First Light Lite

November 3, 2025

Jim Lynch – Editor

Message from the CCAS President

Please excuse the absence of an October FLL issue. Between a medical procedure and a miserable cold, it was maybe not my best month to get any writing done! But the club was quite active in the meantime, and there is a lot to report.

Outreach

We had a variety of outreach events in October, all of them fairly successful.

On September 30th (well almost October), we hosted the students from two sections of Ms. Lederer's DYHS Earth Science class at the Werner Schmidt Observatory, giving them some telescopic views of the Sun and a tour. Thanks to Charlie, Violet, and Gary for their efforts in doing this.

Next was the Eastham 5th grade from the Nauset School District on October 21st. Alan Collette, Gerry Grenier, Tom Buono, and Peter Pilon visited the school and hosted a star party for the students which went well. According to their teacher, Ms. Kat Williams, "the kids had a wonderful time, and specifically enjoyed seeing shooting stars, Saturn and locating constellations." They came back to school full of enthusiasm for science, which is one of our outreach goals!

Our usual star party, held on October 24th, hosted a MASS STEM group from Cape Cod Community College. Unfortunately, the weather window that was supposed to appear that night showed up later that evening, so that the students had to be hosted indoors with a lecture by Hank Ricci and a tour of the dome by Charlie Burke and the other CCAS members present.

Earlier that day, we visited Mr. Adam Cutler and the DYHS Science Club, which is looking around for good projects for the science fair in March. Violet Zitola, Frank Isik, Charlie Burke and myself talked to Mr. Cutler and the students, and hopefully instilled some enthusiasm for astronomy projects (which are one option among many).

All in all, an active outreach month!

Upcoming Events and Requests

As of today, we have committed to a talk and star party at Joint Base Cape Cod for both base personnel and the general public on November 20th, with a November 21st rain date. However, due to the current government shutdown, that event is contingent on the ending of the shut down and the return of government activities to normal status. We'll try to keep members of CCAS informed.

Girl Scout troop 84516 has also asked us for a star party date, which we will arrange soon.

We also have requests for talks on astronomy from the Centerville, Whelan, and Orleans libraries, and are working to arrange solid date for these.

Also, we will be keeping touch with the DYHS Science Club, which meets every two weeks.

Our monthly star party at WSO is scheduled for the week of November 17th to November 21st, depending on weather conditions as usual. (The week of the New Moon is popular for everyone, for obvious reasons!)

Some Other Events and Happenings of Interest

Look to the Skies! Taurid meteor Showers Nov 4-5 and a Full Moon on Nov 5.

Cape Cod Museum of Natural History in Brewster has an exhibit "Chasing the Light: Cape Cod" with works by photographer, Allie Richards. She explores the mysteries of the night sky, from the aurora borealis, the stars above, and the Milky Way to the Cape's magical light of sunrises and sunsets Visit the Naturescape Gallery from November 5 – December 21, (during Museum open hours).

Also, Ms. Richards will give a talk, "Photographing the Northern Lights," on Saturday, November 8th at 1pm. She explains how to learn the signs of a possible Aurora, such as when solar activity is high. She shares apps and other guides along with tips on producing quality photos. Tickets available at www.ccmnh.org.

Astrophotography card designs: Two sisters, Anabelle and Charlotte Hallahan, who love astronomy, learned to use their family telescope, then taught themselves astrophotography. Now, they've started a business called A&C Astrocards selling space-themed greeting cards--Christmas, thank you, birthday, and general--on Etsy. (Profits got towards saving for college.) For details, see acastrocards.etsy.com) or website (acastrocards.com)

Finally, Jim Head from our club sent a notice about launching your name around the Moon in 2026 on NASA's Artemis II mission. I've attached it with our newletter!

Initiatives and Committees

We have devoted some time (yet again) on committee structure and currently are looking at the following committees: Outreach and Speakers, Website, History, By-Laws, Advertising and Publicity, and Membership. We could particularly use help with: Website, 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!

Speakers

This Month's Speaker: YOU!

Topic: Small "smart telescopes" and CCAS Project Ideas

Date, Time, Place: Thursday November 6th, 7:30 PM, DYHS and Zoom

Returning to tradition, some months will be devoted to club activities, and this month is one of them let me discuss the two topics for discussion below.

a. Small smart telescopes (updated)

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 (below) from these and more have been produced. For people interested in imaging, these provide a simple but powerful beginning tool. The Seestar 50 price point, around $550, is also attractive.

We also plan to devote some time to training our members how to use these new systems, and that will be part of this month's DYHS meeting. A big thank you to Frank Isik who has written up an instruction set for the Unistellar scope and to Marinna Martini who has begun to do the same for the Seestar.

Below are very nice recent examples of how well the Seestar scopes can work, courtesy of CCAS members Allan Collette and Marinna Martini. Shown are M33 and the recent comet Lemmon. These are big, wide objects, but perfect for

this small scope. Moreover, time lapse photography of objects like planets, a comet, an asteroid, or the Moon (as examples) can be used to plot orbits and orbital parameters, a nice bit of celestial mechanics that even amateurs can approach! We should try!

Comet Lemmon, Courtesy of Marinna Martini

M33, courtesy of Allan Collette.

b. Main Dome Scope (repeated)

Thanks to Charlie Burke, Gary Walker, and Brian Twohig, our main scope is working again. While doing the troubleshooting, they 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…)

c. Additional Astrophotography (repeated)

While we'd like to do more in the area of astrophotography as a club, many of our members are very 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. This uses a bigger scope, which many of our members have and use for this purpose.

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

d. Project Ideas

As mentioned, we have discussed some "club project" ideas before, similar to the project ideas we have shared with the DYHS students. I will bring some

PowerPoint slides to share with those who attend the meeting on the sixth and will also ask some other members to do so as well. Again, many club members already do such projects individually, but part of the enjoyment of a club is sharing such activities with friends and colleagues with similar interests.

Last month's speaker: Dr. Wanying Kang, MIT

Date: October 2, 2025 Live and on Zoom

Title: Deciphering the icy satellites: from the ice shell geometry to the ocean dynamics

Bio: Wanying Kang is the Homer A. Burnell Career Development Pofessor and an Assitant Professor at the MIT Department of Earth and Planetary Sciences. Her primary research areas are the planets and climate. She investigates large scale atmospheric and oceanic dynamics and their effects on the climate of Earth and other planetary bodies.

Abstract: Icy moon oceans are prime targets in the search for extraterrestrial life, but their hidden dynamics are difficult to probe; instead, the overlying ice shells provide observable clues to the ocean below. Using Enceladus and Europa as examples, I will show how interactions between ice thickness variations and ocean circulation can explain their contrasting shell geometries and reveal how heat is partitioned between the ice and rocky interior.

Precis: Dr. Kang's formal title on the talk was: "Interaction between tides, baroclinic eddies and convection in icy moon oceans." If this sounds like detailed oceanographic tech-talk, it very much is! Dr. Kang is a planetary oceanographer, which is a specialty that has existed only in the past half-century or so. And while this necessitates knowing traditional oceanography as we've learned here on earth, it also needs the practitioner to know astronomy, astronomical instrumentation, geology and geophysics, chemistry, and a few other useful disciplines. So, looking at icy moon oceanography is not for the narrow minded!

Wanyang's first slide showed the richness of the area of "geophysical fluid dynamics" (i.e. including rotation effects) when considering planetary and planetary moon systems. She then showed how the 1997-2005 flybys by the Galileo satellite of Jupiter's moon Europa spotted a surface that had features and a magnetic field that was consistent with an ice covered, subsurface water ocean. The availability of water and the possibility of life are instant lures for extensive

further research, and the rest is an ongoing story! The next slide showed the larger planetary moons of our Solar System, and of those moons five (Europa, Ganymede, Callisto, Enceladus, and Titan) have ice and possibly sub-ice oceans.

In saying the Galileo satellite detected an ice covered ocean on Europa, the questions of why and how need to be answered.

First, why? Using remote sensing on a world which possibly could possess water and life makes sense in that it keeps that world free of human contamination. The discovery of life beyond Earth is a major scientific goal, but if the world is contaminated, such a discovery becomes much harder to prove. Also, remote sensing of planets from space, including our own, has become highly evolved field. (I have a "Methods of Satellite Oceanography" book from 1985. It was an evolved field by the late 1970s!) So, trying a landing initially is not the best course in many cases, though in-situ observation certainly has its own advantages.

Next, what can we see and how? Well, we all know that one picture is worth a thousand words, and a modern satellite can take quite a lot of pictures in quite a number of wavelengths over an entire planet's or moon's surface. When examined by experienced geologists and geophysicists, these pictures tell us a huge amount, and remote satellite exploration of the Solar System has incredibly successful just on the basis of pictures alone.

But what about the planet's/moon's interior? We can't see inside a planet, can we? The answer is that, with some cleverness, we can. The first technique Dr. Kang showed was a "gravitational redshift" based measurement of the planet's average (bulk) density. As many of us know, Earth communications satellites have to correct for time slowing down in a gravitational field, an effect known from Einstein's General Relativity. When the Galileo satellite cruised above Europa at a given height, a fixed source frequency signal sent back to Earth arrived at a lower frequency, which depends on the mass of the planet and the satellites height above it. Given we know the radius of the planet visually, dividing the mass inferred by the volume gives the density. And given we know how dense ice and rocks and metals are, we can get the ratio of them.

A second technique used to infer subsurface structure is to look at the elliptical deformity of the planet/moon caused by tides and rotation. A simple algebraic relation called the Darwin-Radau relation tells you the moment of inertia (i.e.resistance to rotation) of the body and whether the material inside is uniform or differentiated.

Another technique based on the fact that satellites typically revolve around the host planet in a slightly elliptical orbit due to resonant interactions with other satellites gives the tidal heating due to the deformation of the moon. This in turn can be used to infer whether or not an ocean exists.

The libration of the moon also can be used to infer the properties of the surface ice layer if it is treated as a solid body.

Yet another technique discussed to examine for subsurface oceans is magnetic surveying. A subsurface ocean's water will contain salt and move it around due to ocean currents. This creates electrical currents which in turn induce magnetic fields. These can penetrate into space and be measured by satellite. The magnetic fields measured in space are then translated into subsurface structure.

In making a model of the subsurface structure, some or all of these data can be used (in combination) in a general framework known as inverse theory. This theory can also incorporate physical models including dynamics, which give additional constraints on the possible answers.

After looking at these basic techniques, Dr. Kang then turned to the case of Saturn's moon Enceladus, which is also on the list of moons with oceans. This part of the lecture became a bit more in-depth (pun not intended!) and sounded very like what one would hear at one of Woods Hole Oceanographic's physical oceanography seminars.

There was a lot of advanced oceanography in this section, but some of the highlights can be discussed easily enough. As to measurements, ice thickness over the ocean can be gleaned from gravity and shape measurements. This in turn constrains heat transport. Non synchronized rotation of the moon provides ocean momentum transport. The heat transport determines ice topography whereas the momentum transport determines ice motions.

Another oceanographic question asked was whether the subsurface ocean would be stratified (i.e. show density layering) or convective. This evolved into a discussion of bottom heating, heat transport by turbulent features called baroclinic eddies, and how strong convection of these eddies needs to be to penetrate the stratification of the subsurface ocean. The bottom-line answer Dr. Kang presented was: 1) Can convective plumes penetrate the stratified layer? A: Probably not, and 2) How is heat redistributed in the ocean layer? A: Heat will be converged to regions with

thick ice. For those of you who are fans of the evening weather report, these analyses are quite similar to the study of inversions and weather systems.

All of the above are very detailed oceanographic questions, and perhaps the most amazing part of Dr. Kang's talk was that we could be asking such detailed questions of moons that we have never stepped foot on! What we have learned from our own oceans and the power of satellite remote sensing have put us in a position where we can ask such questions and expect to get reasonable answers.

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.