

First Light Lite

April, 2020 Edition

Jim Lynch – Editor

Message From CCAS President

Before saying anything else, let me begin with “be well and stay safe!” The Coronavirus-19 pandemic is one of those rare, nasty twists that nature throws our way, and we just have to deal with them. That isn’t easy for any of us, and I sincerely hope that we all come through OK.

As President of CCAS, I want to see what CCAS can do to help us all cope by giving us something interesting to do. Though we can’t do business as usual, like star parties at WSO, in-person lectures and meetings, and school projects, we *can* offer some pretty good substitutes for the duration of the pandemic that might help people enjoy some of the extra hours we find ourselves with.

Our main tools will be the website and a teleconferencing package that we are signing up for, called GoToMeeting. (This should be a familiar tool to many in business.) Both are easy to use, and in the case of the teleconferencing software, it allows people to interact via voice and computer displays. We wish that we could do things in person, but until that happy day arrives, we’ll make lemonade, as the old saw goes.

The website, whose older material has been updated over the last few weeks, has a target date of April 30th for final completion. When fully updated, it will have both its usual content (e.g. descriptions of the club and its facilities), and also some new content featuring astronomy related things that one can do, both indoors and in one’s yard. The outdoor activities that you can do by yourself will include: binocular and telescope viewing and photography, science projects with simple equipment (ala an initiative that we had hoped to start previously), and even spectroscopy (if you would want to invest a small amount for a diffraction grating attachment to your camera). The indoor activities will include: an updated list of interesting astronomy books, magazines and websites.

The meetings and lectures, which were cancelled for April (while we were all trying to figure out how things might play out during late March), will resume the first Thursday in May over our new GoToMeeting link. I will give the first talk about the DYHS student projects I mentored and will invite my fellow mentors this year to do the same, if they can. The students will all be invited to join in, which might even be easier for them than coming to a physical meeting! At any rate, they deserve their usual yearly spotlight, and using this means, we can give it to them.

Dome Repair and Automation Project

As with most everything else, the work on the dome repair and automation has been put on hold. Sandy Cashen has informed us that the WSO will be cleaned and disinfected by a contractor to DYHS, and Charlie Burke has covered sensitive equipment surfaces for that cleaning. We will finish cleaning and disinfecting those covered surfaces ourselves, before opening again to the public. This delays the plans for the dome that were discussed last month, but certainly doesn't cancel them.

Upcoming STEM Events

I was slated to give a "Joy of Learning" series of four public lectures on astronomy at the Falmouth Public Library in April and early May. These have been delayed until October, assuming things have gotten somewhat back to normal. But even if they are delayed further, I plan to do these eventually.

And the special guest talk by Dr. Sylvester "Jim" Gates, scheduled for March 16th, now has a rain check for sometime in the fall, when conditions have improved to where public meetings are allowed. The "Proving Einstein Right" books he was going to sign for the various student groups at that talk at Barnstable HS are safely stored there until that event.

Upcoming Speakers (Via Internet for duration of C-19 pandemic)

Note: Past May, we still are looking for further speakers for the 2020 schedule, though they will have to be amenable to using the internet for the next few months. If you are interested in giving a talk, or know someone who would be a good speaker, please contact Jim Lynch at jlynch@whoi.edu. Thanks!

May 7th, 2020

DYHS Projects

Speakers: DYHS Mentors

This year, the projects consisted of two projects on globular clusters, one on solar rotation, one on astrophotography, and one on the Galilean moons of Jupiter. We will try to give brief talks about each.

Last Month's Speaker

March 5th, 2020 (At Falmouth Public Library)

Dr. Glen Gawarkiewicz, WHOI and Mr. Paul Fucile, CCAS and WHOI

CubeSat and the Coastal Ocean: Upcoming Missions with MIT/WHOI Collaboration

Abstract: The development of small satellite technology offers exciting opportunities for earth and ocean sciences. A recent collaboration between MIT and the Woods Hole Oceanographic Institution will lead, in the near future, to two separate CubeSat launches, one focusing on the New England continental shelf and thesecond on the Amazon River plume. This talk will briefly describe CubeSatm technology, define the science missions and underlying technical and scientific challenges, and highlight recent changes in the two regions that will be examined by the CubeSat sensors.

Description: The talk by WHOI Senior Scientist Glen Gawarkiewicz and WHOI Senior Engineer (and CCAS member) Paul Fucile was a wonderful look at one of the newest facets of satellite oceanography, the use of the (relatively) new and inexpensive CubeSat technology. Satellite oceanography is not a recent development, dating from the mid-to-late 1970's, but it still is a rather expensive tool, with a relatively small number of costly, high tech missions flying. Due to this, spatial and temporal sampling is often rather sparse compared to what would be desirable. CubeSats hold the promise of being able, thanks to the power and miniaturization of modern electronics, to provide a large number a small, inexpensive sensors that can help cure this sampling problem.

Glen started the talk off with a description of the oceanographic objectives that he is pursuing, specifically coastal oceanography. Glen is a lead PI on the Pioneer Array project that is looking at the oceanography south of the coast of New England, and which employs a wide variety of sensors, both in situ and remote. The “BeaverCube” (after the MIT mascot) MIT/WHOI student program is looking into designing CubeSats that can sample coastal processes, as a learning project that will have a practical result.

After Glen's “science objectives” introduction, Paul Fucile took the stage to describe the CubeSat's engineering. His first slide, entitled “What Makes Space Exploration So Hard” was a rather nice epitomization of the challenges that one must face in making a CubeSat work. The shopping list of hurdles included: 1) the rocket launch itself (g's and vibration), 2) the speeds and distances involved, 3) working in a vacuum, 4) going repeatedly from cold to hot as the satellite orbits, 5) power limitations, 6) radiation (both electromagnetic and particulate), 7) oxygen corrosion (from low-earth orbits), 8) micrometeoroids, and 9) obtaining licenses! The next part of Paul's presentation followed this slide, which I will try to summarize.

The g-forces that rocket launches exert are well known to the public, and can range from just a few g's for a heavy payload to up to 12 g's for a light one. As to vibrations, solid fuel rockets can produce vibrations that are similar in strength to a

couple of minutes in an automatic paint mixer. Avionics (aviation electronics) have to be able to endure such abuse.

The speeds and distances involved in space flight are also large, and also have to be precisely calculated to maintain the low earth orbits (LEO's) that CubeSats have. And though they are going through a very, very thin atmosphere, there is still some air resistance, which cumulatively causes the satellite's orbit to decay. To deal with this, the CubeSats have tiny thrusters based on ejecting ionized salt particles at high speed, a fact which greatly intrigued the audience.

Working in a (near) vacuum is a well known part of space flight, but one that has to be considered carefully when designing equipment. Things like having your equipment explode due to some trapped air would be embarrassing, to say the least.

Going from hot to cold (i.e. sunshine to dark) repeatedly in orbit also places stress on equipment in space, as metals and other materials expand and contract. Repeating such a stress every ~90 minutes is hard on the hardware!

Power limitations are always a limitation for remote instrumentation, and despite having solar panels, power is still at a premium in these small instruments.

Radiation in space, both particulate and electromagnetic, is also a consideration, as the satellites don't have Earth's protective atmosphere shielding them. SPF 20,354 and a good particle umbrella might be in order to protect from UV and those nasty protons (and other nuclei.)

Oxygen corrosion seemed a trifle odd to the audience, but ATOX (atomic oxygen corrosion) is obviously a serious problem to spacecraft materials between 200 and 700 km altitude. And to think we breathe the stuff!

Micrometeoroids are yet another thing that Earth's atmosphere screens us from, but for CubeSats whizzing around in orbit at many thousands of miles per hour, they can cause some serious damage.

Finally, and perhaps the most wryly amusing article on the list, was paperwork and red tape. This item was emphasized more than slightly by Paul!

Paul then turned to the MIT/WHOI students working on the CubeSat technology as part of their coursework. The photos of them putting their project CubeSat mockups through some rather stringent testing were both fun and inspiring to the audience.

Finally, Paul circulated a prototype of the CubeSat's electronics around to the audience. About as big as a loaf of bread, this mockup definitely got the audience's appreciation.

March Business Meeting

The March business meeting was mainly focused on tuning the Planewave telescope tracking and on upcoming dome repairs, but with the schedule we anticipated before the pandemic restrictions and school closings were announced. As mentioned, this schedule has changed until notice is given that gatherings are again allowed.

Star Parties (Cancelled until public gatherings are again allowed)

After August until mid-June, we will (generally) have two regularly scheduled Star Parties each month taking place at 7:30 -10:30pm on the *Saturday* closest to the date of First Quarter Moon (about 7 days old). This is an increase from our old schedule of one per month in the fall, winter, and spring.

From June through August, we have three regularly scheduled Star Parties each month taking place on *Thursdays* at 8:30-10:30pm.

When the moon is near its First Quarter, the terminator (the line dividing light from dark) is favorable for viewing sunlight or shadow on the sides of craters. This time is also favorable for observing the dark side of the moon occult (visually cover) stars in the sky as the moon moves in its orbit. Depending upon the calendar, we may also be able to observe planets and other celestial objects.

Here is the schedule for "Star Parties" up to May, 2020; **the public is cordially invited!**

March 21st, 28th (Cancelled)

April 18th, 25th (Cancelled)

POSSIBLE CANCELLATIONS for Star Parties: Cancellations will be very rare since we have lots to do "inside" as well as outside. Even if the forecast is "iffy"; the Staff Leader for the night may elect not to cancel in case of possible clouds. If clouds arrive after staff and guests have convened, a virtual Star Party will usually take place indoors to include overviews of the sky for that night using computer simulations with our big screen TV, videos of interesting sky events recorded previously, demonstrations and/or training on the use of scopes and other equipment, and consultation/discussions on things astronomical, etc.

However, sometimes a solid forecast for overcast or rain or a storm will result in cancellation of a given Star Party. **IF IN DOUBT ABOUT THE WEATHER AND THE STATUS OF A STAR PARTY, CALL THE OBSERVATORY AT 508-398-4765 AFTER 7:45 pm.** No answer means the event has been cancelled.

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.

For meetings, drive in 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.

H&K directions

Please be reminded that Gus Romano or his delegate host a dinner gathering for members and friends each CCAS meeting night (before the meeting) at the South Yarmouth Hearth & Kettle restaurant at 5:45pm; (the meetings begin at 7:30 at D-Y.) The speaker for each meeting is always invited. Please join the group to dine and talk about all things interesting, including astronomy, each month 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).