

First Light Lite

Nov 1, 2024

Jim Lynch – Editor

Message from the CCAS President

My message here is short – things were more active in October, and as it is easier to break this down by topic, let me do just that. Here goes!

Communications

I started last month's newsletter with an apology – let me update that with a progress report. Our communications difficulties have been partially resolved, and we're hoping to fully resolve them this month. The mailing list is still a bit problematic, but at least we know the problem areas now and hopefully can fix them. We have a list of names of people who are having difficulty receiving our newsletter, and we'll get to them individually if our master list still has problems. We'll also get back to people with various requests.

Speakers and Hybrid Meetings

Our hybrid meeting format has been working out reasonably well, allowing us both an in-person dinner and meeting and also a remote Zoom link for those who can't attend the live event. The upcoming meetings will all be this format, whether the speaker is live or not. So, a bit of progress!

Star Parties

We will be scheduling the November star party for the week of Nov 4-8. If our best night is the 7th, when we have our First Thursday lecture, we can have the star party right after the talk.

Small smart telescopes

CCAS recently purchased both Unistellar and Seestar small, smart telescopes which are very easy to set up and also provide real time stacked images. They both work with iphones and tablets and can also provide images to a bigger screen. They are excellent for wide-field sky viewing and imaging. I have some pictures to show from these, and more coming. For people interested in imaging, these could provide some a simple beginning tool.

We also plan to devote some time to educating our members how to use these new systems. Frank Isik has written up an instruction set for the Unistellar scope and Marinna Martini has done the same for the Seestar, so we plan to devote some time, either during a star party or separately, to having a tutorial session for our members.

Comet and Aurora News

A comet named [C/2023 A3](#) Tsuchinshan–ATLAS passed through in early October while making an 80,000-year orbit around the sun. It was not hard to spot in the western sky and as we saw, binoculars enhanced it, and a small telescope worked even better. Below is a picture of the comet as made by club member Hank Ricci.

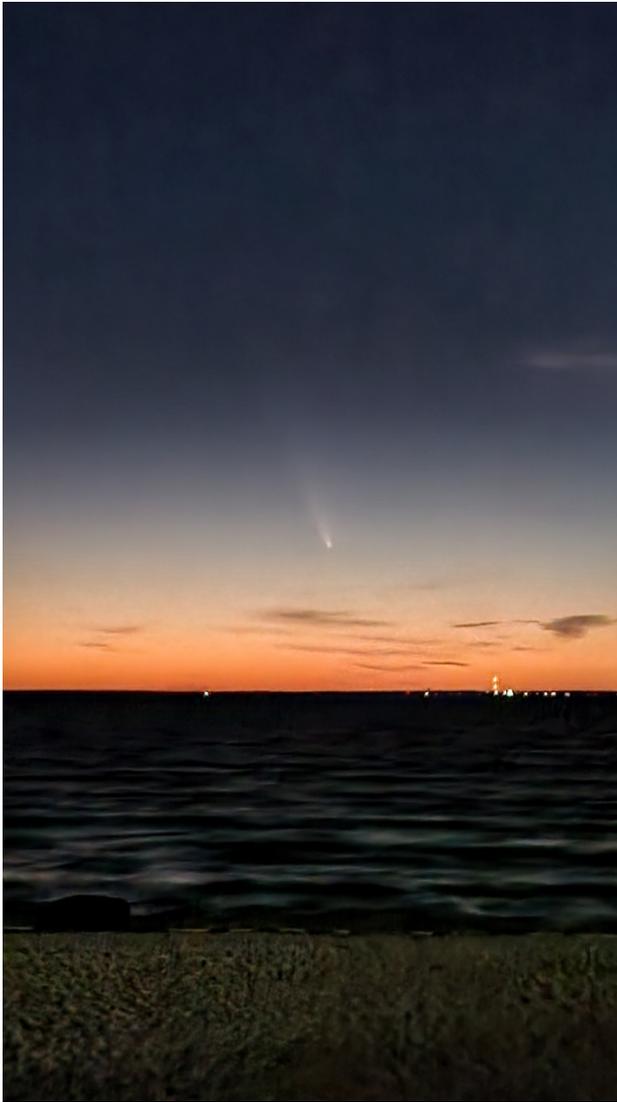


Fig.1. Comet C-2023 photo courtesy of Hank Ricci

Another astronomical treat during October was a strong aurora which was visible at low latitudes, including Cape Cod! Below is a picture I made with my cell phone from our neighbor's yard. The reddish color is from charged particles colliding with oxygen atoms high in the Earth's atmosphere.



Fig. 2. Aurora over Falmouth. Courtesy Jim Lynch.

Small Telescope News

Regarding the new smart telescopes used at the last WSO star party, they put on an impressive display in cutting through relatively poor conditions, and so the CCAF Board appropriated funds to purchase both a Seestar telescope and a Unistellar telescope. They were ordered and arrived quickly. Frank Isik has set up the Unistellar telescope, along with instructions for use, and it now resides at

WSO. Marinna Martini is setting up the newly purchased Seestar and writing up a user's manual for it. It will be used in the Falmouth area. Brian Twohig has also generously donated an additional Seestar telescope to the club, which will reside at WSO. As these scopes are very accommodating, and also can provide very nice displays for the public, I hope our club members will take the time to learn to use them. Perhaps we will set aside a special time to teach people these scopes, as they seem to be the "latest generation" amateur astronomy instruments!

Below is a very nice example of how well the Seestar (less expensive) scopes can work, courtesy of CCAS member Allan Collette. This is the Veil Nebula in Cygnus, an ancient supernova remnant. It is a big, wide object, but perfect for this small scope.



Fig. 3 Veil Nebula in Cygnus. Courtesy Alan Collette.

Main Dome Scope News

Thanks to Charlie Burke and Gary Walker, our main scope is working again. While doing the troubleshooting, Gary and Charlie are also making a detailed “operator’s manual” so that other club members can also learn to operate the scope (which is not totally a trivial chore.) When done with this, interested members are invited to “give it a go” using the manual. The more people who can use the scope the better. (That goes for all of our scopes...)

We already have had one session where Charlie and Gary helped a few members who could attend use the main scope and dome. CCAS member Brian Twohig is shown below doing a daylight “test drive” on October 16th. WSO Observatory Director Charlie Burke is standing behind him.

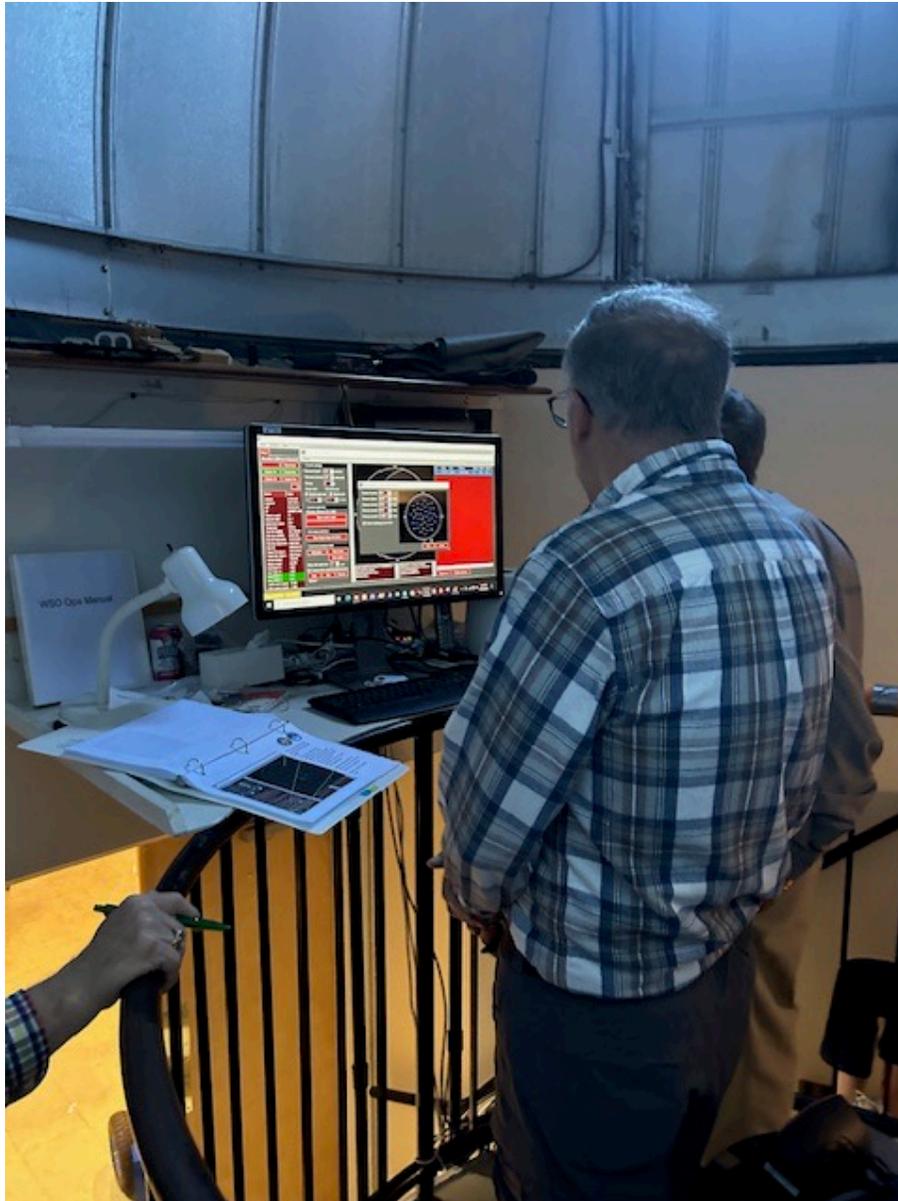


Fig. 4. Dome and scope training session.

Some Additional Astrophotography

While we'd like to do more in the area of astrophotography as a club, many of our members are good photographers individually, as can be seen on our website. Here is an example of the hard-to-capture nebulosity around the Pleiades, which binoculars or optical eyepiece views don't see easily.



Fig 5. Nebulosity around the Pleiades. Courtesy Frank Isik, using 9.25" Celestron scope.

Initiatives and Committees

We have devoted some time (yet again) on committee structure, and currently are looking at the following committees: Outreach, Website, History, By-Laws, Speakers, Advertising and Publicity, Membership, and Member Technical Activities (Projects). We could particularly use help with: By-Laws, Advertising and Publicity, and Membership. These committees should not be overly strenuous as to workload, and hopefully you might be interested in engaging in one if you have not done so already!

Outreach

This last month only had one outreach event, with the Yarmouth Library on October 30th. We drew a small but good crowd and gave our usual talk about amateur astronomy. Brian Twohig and Alan Collette brought their Seestar scopes, which were the stars of the show. Unfortunately, the real stars were hidden (after a sunny day) for the star party scheduled right after the talk, not an unusual outcome on the Cape. But overall, the event was interesting for the participants, which is our main goal when we do such outreach.

Speakers

Last month's speaker. October 3rd: Kevin Hainline, Arizona University

Topic: Distant galaxies (see note below from Kevin)

While my research topic is ostensibly black holes, in the last few years I've been heavily involved in looking for ultra distant galaxies, and we made a big splash by finding the current record-holder:

<https://www.forbes.com/sites/jamiecartereurope/2024/05/31/profound-moment-as-webb-sees-most-distant-galaxy-close-to-big-bang/>

<https://news.arizona.edu/news/webb-telescope-spots-two-most-distant-galaxies-ever-seen-cosmic-dawn>

I'll likely be discussing this at the lecture!

Precis: Astronomers and astrophysicists love the history of their subject, and Dr. Kevin Heinlein is no exception. In his talk about observing the most distant galaxies with the James Webb Space Telescope (JWST), he used that deep and rich history to show how the distance we can see into space kept increasing throughout history with better technology being employed by ingenious practitioners.

The advanced study of galaxies really started with William and Caroline Herschel, who used their (at the time) large telescope facilities to catalogue galaxies in both the North and South hemispheres. One of their most famous results is the New General Catalogue (NGC), which is well known to all amateur astronomers. (William was also a musician who produced some great classical music.)

Fast forward a century or so to the famous Harvard women astronomers who Harvard Observatory director William Pickering gathered as “cost efficient labor.” Apart from being inexpensive to hire, these women were brilliant, and three of them in particular (Annie Jump Cannon, Henrietta Swan Leavitt, and Cecilia Payne Gaposchkin) would be considered for Nobel prizes if they lived today. Of particular interest here is Henrietta Swan Leavitt, who discovered the period-luminosity law for Cepheid variables, which would be the keystone for initially finding the distances to galaxies.

Another key piece of information that would be needed to study galaxies – their radial velocities - could be inferred by the Doppler shifts of their spectral lines. From 1912 on, Vesto Slipher of Lowell Observatory began a serious study of

these radial velocities, a fact well known to astronomers, but which sadly gets overshadowed by the work of his (decade later) successor, Edwin Hubble.

Hubble too was interested in galaxies and also had at his disposal the most powerful telescope at the time, the 100" reflector at Mount Wilson. Hubble was troubled by not knowing the distances to galaxies, but also realized that the period-luminosity law that Leavitt had discovered could provide that information if he saw one of the bright Cepheid variables in a galaxy. He found just that in the Andromeda Galaxy (M31), and so became the first person to show that many of the "Nebulae" that astronomers had observed were in fact distant galaxies far outside the Milky Way. Having both the distances and the radial velocities then allowed him to look at the relation between them, which was the straight line which we now call the Hubble Law, $v=Hr$. Getting distances to galaxies was off to the races. The "cosmic distance ladder" (see the Wikipedia article on this!) had its first rung.

It would be really hard to talk about cosmology in the 1920's without including Albert Einstein, but in Kevin's talk, Einstein was just "this guy standing next to Georges Lemaitre," the Belgian scientist/priest who first characterized the Big Bang in detail by tracking Hubble expansion backwards. The game for astronomers would become (and still is) how close to the Big Bang in time, and thus far in distance, can we see galaxies?

As telescopes and spectroscopy got better over the years, the distances to more and more galaxies grew, but were confined to low redshifts (a distance equivalent) of less than 1. A new "standard candle" was needed. Enter Maarten Schmidt in the 1960's.

Maarten Schmidt is credited as the discoverer of quasi-stellar objects (quasars) which were mysterious, very bright distant objects with a puzzling spectrum. Schmidt figured out that the unusual spectrum was in fact due to the highly redshifted spectrum of hydrogen. The redshift of 1.5 made these the most distant objects yet seen, billions of light years away. We now know that they are active galactic nuclei (AGN's), supermassive black holes in the centers of galaxies which are accreting infalling mass. Given that AGN's are not overly rare, a farther new distance marker had been found.

To get further galaxies, or equivalently to higher redshifts, another technique is needed, and a very useful one is using type Ia supernovae as a standard candle. These supernovae, which are due to the runaway explosion of a carbon-oxygen white dwarf star, are visible at huge distances and have highly reproducible signatures.

Both the quasar and supernova techniques rely on a similar thing – a very bright object embedded in the galaxy of interest. While these are great if present, one can't rely on them being there. If one has a faint galaxy which doesn't have these, another technique called the “Lyman break technique” can be used, which only depends on one getting a spectrum of the galaxy. This technique depends on the sharp break (drop) in the spectrum of galaxies at 912 angstroms while allowing longer wavelengths to go through, this being due to interstellar absorption. As the light from a distant galaxy travels to us, the expansion of the universe redshifts the break to longer wavelengths, which is measurable if one has filtered the spectrum. This technique was the one that Kevin exploited with the JWST.

Kevin's personal sifting of the JWST image data to find likely “high z” candidates showed that an experienced human scientist is still a vital ingredient in doing such research, though perhaps if the volume “candidate galaxies” for spectral analysis becomes high enough, a more machine-oriented process may be developed. (Of course, once a candidate is picked from visual images, training the JWST on it to take spectra takes additional time and effort.)

The curve of “highest z galaxy vs. calendar year that Kevin showed was particularly interesting, in that it looked very much like an exponential growth curve. Given the amount of resources and equipment power versus time, this is perhaps not surprising, but it is still striking. It should be noted that this curve will only go up to 1100, and not infinity, as that is where the cosmic microwave background begins. Past there is optically opaque.

As a closing note, Kevin invited people to “zoom in to” distant galaxies using the software that is available on his website, which can be found at

[https://
kevinhainline.github.io/](https://kevinhainline.github.io/)

I would encourage you to take a look!

November 7th Speaker: Jim Lynch, WHOI/CCAS

Topic: A digital Higgs universe and the flow of time

Abstract: As many CCAS members know, I've been working over the past two years on some "just for fun" cosmology theory to present to our club as one of our First Thursday talks. The topic I looked at is: "What happens if you try to go faster than light?" In pursuing this, some very interesting results about the nature of space, time, and the evolution of our universe were produced. These results seem consistent and perhaps constitute a serious new look at cosmology. Maybe we live in a universe where the Higgs field produces more than just a very famous boson?!

December 5th Speaker: Dr. Mario Motta, Title TBA

<https://www.mariomottamd.com/>

CV: Mario is well known as an astronomer. Working with the American Association of Variable Star Observers, Harvard–Smithsonian Center for Astrophysics, and MIT, he has numerous observations and publications. In 2013, the International Astronomical Union named an asteroid in his honor. (asteroid *133537mariomotta*) In the astronomical community, Dr. Motta is well known for his large and completely homemade telescope and observatory including the optics, a 32-inch f6 telescope.

Directions to Dennis Yarmouth HS and Werner 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.

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.