AMERICAN ASTRONOMICAL SOCIETY
HIGH ENERGY ASTROPHYSICS DIVISION

NEWSLETTER

May 2013

HEAD Division & Meeting News

Joel Bregman & Nick White

The HEAD divisional meeting was held in Monterey 2013, April 7-11, the 13th such event. Despite the unlucky number and the unexpected impact of sequestration it still turned out to be a great scientific success.

There were 354 participants with four days of talks, posters and topical sessions focusing on the both the exciting new results from NuSTAR and the continuing stream of data from the more mature missions such as Chandra, Fermi, INTEGRAL, Suzaku and XMM-Newton. There were also results presented from ground based facilities such as VERITAS and the ACT and SPT SZ telescopes. There was also a lively discussion on possible future missions in high energy astrophysics featuring a panel discussion with leaders from the USA, Europe and Japan.

The week before the meeting the Neutron star Interior Composition ExploreR (NICER) was selected and participants heard about how this telescope on the ISS will use X-ray timing to constrain the equation of state of Neutron Stars and continue the legacy of RXTE for X-ray timing observations. This was the first HEAD meeting organized by the AAS and we thank them for ensuring we had a pleasant, well-laid-out venue.

Joey Neilsen (BU) accepting the 2013 Dissertation Prize from HEAD Chair Joel Bregman at the Monterey HEAD meeting. Joey's talk on "Winds of Change: The Physics of Accretion, Ejection, and X-ray Variability in GRS1915+105" covered the many strange behaviors of this black hole binary system and speculated about what we could learn about other such systems in the future. [Photo courtesy Shuinai Zhang]

The HEAD Newsletter: Back to the Future

Randall Smith

The HEAD Newsletter went electronic quite a few years ago, and in a pure web-page format a few years after that. However, as time passes it seems a version suited for both web and print is most appropriate, and so we have with this newsletter resumed a format last seen around 1993, albeit developed with more modern software.

We have a number of other changes planned for the near future, including an updated (and easier-to-maintain) HEAD website at http://head.aas.org that will include links to all of the HEAD bulletins and meetings of interest to HEAD members. If you have any suggestions or thoughts about how improve our division, please do not hesitate to contact any of the HEAD officers.

Contents

HEAD in the News

Megan Watzke, HEAD Press Officer

High-energy astrophysics has continued to make its presence felt in the traditional news outlets, blogs, and social media through many exciting stories. At the January 2012 meeting in Long Beach, high-energy astrophysics results were well represented in the activity of the AAS Press Office. Chandra made news with the release of a new movie of the jet streaming away from the Vela pulsar. NuSTAR announced findings on a pair of black holes found inside a spiral galaxy.

As results became ready and papers accepted, news streamed out from HEAD missions throughout the past six months. For example, in late February scientists announced NuSTAR and XMM-Newton were used together to clock how fast the supermassive black hole in the center of NGC 1365 is spinning, thus giving clues to how galaxies grow. This important discovery was featured as a phone-in press conference at NASA and involved scientists from both the US and Europe.

Other exciting discoveries during this time period included that Fermi revealed evidence that supernova remnants produce cosmic rays – one of the mission's primary goals. Fermi also weighed in on the amount of starlight in the Universe as well as results closer to home involving improved abilities to study gamma-ray flashes during thunderstorms. Chandra released news on just how big black holes can get, the most distant X-ray jet ever discovered, and the possible source of the youngest black hole in the Milky Way. Chandra also teamed up with Swift on another exciting supernova result involving a young remnant in March.

Swift announced intriguing results on several topics, including a joint announcement with Fermi on the symmetry found in black holes of all sizes. Researchers using Swift also demonstrated the ability of the telescope to look at a wide range of astronomical objects, releasing the results of Swift's observations of Comet ISON.

- *Record Setting X-ray Jet Discovered*" (2012-11-28) http://chandra.si.edu/press/12_releases/press_112812.html
- *Study Reveals a Remarkable Symmetry in Black Hole Jets* (2012-12-13) http://www.nasa.gov/topics/universe/features/black-hole-symmetry.html
- *From Super to Ultra: Just How Big Can Black Holes Get?* (2012-12-18) http://chandra.si.edu/press/12_releases/press_121812.html
- *NASA's NuSTAR Catches Black Holes in Galaxy Web* (2013-01-07) http://www.nasa.gov/mission_pages/nustar/news/nustar20130107.html
- New Chandra Movie Features Neutron Star Action (2013-01-07) http://chandra.si.edu press/13_releases/press_010713.html
- *NASA's Chandra Suggests Rare Explosion Created Our Galaxy's Youngest Black Hole* (2013-02-13) http://chandra.si.edu/press/13_releases/press_021313.html
- *NASA's Fermi Proves Supernova Remnants Produce Cosmic Rays* (2013-02-14) http://www.nasa.gov/mission_pages/GLAST/news/supernova-cosmic-rays.html
- *NASA's NuSTAR Helps Solve Riddle of Black Hole Spin* (2013-02-27) http://www.nasa.gov/mission_pages/nustar/news/nustar20130227.html
- *NASA's Swift, Chandra Explore a Youthful 'Star Wreck'* (2013-03-15) http://www.nasa.gov/mission_pages/swift/bursts/star-wreck.html
- *NASA's Swift Sizes Up Comet ISON* (2013-03-29) http://www.nasa.gov/mission_pages/swift/bursts/ison.html

NuSTAR Mission News

Daniel Stern & Fiona Harrison (CalTech)

The Nuclear Spectroscopic Telescope Array (NuSTAR) hard X-ray mission is approaching one year in orbit, and is making the most sensitive ever observations of the Universe in the high energy X-ray band (3–79 keV). The mission paper, Harrison et al. (ApJ 2013; arXiv:1301.7307), describes the mission design and science plans.

During the 2-year baseline science operations phase, all NuSTAR observations are planned by the international NuSTAR science team. The science team is considering allocating some NuSTAR time to be available for joint observations in future XMM-Newton and Chandra AO's. The team is finalizing the instrument calibrations, and data will begin being publicly released through HEASARC in mid-2013. Level 1 requirements include surveys of the Galactic plane, surveys of the COSMOS and E-CDFS extragalactic fields, mapping the Cassiopeia A and SN1987A supernova remnants, and monitoring of very high energy sources as part of multi-wavelength campaigns with other facilities.

Many of these observations have already begun and we have also undertaken several additional coordinated science observations with soft X-ray telescopes such as Swift, Chandra, XMM-Newton, and Suzaku.

The NuSTAR mission website includes the full list of the science team, the list of Priority A and Level 1 science targets, links to the as-flown timeline, as well as information on requesting Target of Opportunity observations (though note that ToO's are intensive events for the NuSTAR operations team and only a small number are expected to be undertaken per year). This website is: http://www.nustar.caltech.edu.

Chandra X-ray Observatory Report

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

Chandra has now carried out almost 14 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.

The Observatory continues to operate with only minor incremental changes in performance, due primarily to the gradual accumulation of molecular contamination on the ACIS filter and to slow degradation of the thermal insulation. The former impacts the detection of the low-energy x-rays with ACIS, but not with the HRC, the latter impacts observing scheduling and strategies necessary to ensure continued operation in a safe thermal environment. Science data processing, archiving, and distribution proceeds smoothly, with average time from observation to data delivery to observers remaining at about a day.

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 the previous and current observing cycles this has led to a significant increase in the amount of observing time available. We took advantage of the increased observing time to introduce the X-ray Visionary Program (XVP). XVPs are observing programs of 1-5 Msec 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. Now, however, the observing efficiency is beginning to decline towards prior levels, as the orbit continues to evolve and a decision will be made, prior to Cycle 16, as to precisely how to apportion the available observing time amongst the different categories of observation.

The December 2012 Call for Proposals for Observing Cycle 15 attracted 636 proposals from scientists worldwide, who requested ~5.2 times more observing time than will be allotted. Included were 16 X-ray Visionary Projects proposals and 62 Large Project proposals.

Early-career scientists submitted 190 applications for the current cycle of Einstein postdoctoral fellowships. Three-year fellowships were awarded to 12 highly talented astrophysicists who will work at institutions throughout the United States.

Since March, the Chandra program offices at Marshall Space Flight Center and at the Chandra X-ray Center (CXC) have been adapting to new restrictions on travel and conferences that NASA has imposed in response to the recent congressional sequestration of Federal funds. These restrictions have significantly reduced staff travel to conferences, scientific collaborations and operational meetings. As one consequence of the restrictions, the CXC has cancelled the July workshop "X-ray View of Galaxy Ecosystems."

The Chandra Press Office issued 10 image releases and 5 science press releases, as well as an AAS press event. and a press release announcing the selection of the Einstein Fellows. A complete listing is available at http://chandra.harvard.edu/press/.

Progress Towards the Astro-H Mission

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

The joint JAXA/NASA Astro-H mission is continuing development toward a launch now planned for mid-2015. The prototype spacecraft structure has been assembled and completed, and is undergoing mechanical tests at the Tsukuba Space Center in Japan. This activity will take place through June 2013. Engineering models of the four instruments (Soft X-Ray Spectrometer, Soft X-Ray Imager, Hard X-Ray Imager, and Soft Gamma Detector) are in development, and the engineering model of the Soft X-Ray Spectrometer (SXS) was completed late last year and began testing after successfully completing vibration qualification tests. The performance tests indicate that the flight cryocoolers will need to have lower vibration and/or better isolation from the dewar. Presently, the required energy resolution of 7 eV for the flight system is within reach, but there are several efforts underway in Japan to improve the performance. Meanwhile, much of the flight hardware being contributed by NASA is complete or nearing completion. The detector assembly (36-channel microcalorimeter array) and aperture blocking filters have been tested and have undergone calibration and characterization. The combined energy resolution of the array is 5 eV over the 0.3-7 keV band. The first of two X-ray mirrors is complete and has been delivered to ISAS for detailed performance testing and calibration, and the second mirror is in the final stages of assembly. One of the mirrors will be used for the SXS and the other for the Soft X-ray Imager (SXI) being built by several institutions in Japan. A final decision on which mirror will be used for the SXS and SXI will be made following mirror completion and performance testing.

The Astro-H Science Enhancement Option has been approved by NASA/HQ and includes activities related to data analysis, the Guest Observer (GO) program and user support. To manage and implement these activities, an Astro-H US data center has been established at GSFC that is working closely with Japan. The pre-launch operations, rapidly ramping up, are focused on data processing, instrument software, collection of calibration information and preparing the necessary documentation and simulation software to support the GO program for all four Astro-H instruments. The Astro-H US data center will be the liaison between GO's and the Astro-H program with a help desk that will open at times near launch.

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. A call for white papers was issued to consider alternative observing strategies that could maximize scientific opportunities for the future of the mission. See http://fermi.gsfc.nasa.gov/ssc/proposals/alt_obs/obs_modes.html. Recent highlights from the mission include

- Fermi LAT team members Alice Harding and Roger Romani were awarded the 2013 Rossi Prize for their work on studies of gamma-ray pulsars.
- Fermi Guest Investigators Svetlana Jorstad and Alan Marscher combined Fermi LAT data with VLBI radio observations and optical observations to show that a gamma-ray flare from blazer 4C +71.07 was produced far from the central black hole. See http://www.nasa.gov/mission_pages/GLAST/news/aas-flares.html
- Fermi LAT results on two supernova remnants provided the most convincing evidence yet that SNR can accelerate protons to cosmic-ray energies. See http://www.nasa.gov/mission_pages/GLAST/news/supernova-cosmic-rays.html
- Fermi LAT observations of BL Lac objects at different redshifts showed the imprint of interactions with the optical and UV Extragalactic Background Light as an absorption feature. See http://www.nasa.gov/mission_pages/GLAST/news/cosmic-fog.html

Fermi Data and Software Releases

An updated version of the Fermi Science Tools was released by the FSSC on April 24, 2013. It includes a number of improvements which facilitate computational efficiency and usability as well as some minor bug fixes. The Science Tools are available for download from the FSSC web site.

The FSSC is pleased to announce a new resource: a compilation of light curves for all 2 FGL sources and the identification of 4-sigma or greater flares derived using the LAT aperture photometry method. Any sources found to be in a flaring state are identified on a special page which is updated weekly.

Fermi Guest Investigator Program

Cycle 6 Proposals have been reviewed. The results will be announced shortly, following discussions with NASA Headquarters about funding levels. Contrary to rumors, the Cycle 6 program has not been canceled.

Fermi E/PO News

Fermi GBM team member Chryssa Kouveliotou was listed among Time Magazine's 25 Most Influential People in Space. See http://www.nasa.gov/centers/marshall/news/news/releases/2012/12-109.html

The pattern of the Vela pulsar's motion through the LAT's huge field of view was used to produce a remarkable "spirograph" pattern. See http://www.nasa.gov/mission_pages/GLAST/news/spirograph.html

At the Fermi-LAT Collaboration meeting in February, Fermi E/PO held its second splinter session to discuss ways to get scientists more involved in the E/PO efforts.

Fermi E/PO co-sponsored teachers' workshops in conjunction with the Monterey HEAD meeting (Active Galaxies and Black Holes) on April 9, 2013, and the Huntsville GRB meeting (in Nashville, TN) on April 16, 2013 (Newton's Laws and Gamma-ray Bursts). Lynn Cominsky was honored as a Fellow by the AAAS in February 2013, for her work on NASA E/PO programs. She also received the "Women Honoring Women" award in April 2013 from the Sonoma County Commission on the Status of Women for her work inspiring women and girls to study STEM.

XMM-Newton

Steve Snowden & Lynne Valencic (GSFC)

Due to a micrometeoroid impact in December 2012, the MOS1 CCD3 has been damaged and is now considered "unusable for science". While it is not impossible that it could be recovered for science operations, it is not likely. No effect from the event has been observed so far in the other instruments. It is anticipated that the science impact will be small, even if MOS1 CCD3 cannot be recovered, as it is a peripheral CCD and covers ~ 14% of the geometrical area of MOS1. MOS1 itself contains only ~ 22% of the total effective area with both MOS instruments and the PN functioning simultaneously. Thus, the loss of CCD3 would not be felt for on-axis point sources and for extended sources with radius smaller than 5.5 arcmin. For sources that do fall in CCD3, or for extended sources with radius larger than 5.5 arcmin, there is a 22% decrease in effective area of 14% of the field (or, a 12% decrease in signal/noise.)

Scientific observations are currently continuing as normal, though without MOS1-CCD3. Investigations are underway to examine potential changes in the instrument status, but from the analysis completed so far, the effect on other MOS1 CCDs is very small. The quality of spectra and light curves from CCDs 1 (where the boresight is), 2, and 5 are normal. For those from CCDs 4 and 7, they are normal if the science products are extracted with "#XMMEA_EM", not "FLAG==0" (which is normally recommended for spectral extraction, and now leads to spectra with few to no counts.) In CCD 4's outer region, a noisy stripe has appeared and increases the instrumental background below 1 keV. More information is available at these two websites:

http://xmm.esac.esa.int/external/xmm_news/items/MOS1-CCD3/MOS1CCD3_impact.shtml

http://xmm.esac.esa.int/external/xmm_news/items/MOS1-CCD3/index.shtml

LISA in the light of eLISA

Guido Mueller, Scott Hughes, Michele Vallisneri

The European Space Agency released a call for white-papers on possible science themes for its two next large missions, "L2" and "L3" (to be launched in 2028 and 2034). The whitepapers can also advocate directly for observatory- or survey-type missions. The L-class missions are ESA's flagships, so they must be European-led, with an international contribution no larger than 20% of the European stake: for a typical large-mission budget of 1B€ (plus as much as 250M€ from ESA member states), this limits a potential US contribution to 250M€, or $330M. ESA's process calls for whitepaper submissions by May 24th, invited presentations at a September workshop, a senior survey committee report, a proposal by ESA's Director of Science and Robotic Exploration, and the selection of L2 and L3 science themes by ESA's Science Programme Committee in November. The actual L2 mission call would follow in 2014, and the L3 call at the end of this decade.

The eLISA consortium met at the end of March at the Albert Einstein Institute in Hannover, and decided to submit a single whitepaper, proposing a survey mission that addresses the broad science theme of the "Gravitational Universe". The meeting was attended by scientists from Germany, France, the UK, Italy, Switzerland, Denmark, Spain, and the Netherlands; by an envoy from the Chinese Academy of Science; and by Robin Stebbins, Peter Bender, Scott Hughes, and Guido Mueller, representing NASA and the US scientific community. The proposed strawman mission is an ESA-only gravitational-wave observatory based on eLISA, previously costed at 1.27B€ by ESA. eLISA is based on LISA, but reduces cost by using two 1-Gm arms in a drift-away orbit instead of three 5-Gm arms in a stable orbit. The whitepaper will also discuss possible international contributions to mitigate cost and risk, and to improve performance. If the "Gravitational Universe" theme is selected for L2, the US scientific community and the eLISA consortium will discuss with NASA and ESA possible ways in which the US could contribute to eLISA.

The ESA call and the eLISA science capabilities were also the topic of a focus session at the 13th HEAD meeting in Monterey, CA. Karsten Danzmann, the eLISA Consortium spokesperson, described the eLISA concept and the plans of the Consortium. He strongly emphasized the desirability of international contributions that enhance the mission without increasing risk to ESA, such as the addition of a third arm, increased lifetime, more laser power, or larger telescopes. Stefano Vitale reported on the upcoming LISA Pathfinder (LPF) mission, which shrinks one of the eLISA arms to 30cm to test eLISA's drag-free control and local interferometry. The latest issues with the LPF caging mechanism have been resolved, and the task of integrating the sapphire electrodes into the molybdenum housing, a critical hurdle for the expected 2015 launch, has found promising solutions. MIT's Scott Hughes discussed the science reach of eLISA and of a potential three-arm extension, focusing on their ability to probe the properties of high redshift ($5 < z < 20$) massive black-hole coalescences. eLISA would detect these events with high signal-to-noise ratio, determining redshifted masses (and in many cases spins) with good precision, and enlightening the growth of early black holes with their hosts. A three-arm variant would also determine luminosity distances (and consequently redshifts and rest masses), enabling an even more robust probe of early structure.

April was altogether a very busy month for the LISA enthusiasts in the US: LPF and eLISA were discussed at the APS meeting in Denver, with invited talks in sessions on "Future Gravitational-Wave Missions from Space" and "Multimessengers from Space," and the University of Montana in Bozeman hosted a workshop on "Gravitational-Wave Tests of Alternative Theories of Gravity in the Advanced Detector Era," with several relevant discussions.

eROSITA NEWS

Andrea Merloni & Peter Predehl (MPE)

The SRG/eROSITA launch is now foreseen for the Q4 2014. In the meantime, all eROSITA mechanical hardware is now in place and the integration of the telescope structure is completed. The complete Qualification Module (QM) test campaign was carried out successfully at IABG in Ottobrunn, near Munich, between November 2012 and January 2013. Mass and moment of inertia measures, acoustic noise tests, vibrational tests and space vacuum tests were performed.

Currently ~85% of all eROSITA X-ray mirror shells have been integrated, and the integration of the X-ray baffles into the mirror modules is also underway. The first two fully integrated flight mirror modules (including the baffles) were extensively tested in PANTER, according to the standard sequence: X-ray test → integration of baffle →X-ray test → vibration → thermal vacuum→ X-ray test. The results are marginally in line with the requested specifications (HEW=15.2" and 16.8" at 1.5keV for FM1 and FM2, respectively); based on the outcome of these tests, the 2nd baffle is currently under refurbishment.

As far the detectors are concerned, a second flight-like eROSITA detector module in combination with a fully equipped front-end electronics board has been successfully tested in the GEPARD test chamber at MPE. All seven flight detector boards have meanwhile been produced in the "Hybridlabor" of the Max-Planck Institute for Physics in Munich.

Joint German/Russian teams have been established to prepare SRG/eROSITA mission planning, Calibration and Performance Verification phases, as well as science coordination and exploitation. For more information on eROSITA, visit http://www.mpe.mpg.de/eROSITA

AXSIO-Probe

Rob Petre (GSFC), Jay Bookbinder (CfA), Andy Ptak (GSFC), and Randall Smith (CfA)

In December 2012 NASA HQ released its implementation plan for its response to the New Worlds New Horizons (NWNH) Decadal survey recommendations (http://science.nasa.gov/media/medialibrary/2013/04/15/secure-ImpPlan_R2_15Apr2013.pdf). This report focused on the strategy for developing WFIRST and also X-ray and gravitational wave astronomy given that IXO and LISA were canceled by NASA and ESA. The X-ray astronomy portion of the implementation plan was based largely on the X-ray Mission Concepts Study performed through the NASA Physics of the Cosmos program office (http://pcos.gsfc.nasa.gov/studies/x-ray-mission.php). This report, by NASA request, focused specifically on the IXO science goals highly recommended by NWNH with a key finding "that the extraordinary capability of a large-area X-ray calorimeter mission will address the greatest number of IXO science themes."

One of the missions included in the X-ray Mission Concepts Study was the Advanced X-ray Spectroscopy and Imaging Observatory (AXSIO). AXSIO reduces IXO's six instruments to two detectors - the imaging X-ray Microcalorimeter Spectrometer and the X-ray Grating Spectrometer. Specifically AXSIO would have a 10" PSF (goal of 5") and ~1 m^2 of effective area at 1 keV for the microcalorimeter with 2 eV resolution in its central array and better than 3 eV resolution over its 4' field of view. The grating spectrometer would have 1000 cm^2 of effective area with a resolution E/dE > 3000 over its 0.3-1 keV bandpass. These instruments allow AXSIO to accomplish most of the IXO key science goals at a significantly reduced complexity and cost ($1.5B life-cycle costs for a 3 year mission).

The NASA Astrophysics Implementation Plan states that "if a large mission like WFIRST cannot be started this decade, then any X-ray probe-class mission concept that is technologically ready would be a candidate for a probe to start this decade." However the Implementation Plan and public statements by NASA Astrophysics leadership have emphasized that a probe-class mission for this decade must cost less than ~$1B. Therefore, we are studying a less capable version of AXSIO, with a smaller mirror as defined in the X-ray Study (the so-called 'Notional Calorimeter' (N-CAL) mission). N-CAL has similar characteristics as AXSIO but omits the grating spectrometer and has only 0.5 m^2 of area at 1 keV. The Implementation Plan also calls for the PCOS office to develop a Technology Development Plan this year. This plan is nearing completion and is focused on establishing the cost and schedule for bringing the key technology components of an X-ray probe (segmented glass optics, X-ray calorimeter and X-ray grating technologies) to a technology readiness level of 6 by 2020.

NASA HQ has also indicated that it will be issuing a call later this year for a Science and Technology Definition Team (STDT) that will help to establish science requirements and the mission design for an X-ray probe mission. We will be working with the STDT to provide a robust design with well-understood costs to NASA HQ for a potential selection for a pre-phase-A start in 2015.

Athena+: Revealing the hot and energetic Universe

Kirpal Nandra (MPE), Xavier Barcons (CSIC-UC) & Didier Barret (IRAP)

ESA has recently started the process to select the L2 and L3 large missions, with nominal launch slots in 2028 and 2034. The first step in this process is the selection of the two corresponding science themes, which will be based on the consideration of white papers advocating these themes, together with a strawman mission concept showing how the science goals would be achieved. A decision on the selected themes for L2 and L3 is expected by November.

The teams behind the Athena X-ray observatory concept are working on a white paper in response to this call. The science theme is entitled "The Hot and Energetic Universe", addressing key scientific topics in which X-ray observations play a unique role and for which an ambitious new mission concept called Athena+ has been conceived.

Athena+ will transform our understanding of two major components of the Cosmos:

- The Hot Universe: the bulk of visible matter in the Universe comprises hot gas, which can only be accessed via space-based facilities operating in the X-ray band. Revealing this gas and relating its physical properties and evolution to the cosmological large-scale structure, and the cool components in galaxies and stars, is essential if we are to have a complete picture of our Universe.
- The Energetic Universe: accretion onto black holes is one of the major astrophysical energy generation processes, and its influence via cosmic feedback is profound and widespread. X-ray observations provide unique information about the physics of black hole growth and the causes and effects of the subsequent energy output, as well as revealing where in the Universe black hole accretion is occurring and how it evolves to the highest redshifts.

Achieving the ambitious goals set above requires an X-ray observatory-class mission delivering a major leap forward in high-energy observational capabilities. Thanks to its revolutionary optics technology and the most advanced X-ray instrumentation, the Athena+ mission, will deliver superior wide field X-ray imaging, spectral-timing and imaging spectroscopy capabilities, far beyond those of any existing or approved future facilities. Further information is on the website http://www.the-athena-x-ray-observatory.eu, which also contains information on how you can register your support for the new mission. An open meeting dedicated to a discussion of Athena+ is being planned for July 1-2 in Paris (Institute Océanographique de Paris), and we look forward to seeing you there.

Swift Mission News

Stefan Immler (UMCP/GSFC), Lynn Cominsky (Sonoma State), & Neil Gehrels (GSFC)

The Swift mission continues to operate flawlessly. The mission did well in the 2012 Senior Review and is slated to continue through 2016, with the last two years reviewed again in 2014. The primary ground station for Swift is the Malindi station in Kenya operated by the Italian Space Agency. The main antenna had a hardware failure in December and we had to lower the Swift data rate and use back-up dishes in other countries. The Malindi antenna was fixed by late February and the observatory is back to full data collection. Below is an update on recent science findings, GI program and news from the EPO program.

New Class of Gamma-Ray Bursts Found By Swift

Three unusually long-lasting Gamma-Ray Bursts (GRBs) have recently been discovered by Swift. While previously observed GRBs are either short-duration (<2 sec) or long-duration (seconds to minutes) bursts, the three new GRBs 101225A, 111209A, and 121027A lasted between two and seven hours. These ultra-long GRBs are likely caused by low metallicity blue supergiants, stars that can grow to more than 1,000 times the size of the Sun. During the gravitational collapse of such a star at the end of its life, the outer layers take longer to fall inwards and the jet subsequently lasts longer, producing ultra-long duration GRBs.

Swift Discovers new Galactic Supernova Remnant

While performing an extensive X-ray survey of the galactic plane region, Swift uncovered the previously unknown remains of a stellar explosion. With an age of around 2,500 years, G306.3–0.9 ranks among the 20 youngest of all ~300 known supernova remnants in our galaxy. The data reveal no compelling evidence for the presence of a compact stellar remnant and the supernova type could not yet be determined.

Swift Guest Investigator Program

The Swift Guest Investigator (GI) program will continue to solicit proposals in GRB and non-GRB research during Cycle 10. NASA's Research Opportunities in Space and Earth Sciences (ROSES) 2013 and the Swift Appendix were released on February 14, 2013. The deadline for submitting Swift Cycle 10 GI Program proposals is September 25 at 4:30PM EST. Swift observing time can also be requested through the Chandra and XMM-Newton AOs. Please visit the Swift Proposals web site for more details: http://heasarc.gsfc.nasa.gov/docs/swift/proposals/.

Swift E/PO News

In conjunction with the "Huntsville in Nashville" Gamma Ray Burst Symposium, Swift co-sponsored an educator's workshop, held at Vanderbilt's Dyer Observatory. More than 20 teachers attended to learn about Newton's Laws and GRBs. The GRB activities were especially relevant since the ultra-long burst result had been publicized earlier that day at a media telecon from the meeting.

INTEGRAL Mission News

Christoph Winkler (ESA) & Steven Sturner (UMBC/GSFC)

The spacecraft, payload and ground segment are performing nominally. Routine annealing #20 of the SPI Germanium detectors took place in January 2013: the energy resolution was again successfully restored. AO-10 cycle science observations of the are being performed as planned.

INTEGRAL continued public Earth/Cosmic X-ray Background (CXB) observations on 27 September and during 20-21 November. More observations will be done in AO-10 (2013) and beyond. This is a public programme, building on initial observations in 2006 (E. Churazov et al., A&A 467, 529, 2007; M. Türler et al., A&A 512, 49, 2010), where the INTEGRAL s/c will be commanded to a special attitude to let the Earth drift through the field of view of the INTEGRAL instruments. Results from this observation will help in separating the cosmic and instrumental backgrounds, and so ultimately lead to improved background subtraction. Scientifically, the main goals are to measure the spectral shape of the diffuse CXB emission above 20 keV and to study any high-energy emission from the Earth during storms in auroral regions.

The 11th Announcement of Opportunity for observations with INTEGRAL was released on 4 March 2013, proposals were due on 12 April 2013. Accepted observations will be scheduled in the Jan – Dec 2014 timeframe. A second call for data rights on targets within the FOV of accepted AO-11 observations will be released in September 2013.

The INTEGRAL mission is funded until 31 December 2014. An extension of the mission for another two years, until 31 December 2016, has been requested and is currently under discussion.

Recent scientific highlights

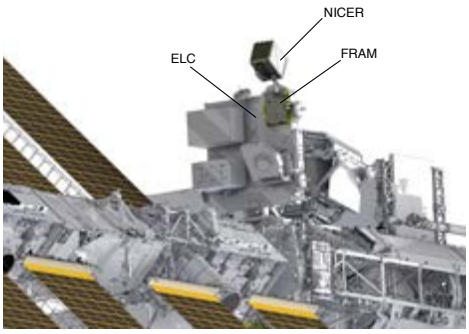
- Hard X-ray line emission from the ^{44}Ti decay in SNR 1987A (S. Grebenev et al., Nature 490, 373, 2012)
- Energetic feedback and ^{26}Al from massive stars and their supernovae in the Carina region (R. Voss et al. 2012, A&A 539, A66)
- Temporal and Spectral Evolution in X- and γ-Rays of Magnetar 1E 1547.0-5408 since its 2008 October Outburst: The Discovery of a Transient Hard Pulsed Component after its 2009 January Outburst (L. Kuiper et al., 2012, ApJ 748, 133)
- First Catalogue of Optically Variable Sources Observed by OMC Onboard INTEGRAL (J. Alfonso-Garzón et al., 2012, IAUS 282, 484)
- INTEGRAL/IBIS 9-year Galactic Hard X-Ray Survey (R. Krivonos et al., 2012, A&A 545, A27)
- The INTEGRAL/IBIS AGN catalogue - I. X-ray absorption properties versus optical classification (A. Malizia et al., 2012, MNRAS 426, 1750)
- The Distribution of High Mass X-ray Binaries in the Milky Way (A. Coleiro & S. Chaty, 2012, arXiv:1212.5460)

NICER

Keith Gendreau & Zaven Arzoumanian (GSFC)

The Neutron star Interior Composition Explorer (NICER) is a NASA Explorer Mission of Opportunity dedicated to the study of neutron stars, the extraordinary endpoints of stellar evolution that embody extreme electromagnetic, gravitational, and nuclear-physics environments. Through a unique combination of photon time-tagging resolution, energy resolution, and sensitivity, NICER will provide unprecedented time-resolved spectroscopic capability in the soft (0.2–12 keV) X-ray band, where the thermal spectra of neutron stars peak. This capability will enable novel investigations of the exotic states of matter within neutron stars, of dynamic phenomena powered by accretion and superfluidity, and of neutron star magnetospheres, perhaps the most powerful cosmic particle accelerators known.

NICER will achieve these goals by deploying, in late 2016, its X-ray timing and spectroscopy instrument as a payload on the International Space Station (ISS). A robust design compatible with the ISS visibility, vibration, and contamination environments allows NICER to exploit established infrastructure with low risk. Grazing-incidence optics and silicon drift detectors, actively pointed for a full hemisphere of sky coverage, will provide photon-counting spectroscopy and timing registered to GPS time and position, with high throughput and relatively low background. NICER will provide a rapid-response capability for targets of opportunity, continuity in X-ray timing astrophysics investigations post-RXTE through a proposed Guest Observer program, and new discovery space in soft X-ray timing science.



NICER, integrated with a standard Flight Releasable Attachment Mechanism (FRAM), is attached to one of the ISS zenith-side ExPRESS Logistics Carriers (ELC). The ELC provides power and a telemetry interface. Shown in its deployed state, NICER offers a full hemisphere of sky coverage with high viewing efficiency even when obscurations by ISS components (such as the solar arrays) and interruptions due to ISS operations are taken into account.

For more information, please visit http://heasarc.gsfc.nasa.gov/docs/nicer; the HEASARC WebPIMMS and WebSPEC tools may be used to simulate NICER observations. We welcome communications from prospective users about novel investigations—including those beyond NICER's core neutron star agenda—enabled by NICER. A proposed Special Session at the 2014 AAS Winter Meeting will be devoted to NICER science.

Suzaku NEWS

Koji Mukai (GSFC / CRESST)

The prognosis for the power-supply capability of the Solar Array Paddle (SAP) has improved since the last HEAD newsletter. Recent data do not follow the earlier trend, which suggested a continuous degradation at a rate which would likely have led to a significant impact on the observing program during the AO-8 period (April 2013 - March 2014). The project is now hopeful that normal observations with the current, full complement of instruments (3 operational units of XIS and both PIN and GSO detectors of HXD) can continue throughout the AO-8 period and probably beyond.

The XIS team has updated the XIS rmf generator. The new version includes an improved response model around the Si K edge for XIS1 data. Combined with the calibration file updates provided by the team last year, this should improve the calibration of all XIS data in the 2 keV region. For more, see http://heasarc.gsfc.nasa.gov/docs/suzaku/analysis/sical_update.html.

Finally, please note: planning is underway for the fifth Suzaku science conference, held in Japan in early 2014.

X-ray Science Analysis Group News

Jay Bookbinder (CfA)

The X-ray Science Analysis Group (XRSAG) held a one-day meeting after the Monterey HEAD meeting, focusing on the near-term and far-term Technology Development Plans. The status of these plans (see also the AXSIO-probe section on page 6 for more about the near-term plan) were presented by Rob Petre and Paul Reid. Optics technologies were presented by Martin Weisskopf, Will Zhang, Paul Reid, and Suzanne Romaine, to the accompaniment of very lively discussions. X-ray grating progress, including both off-plane gratings and CAT gratings, was presented by Randy McEntaffer and Ralf Heilmann, respectively.

The afternoon was devoted to discussion of detector technology. A presentation on X-ray silicon detectors (and grating blocking filters) was given by Mark Bautz, followed by one on large-format silicon detectors by Abe Falcone. For higher energy X-ray detection, Matthias Beilicke spoke about small-pixel CZT devices. In the cryogenic regime, Ben Mazin gave a presentation on MKID detector developments, while Simon Bandler covered a range of transistor edge and magnetic microcalorimeter detectors. Finally, Kent Irwin gave a thought-provoking talk on advances in multiplex readouts for large-format microcalorimeters.

PDF vesrions of these talks are available at http://pcos.gsfc.nasa.gov/sags/xrsag/monterey-2013.php

The goal of the XRSAG is to provide quantitative metrics and assessments to NASA in regard to future X-ray observatories. XRSAG membership is open to all who wish to assist in these goals, and our website http://pcos.gsfc.nasa.gov/sags/xrsag.php contains all of our recent results and a link to join the XRSAG mailing list.