First Light Lite

September 1, 2024

Jim Lynch – Editor

Message from the CCAS President

August actually worked out pretty well as far as having some normal activities going on. We had a great in person speaker with Tony Stark from the Harvard Smithsonian Center for Astrophysics, and even had our traditional H&K dinner beforehand. We had a "Five Star" star party on August 14th which, despite some horrific viewing conditions, turned out quite well. We got to make contact with the Falmouth High School Physics and Astronomy teacher, Mr. Andrew Cozzens, and discussed possible programs for the spring semester. And we learned a lot more about some of the newest smart telescopes and are planning to obtain one or two. So, definite forward motion!

Regarding the new smart telescopes used at the last star party, they put on an impressive display in cutting through the smoky haze that turned a bright day into a rather murky evening. Five bright stars were visible (the Summer Triangle, Arcturus, and occasionally Albireo) and the Moon, and not much else. But when pointed (automatically after using the bright stars for positioning), the Unistellar and Seestar scopes used image stacking to cut through the visual haze and create images of the Ring Nebula, M13, the Pinwheel Galaxy, and the Whirlpool Galaxy. These visually invisible objects appeared over a few minutes over both cellphones and iPads and also in an electronic eyepiece (for the Unistellar). Both club members and the general public attending were amazed at how well these small scopes dug these images out of the noise. As most of us know, stacking averages out noise, but adds signal, so scientifically, it seems straightforward. But seeing it work in digging objects out of an almost opaque sky was visceral. Magic, almost!

Hybrid meetings (Zoom plus live at DYHS)

One of the things that came out of our recent monthly CCAS officers/CCAF board meetings was the agreement that we should have our monthly talks be in a "hybrid" format, i.e. both live from DYHS and with Zoom, whether the speaker is remote or not. That would allow us to have our H&K club dinner beforehand and enjoy some real face-to-face socialization, and not just the (great) talks. The Zoom link will still make the talks available to those who can't come to DYHS that day. This is the format we will use for our remote speaker in September, Dr. Antonio Hales. We can also consider meetings at other places (e.g. the Falmouth Public

Library, where we've previously held meetings), though these will need to be booked in advance and will need an internet connection.

Upcoming Events (Club and Astronomical)

We again have a lot of upcoming activities planned for outreach, talks and star parties! *We will need some volunteers for these.* Please contact Jim Lynch at jlynchwhoi@gmail.com if you are available to help.

To begin with, we have our First Thursday Speaker, Dr. Antonio Hales on September 5th. Please consider coming to DYHS for this talk if you can! Next, we have a star party/lecture event set up with the Cape Cod National Seashore folks on September 6th (and rain date September 7th.) We still need some more volunteers for this! Next, there is a star party week, which we have shifted from the window of September 23 to September 27th to October 1st to October 5th. This is a bit later than usual, but it takes full advantage of the New Moon and also gives us a bit bigger window to work on recalibrating our main dome's Planewave scope. Finally, we have an event for the Waquoit Bay National Estuarine Research Reserve on September 30th , the day before our WSO star party window. This should be an active period, and again we need some club members to help host these events!

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!

Dues

This year, as we have resumed normal activities, we are requesting dues at a flat rate of $15 per family (or individual, if there is no family to consider. Dues are waived for any students.) Dues were due July 1st. If you have sent our treasurer (Dr. Ken Brink) dues in the last year (during 2024), 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. Thank you in advance!

Speakers

Last Month's Speaker - August 1st – Dr. Tony Stark, Senior Astronomer, Harvard &Smithsonian Center for Astrophysics

CV: Antony Stark is a pioneer of Antarctic Astronomy and is a founder and designer of the South Pole Telelescope (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.

Title: "The LSST Survey and You"

Abstract: The Large Synoptic Survey at the Vera Rubin Observatory is starting up and will operate for the next decade. It will survey the Southern Sky in six visual-wavelength bands with an 8 meter primary mirror, covering a large fraction of the sky repeatedly with billions of CCD pixels, in order to detected time-variable sources and build up a long exposure of deep sky objects over the years. It will be producing data as if from a fire hose, data that will be immediately available to the public, and that includes you!

Precis: Again, we thank Tony Stark for taking a few hours out of his summer vacation time to give a talk to our club about the latest goings-on in astronomy. This time, Tony talked about the whole-sky surveys being made (and soon to be made), which will generate unique (and huge) data sets.

His first slide set the tone of his talk: "In the past century, we have gone from barely being able to photograph a galaxy in blue light, to near quantum-limited detection in 0.1 arcsecond pixels in wavelengths from radio to X-ray. This is

mostly due to the revolution in electronics. In the past few decades, we have gone from images of individual objects to comprehensive surveys of the entire sky, down to background (from space!) with a resolution of 0.1 arcseconds.
This is mostly due to the revolution in robots and rockets. In the next few years, we will have made comprehensive surveys of the entire sky with 0.1 arcsecond resolution at a wide variety of wavelengths freely available to anyone on the internet (and that includes you). This is mostly due to the revolution in computers and the internet." As you can see, our most advanced technologies have quickly been adapted by the astronomy community, and with spectacular results.

A fuzzy picture of the Andromeda Galaxy made by Edwin Hubble a century ago compared with the output of a small, simple amateur scope brought this progress across quite nicely and dramatically.

Tony's next point was that data from professional instruments is now being quickly and widely distributed to the public via the internet, and that even amateur astronomers now have access to mind bogglingly large data sets. Moreover, the profession of astronomy has changed from when people like Edwin Hubble had to sit in a cold, high telescope perch to get data that only a select few could access to nowadays where astronomers don't even need to leave their homes to collect the data and use the computers needed for research. This point was also made by previous CCAS speaker Emily Levesque in her lively book "The Last Stargazers" (which I highly recommend!)

Tony next discussed what 0.1 arcsecond resolution buys you. First off, if you look at the entire sky, it buys you 53 trillion pixels, a very respectable amount – but also one that is approachable with the computer storage available to the average user nowadays! (Processing 53 trillion data points is a different story – selectivity then comes in.) This 53 trillion data points at 0.1 arcsecond allows you to resolve all the stars in the Milky Way (given we get the data). It also allows you to resolve everything in the "high redshift (distant) universe" given a peculiarity in how the expansion of the universe affects the angular diameter of objects we can see.

Which brings us to the Vera Rubin telescope which will begin making synoptic sky surveys soon, perhaps even as soon as late 2024. The next segment of Tony's talk discussed the particulars of this amazing new facility, its construction and the data it will produce. The 20 TBytes/night it will produce will be immediately and publicly accessible, along with some processing software! So, amateurs, you are in business!

However, when you look at the science questions that Tony outlined as the Rubin telescope's agenda, you might also realize that these will take a "wee bit of background" to understand, much less tackle starting with raw data streams! Having a knowledgeable advisor is necessity, unless you already have some serious background in astronomy and cosmology!

This last point was brought home, at least to me, by the next part of Tony's talk which was about "wide separation (gravitationally) lensed quasars." Gravitational lensing, which results in the Einstein arcs and rings commonly seen in images from Hubble and the JWST, is in fact a common phenomenon, and sky surveys show tons of this effect in the data. Which means that you have to be carefully selective in going through such data sets if you want to see, e.g. lensed quasars as opposed to some penny a pound galaxy or something common like that (LOL). Tony did this, and then he and a colleague from the University of Chicago had some students sift through the winnowed data. And in a number of cases, these students found their prey in the data, and with expert guidance were able to publish professional, peer-reviewed papers on their results. This is a spectacular use of large data sets by neophyte astronomers! But where I might disagree with Tony is that these students are not exactly amateurs, and they are getting *very* high level guidance!

High redshift (very distant) galaxies and early universe galaxy clusters are also in the "exotica" category, and Tony showed some lensing results on these as well, again with some very good student papers resulting.

To conclude, Tony showed that a lot of data will be available, and also some of the things that can be done with it (almost as a teaser, given the amazing data sets.) But using these data sets is not for the faint of heart, and it seems pretty obvious that to make a real contribution with them, some good guidance is needed!

September 5th Speaker: Dr. Antonio Hales, National Radio Astronomy Observatory

Title: ALMA Studies of Eruptive Stars

CV: Antonio Hales is a scientist and the Deputy Manager of the North American ALMA Regional Center at the National Radio Astronomy Observatory (NRAO). He works in astrophysics, education, outreach, and the art-science relationship. Hales is also the lead of the Telescope Interface Group and his

research interests include the formation and evolution of planetary systems, protoplanetary and debris disks, and episodic accretion in young stars.

Abstract: Stars are now believed to acquire a significant fraction of their mass in short episodes of accretion outbursts. This episodic accretion picture has replaced the traditional steady-state accretion model. It is changing our understanding of how stars gain their mass (and the origin of the IMF), binary formation, planet formation, the luminosity spread in young clusters, disk chemistry, and snowline migration. Despite its relevance to the field, the physical mechanisms responsible for episodic accretion still need to be better understood. In this talk, I will present recent observational and modeling advancements aimed at constraining the physical properties of outbursting sources to help understand what drives this critical phase of star formation.

October 3rd Speaker: 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!

November 7th Speaker: Jim Lynch, WHOI/CCAS

Topic: A 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?!

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.