

First Light Lite

Aug 1, 2023

Jim Lynch – Editor

Message from the CCAS President

The weather, at least as far as observing is concerned, has continued to be dismal during the New Moon week when we schedule our monthly summer star party. As mentioned, what constitutes good beach weather often is not so good for observing. But, we live on Cape Cod, so...

As with last month, we've made a bit more lemonade out of the weather-induced lemons. Instead of an observing night (which wasn't an option due to clouds), we switched the last open day from a star party to a "Telescope Day" where we had people both tour our Observatory and also learn how to use smaller amateur telescopes and other observing gear. We had a good turnout and an enthusiastic response, so all was not lost. We also mentioned to people that observing conditions (both total darkness hours and weather) tend to be more favorable in fall and spring, so please consider those as well. (And if you're hardy, winter has some really nice attractions, the most dark hours and the clearest skies - but dress warmly!)

In addition, our club members gave some well received astronomy talks at the Centerville and West Barnstable libraries this last month. So, CCAS was active even when skies were not so clear!

Star Party for August (14-19 August window)

As anyone who has been reading this newsletter knows, we have changed our "modus operandi" as regards star parties from what it was pre-Covid. Rather than having 1-2 definite dates per month for a star party, which more often than not were weathered out, we have gone to a six-day weather window centered around the New Moon, which gives us a reasonable chance of a dark, clear night. (And even with this, we've been weathered out a few times the past few months.) But by and large this is a more workable strategy.

We've also gone towards "binocular sky tour" and "smaller scope eyepiece viewing" outdoor activities, together with a "real time video image show" (through the main dome scope camera) in the lower level of WSO combined with a dome tour. This set of activities tends to give guests the best overall experience, and we will also continue to refine our format.

CCAS and CCAF Elections

A quick acclamation vote at the last meeting elected the following CCAS officers and CCAF Board members.

Janice Marks had been filling Gus Romano's CCAF term (to 2023) as Treasurer, had done a great job, and was elected for a full term (to 2028). The current CCAS Officers (Jim Lynch, President; Ashish Dutta, Vice-President; Jonathan Hatch, Secretary; and Ken Brink, Treasurer) were re-elected for another one-year term.

Dues

During Covid, we did not require dues, and left them to be entirely voluntary at \$30 per family. This year, as we are resuming activities, we are requesting dues at a reduced flat rate of \$15 per family (or individual, if there is no family to consider.) Dues will be due July 1st. If you have sent our treasurer (Dr. Ken Brink) dues in the last year, you will be considered to have paid dues for this year. If not, we would ask you to submit them, as this money is used to support our activities with the schools and the public. (We don't buy equipment, as that is the Foundation's function.) Dues should be sent to: Dr. Ken Brink, 16 Greengate Rd., Falmouth, MA 02540. If you send your dues to the Observatory or DYHS, they will be delayed in their transmission to the CCAS Secretary.

I'd note that most CCAS activities will be available to those who do not pay dues, but when we eventually have remote observing online, that might be restricted to those who are dues paying members. It is a small amount, and it is hoped you can pay if you wish to be active in CCAS.

Last Month's Speaker: Dr. G. Fabbiano, Center for Astrophysics | Harvard & Smithsonian

Time, Date and Place: 7:30 PM, July 6th in the DYHS Library (as well as Zoom).

Title: Chandra & the Supermassive Black Hole (SMBH) – Galaxy Interaction

Abstract: The Chandra X-ray observatory, NASA's Great Observatory for the X-Rays, was launched from Cape Canaveral on 23 July 1999 on the Shuttle Columbia, and has been operational ever since, providing a new detailed view of the energetic universe. In this talk I will introduce Chandra and its unique capabilities, and I will then discuss our studies of SMBH-Galaxy interaction that Chandra has made possible. The discovery that all galaxies host a SMBH in their nuclei led to the realization that the evolutions of galaxies (of which the Milky Way is our home) and SMBHs are interconnected. When a SMBH is 'awakened' by the in-fall of stars or nearby clouds, it becomes an Active Galactic Nucleus (AGN) or quasar. In this phase, a tremendous amount of energy is released, equaling, or even surpassing the total energy output of the 100-1000 Billion stars in the galaxy. This energy, in the form of radiation and winds, interacts with the interstellar clouds in the disk of the host galaxy, leading to the X-ray emission that we are studying with Chandra. A new detailed understanding of the AGN phenomenon is emerging from these observations, not restricted to the immediate vicinity of the SMBH, but that may involve the whole host galaxy. In closing, I will advertise the Chandra Source Catalog and its visual interface that allows a direct exploration of the X-Ray sky.

Biography: Giuseppina Fabbiano is Senior Astrophysicist at the Smithsonian Astrophysical Observatory (SAO), a member of the Center for Astrophysics (CfA) | Harvard & Smithsonian, in Cambridge MA, USA. After completing her studies in Physics at the University of Palermo (Italy) in 1973, Fabbiano joined the group led by Riccardo Giacconi at the CfA that became the major center for X-ray Astronomy worldwide. She was a scientist in the data management teams of the NASA UHURU mission, the first X-ray astronomy satellite, and the HEAO-1/A3 mission. As project scientist for the Einstein Observatory, she was responsible for the data processing system, and was a key member of the successful proposing team for the NASA Chandra X-ray Center (CXC). Today, she is the Head of the

CXC Data Systems Division, with oversight of the software, hardware and system groups, as well as the Chandra data processing and archive. Fabbiano is an active astrophysicist, with over 700 highly cited publications (275 refereed). She is a leader in the observational studies of populations of X-ray sources in galaxies, the hot interstellar medium, and the interaction between nuclear massive black holes and the host galaxy. She is the author of two invited reviews in the Annual Review of Astronomy and Astrophysics. Fabbiano is a co-author of the Smithsonian Institution Digitization Strategic Plan (for 2010-2015) and of the 2009 report of the US Interagency Working Group on Digital Data ‘Harnessing the Power of Digital Data for Science and Society’. She chairs the US Virtual Observatory Alliance and is a member of the International Virtual Observatory Alliance (IVOA) executive committee, which she chaired in 2016-2018. Fabbiano is a member of the American Astronomical Society (AAS) and the International Astronomical Union (IAU), an elected Fellow of the American Association for the Advancement of Science (AAAS), and Member and former Trustee of the Aspen Center for Physics.

PRECIS: The Chandra X-Ray Observatory was originally slated for a five-year mission and launched in 1999. Yet here it is 2023 and it is still merrily chugging along and producing unique and valuable data in a wavelength band that is extremely important to astrophysics. Though it is only sending back data at 2 kbits/sec (Holy Telephone Modem, Batman!), over its nearly quarter of a century of productivity, that comes to quite a few bits. If one looks at the Wikipedia article about Chandra, its list of “important discoveries” is extensive and impressive. The UHURU, Einstein and Chandra spacecraft added imaging in the x-ray band to the astronomer’s spectral palette.

Dr. Fabiano began her talk with a description of how Chandra works and what its technical specs are. Chandra works with optics that look vastly different from optical band or IR band telescopes. Rather than flat mirrors, Chandra has a nested set of four hyperbolic reflectors that work at grazing incidence, rather than normal incidence. These mirrors funnel light through a tubular looking structure, and onto electronic sensors that detect signals in the energy range of between 0.1 keV and 10 keV. This energy window allows looking at high energy atomic transitions, especially in heavier, ionized atoms. The system has an ~1 degree field

of view and 0.1 arcsecond of resolution. So, like many other “big telescopes” one has to mosaic images of larger astronomical features.

With these specs, Chandra has proven useful in many aspects of astrophysics, and again I would refer the reader to the Wikipedia article to see the extensive list.

Dr. Fabiano then turned to her technical interest, how supermassive black holes commonly found in the centers of galaxies interact with a surrounding galaxy. As well as attracting nearby material into the black hole, these massive objects (also known as Active Galactic Nuclei) also blast out massive jets of energy powered by the rotation of the black hole and its massive magnetic fields. These jets interact with the gases in the galaxy that are in their path, and those interactions in turn determine whether or not there is available material and proper conditions to make more stars. The various x-ray energies that Chandra senses allow one to make a map of the various reactions that go on, induced (or prevented) by the black hole’s jets. These maps can be superposed on optical and IR images, as well as being of interest on their own. With such pictures in hand, astronomers can make sense of the interactions between the black holes and the surrounding galaxy. This is a very active area in modern astronomy.

Dr. Fabiano’s lecture concluded with a discussion of the issues surrounding the maintenance of the large Chandra database. As with any large project, keeping the data in a convenient and useful form and scanning it for interesting features is not such an easy chore, and Dr. Fabiano has a large part in this for Chandra. One interesting thought that came up in the post-talk discussions was the possibility that “citizen science” efforts could be used in scanning the data, much as is done in Galaxy Zoo and other such projects. (Sky and Telescope magazine has an interesting list of such projects.) We would love to see something come of this suggestion!

This Month’s Speaker: Dr. Tony Stark, Senior Astronomer
Center for Astrophysics | Harvard & Smithsonian

Date: August 3rd, 2023

Title: The Golden Age of Observational Cosmology

Abstract: Thirty years ago, we knew there was almost certainly a "Big Bang", we thought the Universe was "open", and we had observations of a few objects at redshifts $z > 1$. Now the "Lambda Cold Dark Matter Big Bang" model parameters are known within a few percent, including the fact that it is "just closed", and we routinely observe the formation of galaxies at redshifts $z > 6$. We now understand in some detail the story of how the world came to be, from the first fraction of a second after the Big Bang until today, a story that involves the mysterious "Dark Matter" and "Dark Energy". Observational cosmology, a field of study driven by the revolution in technology, is the source of this new knowledge.

Biography: Dr. Antony Stark is a pioneer of Antarctic Astronomy and is a founder and designer of the South Pole Telescope (SPT), which is among the most important instruments for observational cosmology. He is PI and designer of the Parallel Imager for Southern Cosmology Observations (PISCO), a photometric camera on the Magellan Clay telescope for taking fast simultaneous g, r, i, and z band images. PISCO is being used to take the first images of galaxy clusters discovered by the SPT to determine their mass by gravitational lensing analysis. PISCO is also in use by several groups from Magellan consortium institutions to study asteroids, galaxy formation, exoplanets, and X-ray sources. Stark is a member of the STO and GUSTO balloon-borne telescope teams for Milky Way and Magellanic Cloud TeraHertz spectroscopy surveys of the dominant cooling lines of the interstellar medium.

Next Month's Speaker: Dr. Mansavi Lingam, Florida Institute of Technology
Topic: Life in the Cosmos, exact title TBA.

Directions to Dennis Yarmouth HS and Schmidt Observatory

For information on the location of our Dome behind Dennis-Yarmouth High School, click on the purple button "Old Website" and once there, click on "Meeting Location" viewing the two maps that are there: external for the Dome, and internal to locate the high school library where meetings are held. **NOTE:** We are redoing the website, so that this information may become dated soon. We intend to move any currently useful information to our new website.

For meetings, drive along the south entrance road and go around behind the main building. Park in the lot about halfway down the building and go in the back door and turn down the hall to your left to find the library.

For Star Parties at the Dome, drive in the north entrance road all the way past the north side of the main high school building, through a gate, and on to park near our Dome. You can (and should) park on the grass there.

H&K directions

CCAS hosts a dinner gathering for the speaker (if available), members and friends on meeting nights (just before the meeting) at the South Yarmouth Hearth & Kettle restaurant at 5:45pm; (the meetings begin at 7:30 at D-Y.) Please join the group to dine and talk about all things interesting, especially astronomy, before our meeting. The H&K is at 1196 Rt 28, South Yarmouth, about a half mile west of the Station Avenue/Main Street intersection with Rt 28 (stop light). **NOTE:** Since Covid, we have a mix of fully remote and hybrid in-person + remote meetings. Check the newsletter and/or website to see what the format is each month! There are no dinners when the meeting is fully remote.