

First Light Lite

September 1, 2020

Jim Lynch – Editor

Message from the CCAS President

As always during this pandemic, I hope that all of you reading this are well and are staying as safe as possible. That is the most important thing!

In last month's First Light Lite, I asked the question: how do we adapt to the limiting circumstances we find ourselves in? Though over the course of the month there have been developments, they have been coming slowly, and last month's status is pretty much the same as this month's.

As reported, we've halted our in-person activities until we can operate them safely, and we've gone to the "virtual world" wherever we can. While we are all tired of this virtual universe after half a year, it will continue as the status quo for at least another few months, and perhaps longer. As stated, I am an optimist that we can ramp back up to pre-pandemic levels once safety is again assured, but it's anyone's guess when that will be exactly.

The current status of our three main activities, i.e. lectures/meetings, star parties, and interactions with DYHS and other Cape schools is as follows:

Re lectures, we remain in good shape. We have some wonderful scientists lined up to speak with our club over GoToMeeting this fall, and I will be describing last month's and the coming month's talks in this letter.

As regards star parties, club member George Silvis has made his private observatory a star party Zoom broadcast site on an "as available" basis to people who sign up with him. If you are not yet part of this group and are interested, you can ask George for an invitation via me at jlynch@whoi.edu. The group is called "Mashnee Virtual Observers," and again we thank George for this individual effort.

We also would like to have virtual star parties delivered via webcam and GoToMeeting (a Zoom equivalent) from the Werner Schmidt Observatory (WSO), but this effort is pending negotiations with the school district on reopening the facility. We will keep our membership informed as to the status of this effort.

Regarding our educational/mentoring interaction with DYHS and other schools on the Cape, we are again in the discussion phase. It has been exceedingly difficult for the schools to determine how things will play out in the fall, and we are dependent upon their decisions before we can plan our own activities. Again, I will try to keep you all informed as things develop.

Finally, you might notice that some of the material above and below is recycled from last month. That is because the pace of “new events” has slowed considerably. I have only recycled what may still be relevant this month. My apologies for this – I will definitely stop doing this as soon as this \$%^@# bug goes away!

Werner Schmidt

It is hoped that we can hold a memorial service for Werner at the WSO in the not-too-distant future. But, as with everything, exactly when will depend upon how the virus affects any gatherings.

Invitations to our virtual meetings

To date, we have been inviting people to the CCAS virtual meetings (via providing a link and a password through email the morning of the meeting) using a recent members list, and also by creating a list of people on this FLL mailing list who have contacted me (at jlynch@whoi.edu) stating that they wanted to log into the meetings. The offer to be put on our “meeting login list” remains open, and anyone who is interested, but has not received a previous invitation only needs to contact me and express interest. We have some excellent speakers enlisted for the entire rest of the year, and plenty of room in our virtual lecture hall for a bigger audience! Please consider this offer!

We also plan to broaden our outreach to the public soon, so as to expand the list of people who can attend our virtual meetings, star parties, etc. That effort is awaiting the disposition of other matters, but should happen soon.

Website

Our upgrade of the website is one project that can be done easily enough during the current pandemic, and we hope to get back to it soon.

Miscellaneous talks and resources

I would like to remind people that there are many other organizations that offer excellent Zoom seminars to the public. Check the latest listings of (for example): the American Association of Variable Star Observers (AAVSO), the Maria Mitchell Observatory, and the Harvard Smithsonian Center for Astrophysics. These, and other programs, have very interesting web-based talks available.

Also, I will be giving a series of four weekly talks on amateur astronomy in October via the Falmouth Library's "Joy of Learning" series, which I will make sure can be available to our club. The talks scheduled are:

- 1) Backyard Astronomy (Equipment, the Solar System and Deep Sky Objects visible, Web Resources, Books, Apps)
- 2) Exoplanets, Extraterrestrial Life and the Drake Equation (Fascinating and just a bit scary)
- 3) Black Holes, Their Ins And Outs (One of the most popular topics, covering a lot of the recent work done)
- 4) The Big Bang and Cosmology (Science at "The Outer Limits.")

Binoculars

And finally, despite there currently not being "in person" CCAS star parties where we can make telescopes and laser pointer sky tours available to the public, there is a LOT you can see in summer and fall by yourself with an inexpensive, standard pair of binoculars and a simple star chart that shows the constellations and the "Messier Objects." The latter are bright and easy to see astronomical objects, and the late summer sky has many of them to offer, especially around the Milky Way in Sagittarius.

Some hints for using binoculars: 1) they can “jitter” the image a lot unless you brace them, preferably against something solid, 2) they can get heavy in your hands after a while, especially bigger pairs, and 3) if you are looking high in the sky, get a reclining patio chair or similar to lay down in! You will have little or no success looking up past 45 degrees otherwise!

Last month’s speaker

August 6th, 2020

Speaker: Dr. Antony Stark, Senior Astronomer, HSCfA

Topic: Astronomy Can Save Your Life: The Search for Near-Earth Objects

Precis: Last month’s featured speaker, Dr. Tony Stark, has been a frequent visitor to CCAS, and always gives interesting talks. Last month’s talk, having the added edge of discussing an existential threat to humanity, was no exception.

Tony began with a qualified reassurance that we probably won’t be hit by a giant asteroid anytime soon... but if you’d really like to worry, planetary orbits are not stable forever, and giant planets could eventually move some heavy hitters around. You might hang on to your “the end is near” signs, just in case.

Tony then showed the distribution of asteroid sizes versus numbers, which shows that there are a lot more small asteroids than large ones. (A power law distribution, for aficionados).

In addition to the size, there is also the asteroid’s density to consider, which varies from ball-bearing steel density to that of cigarette ash. And of course, there is the velocity of the asteroid relative to earth, which is the last key piece to consider in a possible collision scenario. When you put all these together, a nice back of the envelope calculation that Tony did shows that “the energy of impact from an asteroid of size “d” is $76 (d / 100\text{m})^3$ Megatons of TNT.” With this equation, you can see that “the impact of a $d = 10\text{m}$ asteroid is 76 Kilotons of TNT.”

Although we’re interested in asteroids and meteorites in general (e.g. our June speaker, Brother Guy Consolmagno), we are especially interested in the ones in

our neighborhood which might casually wipe us out, whether on a local or global level. So, we need to know how many of these there are, and where they are, and also estimate how many we might be missing. At this point, the NASA's WISE (Wide-field Infrared Survey Explorer) satellite enters the picture. This was a satellite, launched in December, 2009, with the purpose of scanning the entire sky twice in infrared light. With its primary mission done, it was put to sleep in 2011. But things were to change.

To quote the NASA website on WISE, "But in Sept. 2013, NASA reactivated the mission with the primary goal of scanning for near-Earth objects, or NEOs. Though the WISE mission had been doing asteroid searches before it entered hibernation, through a project called NEOWISE, that had not been its main purpose until now. For its new chapter in life, the mission is officially renamed NEOWISE." If this name sounds familiar, it is the satellite that discovered the comet NEOWISE that was prominent last month, and that many of us have seen. Our estimates of how many NEOs we know about and how many we might be missing has been greatly improved by NEOWISE.

A slide discussing "What is the situation" was both reassuring and not. The reassuring part is that large asteroids are rare, and well known, and the small ones burn up in the atmosphere. The not-so-reassuring part was that asteroids between 10m and 100m size are not so well known, and can hit the Earth with the energy of a good size nuclear bomb. A map of "bolide events" over the Earth's surface from 1994-2013 shows that there are a LOT of these events. Two notables were the recent Chelyabinsk "near miss" (440 kT) and the famous Tunguska strike in Siberia in 1908 (3 MT). OK, you can start worrying now.

One way to get a bit more observing power is to use 1m class telescopes (the upper edge of "amateur" size), which can be deployed much more cheaply and plentifully than large scopes or satellite missions. Tony described his experiences with this class scope, his PISCO sensor (Parallel Imager for Southern Cosmology) and an ungodly good undergraduate student who tracked an asteroid for an undergraduate thesis (which Tony said would have made a perfectly good PhD thesis).

Next on the docket was the Gaia satellite, which boasts the largest CCD camera deployed in space, and uses it with a clever scheme to measure the parallaxes (and thus distances) and motions of hundreds of millions of objects in our galaxy. Tony's comments about Gaia on one of his slides is particularly worth noting for amateur astronomy fans: "The Gaia on-line, freely-available catalog has over 2 billion entries and is complete to m AB

~ 20. Listed are star positions, proper motion, parallax, orbital elements of multiple star systems, perturbations by planet-mass objects, photometric color information, all with evaluated errors. 2 billion seconds of time = 72 years, so you'd better have your computer deal with it, although the entire data set will fit in your home computer." Quite a bargain, but please make sure to save a few hours a day to eat, rest, and other things!

The final observing tool mentioned was the Vera Rubin (of dark matter fame) Observatory, which will scan the entire Southern Sky every few days.

So, we're safe, or soon will be, right?! Ummmm. Not so fast.

Interstellar objects, probably numerous, on hyperbolic orbits (not trapped by the Sun), and comets from the largely unmapped Oort cloud are still "unknowns" that can come at us without warning. So, if you are a professional worrier, and would rather not cross NEOs off your OMG list, rest assured – we're not quite out of the woods yet!

Coming speakers this fall

September – Dr. Charles Lada, "Adventures in Exploring Star Birth in the Uncharted Realm of the Cold Universe: 1970-1990."

October – Dr. James Head, "The Apollo Lunar Exploration Program."

November - Dr. Larry Marschall, "An Astronomer Looks at Climate Change."

December – Dr. Frank Primini, "The Chandra Source Catalog"

This month's speaker - details

September 3rd, 2020

Dr. Charles Lada, Senior Astrophysicist, HSCfA

Topic: Adventures in Exploring Star Birth in the Uncharted Realm of the Cold Universe: 1970-1990.

Dr.Charles (Charlie) Lada has been gracious enough to give talks to CCAS a number of times, with his last talk being on the history of star formation studies, as noted below. This month, he will talk about star formation, but from a more personal viewpoint. This should be especially interesting to those who would like to see how research works in a “more human, less textbook” vein!

Abstract: Star formation is one of the fundamental pillars upon which rests our understanding of galaxy and cosmic evolution. A couple years ago I gave a talk at the CCAS reviewing the history of humanity's quest to understand the origin of stars from antiquity to the mid-twentieth century, when technological advances led to a pivotal revolution in both our knowledge and understanding of star birth. This revolution propelled star formation studies into the forefront of modern astrophysical research where it still remains. In this talk I will give a very personal account of the early days of this revolutionary period as seen by a young astronomer who was an active participant in the development of the field. I will describe milestones such as the discoveries of giant molecular clouds, the largest and coldest objects in the Milky Way, protostars, bipolar jets and proto-planetary disks, the sites of present-day planet formation. I will also illustrate a few examples showing the tremendous advances that are now being made in these areas by young astronomers of the 21st century. So please join me as I describe a personal voyage of learning and discovery in the uncharted waters of the cold universe during the 1970s and 80s.