

First Light Lite

January 4, 2021

Jim Lynch – Editor

Message from the CCAS President

Goodbye, 2020. We'll miss y...nah, no we won't. Though we may still have to go through a rough patch in 2021 until the pandemic is brought under control, seeing 2020 in the rearview is not going to distress anyone, with perhaps the exception of Zoom stockholders. The New Year's ball in Times Square couldn't drop fast enough.

This year, I'm hoping that our emphasis will not just be on surviving the remainder of the pandemic as a club (OK, a Society), but also on looking at what we want to be in the future when the air clears and we can resume nearly normal activities. CCAS has been around as a club for a fairly long while (since the mid-eighties), and I'd like to see us continue for at least as long into the future! I think that CCAS does some good things for its members, the local schools, and the public at large, and these should continue. Indeed, I think people will be looking hard for social, interesting, post-pandemic activities, and CCAS and amateur astronomy are places I'd like to see them looking.

Toward that end, I have attached to the email a Powerpoint presentation that I would like to discuss both here, and at the meeting portion of the next two CCAS virtual meetings (i.e. after the talks).

We really, *really* need some more active members, both for committee work (which can be done from home and over Zoom, which despite my maligning it here, works well!) and for "hands-on," outside the home (and some outdoor) tasks. This can be as small a commitment as an hour or two or three a month, or more if you wish to and have the time. Right now, we have a smallish core of people which suffices during the pandemic, but will not be adequate for an active club when things improve. We need some fresh faces and voices (which you can also hide and mute on Zoom, if you wish. 😊)

I'm hoping that some of you who read the PPT will be willing to say that you are interested in some of the committee or other work that I describe. To do this, just drop me an email at jlynch@whoi.edu saying "I'm interested" or, if you're logged into our meetings, stay around for the club meeting portion and tell me in (virtual) person. As I said, this doesn't have to be a big commitment (or any at all, if you decide it isn't a good fit), but we DO need some additional help in the coming year.

Upcoming Meeting Talks

The winter, spring, and summer's agenda for talks is the first item to discuss, as we already have some good talks lined up (and also one by me this Thursday.) If you've read this section last month, feel free to move ahead to the next section – our speaker list hasn't changed since then.

Very generously, Dr. Jim Gates, the incoming President of the American Physical Society, who is also well known to the public for his Nova and other media appearances, agreed last spring to give us a rain check for the talk that was cancelled on March 16th. We contacted Jim recently, and both he and his co-author, Cathie Pelletier, said they would come (virtually) this spring to talk to CCAS and the Cape area schools. This talk will be our "First Thursday" talk in March. We are currently working with the schools and Jim and Cathie on detailed logistics.

Also, Dr. Alyssa Goodman, whose recent work on the "Radcliffe Wave" discovery has been prominent in the news this year, has agreed to talk to CCAS this summer, hopefully live if meeting restrictions are lifted.

Next, Dr. Jim Head of Brown University, who recently gave a very well received talk on the Apollo Program and US lunar exploration, will give another talk in February on the Chinese lunar program. That program is currently very much in the news with the success of the Chang'e-5 mission, collected moon rocks, the first such effort in many a well, you get the idea.

As to January, I'm stealing the slot to talk (at a lay level) on January 7th about

the nature of space and time. There is a lot of work on this going on nowadays, closely linked with quantum gravity, cosmology and fundamental quantum mechanics. The peer reviewed literature on this is quite formidable, but luckily there are enough good popular science writers who are also experts in these areas that laymen can at least get a glimmer of what is going on. I'll try to muddle that far, and also provide some good references.

We are pursuing further speakers for next year, but that's our roster for now. If anyone has any further thoughts or leads, please let me know!

Webcam recording

One area where we could use additional help *soon* is in using our recently purchased webcams, and getting some videos going (for star parties, club advertising, etc.) David Donahue, Charlie Burke and I have already committed to working on this in the near future, but if you have any expertise in this area, we could also use your help! These videos would be good advertising for the club, good website material, and also a good way to start back towards in-person star parties. Again, just email me if you're interested.

“Backyard Astronomy” update

In last month's newsletter, I described three “mini-projects” you could do with rather basic equipment and promised to show some results in the coming newsletter, i.e. this one. Well, I'm going to have to ask you for a postponement, for two reasons. First, December was far more busy than I had anticipated, with both a technical society meeting and the holidays. And second, two out of the three projects turned out to have some “wrinkles,” which will take a little more time to address. (The telescopic attachment for the iPhone camera had a lousy focus at infinity, and the inexpensive light meter's sensitivity petered out for very faint light pollution and sky variations.) It will be fun to devise a Plan B to cure these shortcomings, and I will endeavor to do so this month! I prom....nah, I'll try!

In Memoriam

Through a quirk of fate (and overcrowded office conditions at WHOI's Village Campus), I had the privilege to share an office for a few years with Dr. Robert Frosch, who at the time was a WHOI Trustee and in a previous position was the 5th Chief Administrator of NASA, from 1977-1981. While at NASA, Bob was responsible for overseeing the continuation of the development effort on the Space Shuttle. Bob had a great interest in both ocean and space science, and we had some wonderful conversations about both (when not working, of course.) Bob passed away on New Years Eve, and his wit and sharp intellect will be greatly missed by the many of us from WHOI who got to know him well.

Last month's speaker

December 3, 2020

Dr. Frank Primini, Astrophysicist, HSCfA

Abstract: The Chandra Source Catalog (CSC) is the definitive catalog of X-ray sources detected by the Chandra X-ray Observatory. Version 2.0 (CSC2) is the second major release of the catalog, and represents a significant improvement with respect to version 1.1 in terms of sky coverage, sensitivity and capabilities. CSC2 includes measured properties for 317,167 unique compact and extended X-ray sources in the sky, allowing statistical analysis of large samples, as well as individual source studies. In this talk I'll describe some of the tabular data and data products available in CSC2 and demonstrate some of the ways users can access it.

Precis: To quote Frank's introduction, his purpose was "to describe some of the content of the Chandra Source Catalog and how you can access it. By Chandra, I mean the Chandra X-Ray Observatory, operated by the Chandra X-Ray Center at the Harvard-Smithsonian Center for Astrophysics in Cambridge."

As in his two past talks, Frank started out showing a bit of the history of astronomy catalogs, dating back to Ptolemy's Almagest. (Astronomy is lucky to have perhaps the longest history of all the physical sciences.) After a quick look at the tabular data in the Messier and Draper catalogs, he quickly came to x-ray

observations from the Einstein Observatory satellite that was Chandra's predecessor. The catalog for this mission was perhaps the prototype for modern catalogs, showing both images and tabular data as "data products." Modern catalogs have even more detailed content, which includes both the tabular data, but also "science ready data products," including images and event lists, spectral data, and light curves. A modern data catalog is a far cry from the tables of old, though the motivation to enable research is the same.

Links to many (typical) mission data catalogs were next discussed, and as with the Gaia data that Tony Stark discussed, the riches that are publicly available on the internet are just amazing. Right after that, Frank turned to the Chandra data.

The main Chandra website can be found at:

https://www.nasa.gov/mission_pages/chandra/main/index.html. The Chandra Source Catalog that Frank discussed is at: <https://cxc.cfa.harvard.edu/csc/>.

Frank then discussed some of the details of the Chandra catalog(s). The original CSC1 catalog boasted 106586 sources, with 5101 observations publicly available by the end of 2009. The newer CSC2 catalog has 317167 sources, including 1299 highly extended sources, 10382 observations publicly available by the end of 2014, and a full re-analysis of all data including CSC1.

A quick look at the Chandra telescope came next. X-ray telescopes are quite different in appearance from the refractors or reflectors that standard optical frequency observations use. Rather, they employ a series of grazing incidence mirrors that are close to parallel to the direction of the incident x-rays. (Think of a mirror being on the side of the telescope tube, and angled very gently towards the focus.) A good picture and description of this can be found on the website: https://imagine.gsfc.nasa.gov/observatories/technology/xray_telescopes1.html.

After this brief orientation to Chandra, Frank then dove into the meat of the lecture – the data itself, and how it is processed and quality controlled. Before the talk, Frank mentioned to me that "parts of the talk might be a bit dry for some people." I suspect he meant this part, but if that's the case, let me misquote Tom Hanks in "A League of Their Own" and say "It's the dry that makes it great!"

The data from Chandra, and other such satellite astronomy missions, is extremely valuable and hard to obtain overall. Given the value, uniqueness, and

richness of such data sets, it is entirely fitting that large teams of scientists (like the Chandra team listed on Frank's initial slide) work on it and put it in best form. The remainder of Frank's talk showed just how much painstaking analysis effort went into that, and what some of the end results were.

The prime example Frank used was the Milky Way's galactic center region, which includes SgrA* (the MW's central black hole.) In that region is a "typical" point source with the dazzling name of 2CXO J174607.5-285951. Given the large amount of data taken in that region, this was a good object to use as an example.

Given a "point source", its position and position uncertainty are the first things you would think to look at, and Frank did so, in loving detail. The same was done for aperture photometry, significance, spectral properties, and variability, all things which a user of the data would like/need to know. This is the part Frank thought was a bit dry, but for those of us who have collected and used data (which fits the description of many CCAS members), this was just masterful stewardship of an invaluable resource. I, for one, wanted to get up and cheer.

Frank ended the talk with a real-time look through the data base, and an exhortation to the audience (including you) to look through it and try it. It is a wonderful resource, and the Chandra website and database have some fascinating looks for those who are willing to invest an hour or two browsing through them. I find multispectral images the most fascinating, but I'll let you decide for yourself.

As a postscript, Frank has graciously agreed to allow his talk PowerPoint to be distributed to whoever might want to see it. I didn't distribute it to the entire list, as it is a large file (and I've had a complaint or two about sending such), but if you'd like it, please just email me at jlynch@whoi.edu and I will send it to you.