

First Light Lite

March Forth, 2024 😊

Jim Lynch – Editor

Message from the CCAS President

February, like January, was a slow month in some ways, but active in others. We *did* have an excellent speaker for our February First Thursday talk, after our Post-Holiday Season January lull. But we again didn't have our scheduled star party, this time for a different weather-related reason. Early in the week, we had a dumping of wet snow which, thanks to cold temperatures continuing, stayed on the ground and froze the rest of the week. With such a condition on the DYHS grounds, we couldn't invite people to park or walk around safely. So, despite some clear, cold nights, we cancelled the rest of the week. Disappointing, but safety must always come first.

But we again did have a very good planning session at our monthly CCAS meeting and so have further good items to discuss. And we have a star party lined up for March, which has some great galaxy viewing, so let's proceed to those items!

Star parties

We are scheduling our usual monthly star party for the week of the 11th to the 16th of March. Let's (yet again) hope for better weather conditions! As an added attraction, we are still hoping to preview a new, easy to use telescope. At the January CCAS meeting, George Silvis showed us what the new ZWO Seestar smart telescope could do, which is impressive! He has committed to bringing this scope along to a star party and I think people will be wowed with both its user friendliness and its imaging capabilities. This might be a good scope for us to recommend to beginners (and even some non-beginners.)

Speakers

Last month we had Dr. Sarah Wellons from Wesleyan University as our First Thursday speaker, via Zoom. She gave a great talk on galaxy formation and black holes. This month (March) we have Dr. Maria Kazachenko from the University of Colorado Boulder and the National Solar Observatory speaking about "Living in the Golden Age of Solar Physics." A fitting topic given the coming solar eclipse!

See below for details about both talks. We still need to get speakers for April and beyond, and Charlie Burke, Jim Lynch and Jim Head are working on it. Any suggestions welcome!

School interactions

Our biggest interaction with DYHS will be the day of the (partial on Cape Cod) solar eclipse, and we will have a “Sun Party” for the students from 2-4 PM. Unfortunately, this event occurs on a school day, and the students are still around doing after school activities. So, we will limit attendance to a small number of CCAS club members and school faculty and students. We hope people can get the (rather inexpensive) solar filter glasses needed to look at the eclipse, but unfortunately we must restrict the WSO event.

We had also been assisting Mrs. Garcia’s students at DYHS with poster projects and book reports, and Jim Lynch will be talking to Mrs. Garcia about possibly highlighting the students’ work in our newsletter and at a meeting. We also have mentored one science fair project at Falmouth Academy and are happy to report that the student placed first in the local competition. We feel good about having our student programs active again!

Outreach

We have events scheduled with the Chatham Bars Inn, Sandwich Middle School, and the Chatham Library this month and have a number of other plans for the upcoming months. If you would like to help us staff these events, please let us know via email.

Workshop on using WSO dome and main telescope.

On January 4th, Charlie Burke put together a very successful and well attended workshop on how to access WSO and use the main dome telescope. He then put together a set of instructions which was edited by a few members and distributed to our members and friends list. A follow up to this workshop on how to use the main scope for astrophotography and how to process those images is still being planned. Stay tuned for details!

Adopt a scope, learn it, document it.

Charlie Burke’s idea to have individual members “adopt” a specific scope from the WSO inventory, and then learn its nuances and document them to make them

generally useful, has taken off nicely. To date, members have adopted the C8, LX-200, Lunt Solar, 6" Meade, and 8" Dobsonian scopes. We are also compiling a list of qualified users of these small scopes (not just the above) so that we can staff our events adequately and not overuse a small number of people. Anyone interested in further developing this initiative should contact Charlie Burke.

Division of labor for scopes and star parties, docent material

As mentioned last month, we'd like to get more members trained in using not just the large scope, but also the Dobsonians, Go-To Scopes, and Binoculars. This is not only for the enjoyment of our members, but also to have enough people who can use these instruments at our monthly star parties. Users of each type of equipment should also learn what some popular sky targets are for them during each season. Towards this latter goal, Brian Twohig is putting together some "docent notes" which he will distribute when he has finished them.

Technical Projects for the club/schools

As also mentioned last month, many of our club members are looking for astronomy-related technical projects which can be done either individually or as a team. Some of the possibilities mentioned to date have been: 1) a radio telescope project, 2) displaying the spectral classes of stars using RSPEC, 3) measuring the full set of lunar orbital parameters, 4) a photo gallery of deep sky objects using the main telescope, and 5) an analemma. Also, we've been informally chatting about doing such longer term projects in league with the DYHS students. As always, any further ideas are welcome!

Contributed Newsletter Articles

As we have become more active post-Covid with in-person activities, there are more things to relate that would be of interest to each other. If people would like to submit brief (1-2 paragraph) articles for the newsletter about such activities or events, the newsletter editor would be more than happy to include them. This would be subject to editing, and pictures of people are discouraged, as permission rules have become rather strict of late.

Main Scope Automation Project

The main dome telescope automation project is well into its initial planning stages, money is available, and a possible suite of equipment has already been identified. However, the complication of the system is making us think hard and look before we leap, and we are still looking at alternate solutions. This is an ongoing, longer-term project.

Dues

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. Also, dues are waived for any students.) 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 club observing events, those might be restricted to those who are dues paying members. Also, we plan to make our surplus and donated equipment available to members at a reduced rate. 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. Sarah Wellons, Wesleyan University

Topic: "Simulating the growth of galaxies and supermassive black holes."

Abstract: In this talk, I will summarize what we know about the physical processes that govern how galaxies form and evolve, from the collapse of their dark matter halos on large scales to the energetic processes like supernovae and feedback from accreting supermassive black holes which regulate star formation. I will describe why and how we use numerical simulations to test our understanding of this physics and will give a few highlights from some of my work on massive high-redshift galaxies showing what we can learn from such simulations.

Bio: Sarah Wellons is an Assistant Professor of Astronomy at Wesleyan University. She earned her PhD from Harvard University in 2017 for her work studying the formation and evolution of unusual high-redshift galaxy populations

in the Illustris cosmological simulation of galaxy formation. Since then, she has continued studying the physics of massive galaxies using zoom-in simulation techniques and is currently focused on how galaxies interact with the supermassive black holes they harbor at their centers.

Precis: Dr. Wellons' talk started off with some Hubble Ultra Deep Field pictures showing both blue (generally young, bluish star forming) and reddish (older with reddish stars) galaxies in the Hubble field, pictures that many of us are familiar with. She then stepped right into how you might quantify such galaxies via the so-called "stellar mass function" which tells you what the probability of finding a galaxy of a particular mass is. This function shows two distinct curves in it, corresponding to the red and blue galaxies. But both types of galaxies seem to fall off in number past 10^{10} to 10^{11} stars. Why?

Stellar mass seems to correlate/scale with a number of galaxy properties, including size, number density, and star formation rate, and moreover these scalings change with cosmic time. Of particular interest is the time of the early universe ($z \sim 2$) where one sees a "youngish" (by cosmic time) red, already quenched galaxy almost an order of magnitude smaller than the Milky Way, but with ten times the mass! Certainly anomalous, but how do we find out why? The gravitationally lensed images from the James Webb Space Telescope (JWST) show a nice stretching of the lensed galaxies that can actually provide better separation "side to side" of a galaxy and allow some better spectroscopic analysis (e.g. Doppler to get the rotation curve). Having such rotation curves, one can ask what produces them for these early galaxies? At this point, appealing to computer models becomes a productive way of searching for an answer.

A usual starting point for early universe models is the "background model" of the cosmology (i.e. the expanding universe), and from there one adds huge gobs of more detailed physics including (but not limited to): gravity, star formation, stellar winds, supermassive black holes, galaxy "cannibalism", supernovae, hydrodynamics, radiative cooling, and...well, you get the picture. Lots of processes and moreover on lots of scales from large to small. For those familiar with computer modeling (like many of our oceanographer members), the huge expanse of process scales is a well-known difficulty, in that it seemingly requires time and space grid scales spanning many orders of magnitude. Clever ways of incorporating the smaller "sub-grid" scales for large scale models need to be devised, as the small scales do indeed affect the larger scales. To make a long story short, such work has been done and is still being done. So, such models exist. Dr.

Wellons then showed her own work on modeling the massive compact galaxies that we mentioned previously, with some impressive agreement.

Next, Dr. Wellons turned to “zooming in” to some of the finer scale processes mentioned above. Doing this, we can home into an individual galaxy and look at the processes that form it. Supermassive black holes (SMBH’s) are of particular interest, as they are commonly found in the centers of galaxies and certainly should be part of a galaxy’s evolution. A clear correlation between the galaxy’s “velocity dispersion” (the speeds at which its elements are buzzing around) and its black hole mass points clearly to that co-evolution. At this point, Dr. Wellons showed the pieces of physics of that BH/galaxy evolution, and how one would model it. Again, a slide with a LOT of detailed processes on it! She then showed the computer pictures such models generate, and at least to our audience, they looked pretty convincing!

With the JWST now up and working beautifully, more data such as that we saw will be coming out soon, and the early universe will be providing us with much more to think about. From what we saw, it will be crazy interesting!

We thank Dr. Wellons for a very informative (and well-attended) lecture!

This month’s speaker: Dr. Maria Kazachenko, U. Colorado Boulder and NSO.

Title: “Living in the Golden Age of Solar Physics.”

Bio: Maria Kazachenko is an assistant professor at the University of Colorado and the National Solar Observatory. She leads the Solar Magnetism research group and uses models and cutting-edge telescopes on the ground and in space to understand how eruptions on the Sun work. Originally from Eastern Europe, she became curious about the Sun after her first total solar eclipse in Hungary in 1999. She then earned degrees at Montana State University, Bozeman and then joined UC Berkeley as a scientist. She has more than 40 refereed publications and has been honored by prestigious awards including NASA Heliophysics Early Career Award, Robert Bartnik Fellowship in Australia, National Science Foundation CAREER Award and Brinson Award. Prof. Kazachenko has been involved in the development of the Critical Science Plan for the Inoue Solar Telescope, the largest solar telescope in the world, built on Maui in 2022. Her work has been funded by the National Science Foundation, NASA and private Brinson Foundation. Prof. Kazachenko is also passionate about sharing the wonders of the Sun and space with the public. In October 2023 she led a group of scientists to do outreach

in schools of Uvalde, TX for the annular solar eclipse. During the 2024 total solar eclipse Prof. Kazachenko will be coming back to Texas to lead outreach in schools of Eagle Pass and Del Rio, TX in English, and Spanish. Her home page is at <http://solarmuri.ssl.berkeley.edu/~kazachenko/> and her email is maria.kazachenko@colorado.edu

Abstract: Space weather is largely caused by the activity of our Sun. Invisible yet powerful magnetic fields, created within the Sun, determine when and where the next solar eruption will happen. Large solar storms can put our technological society at risk. In this talk, CU Boulder and National Solar Observatory professor, Maria Kazachenko will discuss how advances in solar telescopes allow scientists to understand the Sun in a lot more detail than ever before.

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.