10th INTEGRAL Workshop "*A Synergistic View of the High Energy Sky*" was held in Annapolis, Md, USA from 15-19 September 2014. About 75 scientists attended the meeting (less than half came from Europe). The latest results using INTEGRAL data were presented, and placed them in the context of other missions, such as AGILE, Fermi, Swift, XMM-Newton and NuSTAR, as well as ground-based observatories. The current buzzword is the synergy between them. The highlight of the meeting was the session on the first, direct evidence of the radio-active decay of ^{56}Ni and ^{56}Co in the Type Ia SN2014J, as discussed above. Results from the 7 Msec of observations were given by various groups, which led to a lively discussion. Furthermore, future missions and ideas focusing in the hard X-ray and gamma-ray regime were presented. All in all, the meeting was successful. The proceedings of the workshop will be published in Proceedings of Science (PoS).

INTEGRAL-related scientific highlights

- The spectral catalogue of INTEGRAL gamma-ray bursts: results of the joint IBIS/SPI spectral analysis (Ž. Bošnjak, et al. 2014, A&A 561, A25)
- Population of the Galactic X-ray binaries and eRosita (V. Doroshenko et al. 2014, A&A 567, A7)
- Cutoff in the hard X-ray spectra of the ultraluminous X-ray sources HoIX X-1 and M82 X-1 (S.Yu. Sazonov, et al., 2014, AstL 40, 65)
- Early 56Ni decay γ-rays from SN2014J suggest an unusual explosion (R. Diehl, et al. 2014, Science 345, 1162)
- ^{56}Co gamma-ray emission lines from the type Ia supernova SN2014J (E. Churazov, et al. 2014, Nature 512, 406
- Supernova breaks the mold (D.Clery 2014, Sci. 345, 993)
- Astrophysics: Supernova seen through γ-ray eyes (R.P. Kirshner 2014, Nature 512, 375)
- The puzzling source IGR J17361-4441 in NGC 6388: a possible planetary tidal disruption event (M. Del Santo et al. 2014, MNRAS, 444, 93)

As of Sep 17, the total number of INTEGRAL refereed publications since launch until the End of July 2014 is 806. Including conference contributions and other non-refereed papers, the total number of publications is 2165. So far, during the total year 2014, 30 refereed papers have been published, up to End July.

Athena: Revealing the hot and energetic Universe

Kirpal Nandra (MPE), Xavier Barcons (CSIC-UC), Didier Barret (IRAP), and Randall Smith (CfA) for the Athena Science Study Team

One year ago, the science theme of "the hot and energetic Universe" was selected by ESA for a launch in 2028. With the subsequent choice of Athena to address these science themes, the mission has moved into a study phase. Once the mission design and costing have been completed, it will eventually be proposed for 'adoption' in around 2019, before the start of construction.

Recent Athena activities include an initial study of the Athena design by ESA's Concurrent Design Facility, whose job is to identify a baseline design and cost for the mission to be further refined during the Phase A study. The results of the CDF will be announced soon.

In addition, ESA has created the Athena Science Study Team (ASST). The ASST's remit involves multiple tasks, which include acting as a focus for the involvement of the broad scientific community. With the agreement of ESA, the ASST therefore plans to establish a Working Group structure to be populated by members of the community. These Working Groups are intended to bring the expertise and effort of that community to bear in support of Athena. The Working Group structure aims to provide continuity with that developed for the submission of the Hot and Energetic Universe White Paper, Supporting Papers and successful Athena mission proposal, but at the same time offers the opportunity for new contributions from individuals who might be willing to join the Athena project in its present phase. More information about the Working Groups is available at http://www.cosmos.esa.int/web/athena/community-wg. There are slight differences in the application procedure for US-based scientists; more information can be found at http://pcos.gsfc.nasa.gov/studies/athena/.

X-ray Science Interest Group

Jay Bookbinder (CfA) & Mark Bautz (MIT)

The XRSIG held a well-attended evening session at the HEAD meting in Chicago, discussing US involvement in Athena (see above), the SMEX call, and plans to prepare for the 2020 Decadal. The next XRSIG meeting will be held the morning of January 4, 2015 in Seattle to coincide with the AAS meeting; suggestions for the agenda should be sent to Jay Bookbinder (jbookbinder@cfa.harvard.edu). For more information about the XRSIG, including how to be added to the mailing list, see http://pcos.gsfc.nasa.gov/sigs/xrsig.php.

Inauguration of the ASTRI/CTA prototype and SST-2M ASTRI/CTA Mini-array

Giovanni Pareschi, Stefano Vercellone, Elisabete de Gouveia Dal Pino and Markus Boettcher for the ASTRI Collaboration and the CTA Consortium

ASTRI (Astrofisica con Specchi a Tecnologia Replicante Italiana) is a flagship project of the Italian Ministry of Education, University and Research related to the next generation Imaging Atmospheric Cherenkov Telescope (IACT), within the framework of the Cherenkov Telescope Array (CTA) International Observatory. In this context, the Italian National Institute of Astrophysics (INAF) has recently inaugurated a large field-of-view (9.6 degrees), dual-mirror prototype of the CTA small size telescope in Sicily (Italy). CTA plans to install about 70 small size telescopes to allow the study of the uppermost end of the VHE domain (a few TeV - hundreds of TeV). During the temporal hiatus between the prototyping phase and the full CTA deployment, some sub-arrays of pre-production telescopes will be placed at the final CTA sites. The ASTRI/CTA SST-2M mini-array is one of them. It will be composed of at least seven units, as a result of a collaborative effort among INAF, the Institute of Astronomy, Geophysics and Atmospheric Sciences of the University of Sao Paulo, Brasil, and the Centre for Space Research, North-West University, Potchefstroom, South Africa. The sensitivity of the ASTRI/CTA SST-2M mini-array will be comparable to that of H.E.S.S., extending it to about 100 TeV. It will allow us to test the array performance in several areas, to validate our Monte Carlo simulations and to perform the first CTA observations of both Galactic and extra-galactic sources.

The 4m ASTRI telescope, inaugurated in Sicily on Sept 24th, 2014. It represents a prototype of the 70 Small Size Telescopes to be installed at the CTA southern site.

Progress Towards the Astro-H Mission

Richard Kelley, Takashi Okajima, Lorella Angelini, Rob Petre (NASA/GSFC)

The joint JAXA/NASA Astro-H project, with contributions from ESA and the Canadian Space Agency, continues to make significant progress toward the completion of the flight instruments and spacecraft development, and is on track for launch readiness near the end of 2015. Flight versions of the four instruments (Soft X-Ray Spectrometer, Soft X-Ray Imager, Hard X-Ray Imager, and Soft Gamma Detector) and x-ray mirrors have all now been completed and are now undergoing testing and calibration at the instrument level. Final spacecraft integration will start in early 2015. The cryocooler micro-vibration issue that degrades the energy resolution of the Soft X-Ray Spectrometer (SXS) x-ray calorimeter instrument has been extensively investigated. Work is now underway to procure passive mechanical isolators for the cryocooler compressors that will provide mechanical isolation from the compressors, yet not amplify low frequency vibration from launch that could potentially damage the compressors. In the meantime, the SXS is completing instrument characterization and initial calibration prior to proceeding to vibration tests at the Tsukuba Space Center in December 2014. Following that, additional calibration work will take place at Tsukuba in January before spacecraft integration in February 2015.

Considerable progress is being made in the development of the requirements for the databases and pipeline software as the four instruments finalize their telemetry outputs.