First Light Lite

September 4th, 2017

Jim Lynch, Mike Hunter, Gus Romano - Interim Editors

Website Committee

To repeat our usual message: our new website is coming along, and there is a wealth of information on it. The news from the August 21 eclipse, both from the Observatory event and from members and friends who traveled to see the total eclipse, should be very interesting. In your browser, bring up www.capecodastronomy.org to see the latest info. We will continue to get updates from the committee at each monthly meeting.

Communications Committee and Overall Efforts

After being dormant for a few months, our Communications Committee restarted its efforts with a conference call on July 26th. Initial efforts centered on posters and media advertising for our meeting speakers, star parties, and the important eclipse event on August 21st.

The initial efforts have paid off with a very good attendance for last month's speaker, Dr. Tony Stark of HSCfA, and for the eclipse event, which saw an estimated 200-300 people visit the Werner Schmidt Observatory.

As an example, Joel Burnett designed a new CCAS business card that members distributed to visitors at the eclipse event. This will hopefully gain CCAS more members and friends, as people learn how to contact us. Also in the works is a new, updated brochure for CCAS. Media efforts at the eclipse were also very successful, as will be reported on the website.

As a penultimate note, we could use help in distributing the posters before events in libraries, churches, schools, and other venues that will permit their posting. If you are willing to do so (and take them down afterward!), please let Jim Lynch know at jlynch@whoi.edu.

Finally, if you are interested in joining in these efforts (which do not require great amounts of time), again, please email Jim Lynch. You can join in our (half-

hourish) conference calls for free, and see if there is some facet of this work you would like to help with!

Eclipse Event at WSO, August 21st

In that there will be a full writeup of this on the website, along with pictures and video, we will not belabor things here, but just point out a few highlights.

The staff who showed up expected perhaps 30-50 people. Instead, we hosted 200-300 people during the day. Our ~70 cardboard solar glasses were given out early, but luckily we saved a few pairs which we circulated among the crowd during the day. The solar binoculars also were popular, and circulated around the crowd by the members. The outdoor scopes were big hits (with the exception of the iOptron mount and small solar scope, which didn't work, for some reason), and there were two long lines to see the main scopes in the Observatory. Werner Schmidt made an appearance at the event, and we're sure was pleased with the crowd attendance and enthusiasm. The event was also run with very good regard to safety, a prime concern with solar observations.

Short Note from CCAS President

As you might have noticed, this month's newsletter was a few days late. This was due to Jim Lynch traveling to the Scripps Institution of Oceanography to celebrate the 100th birthday of an esteemed colleague, Dr. Walter Munk. When people like Walter and Werner celebrate 100 years, routine things are set aside a few days to celebrate such an event!

August CCAS Meeting Speaker

We'd like to thank Dr.Antony Stark of the Harvard Smithsonian Center for Astrophysics for coming back to CCAS to give his talk "Star Formation in the Milky Way and Beyond." A description of this talk can be found in our meeting minutes from the last meeting.

Upcoming Speakers and Topics

September – Katie Sisson, CCAS. - "Stellar Evolution and Structure"

What is a star? In this talk we will explore the life of a star from birth, to main sequence, to death. Stars are born in giant molecular clouds of gas and dust called nebulae. Under the force of gravity the center of these clouds will attract more and more matter in towards the center. As matter coalesces, temperature rises and a protostar begins to form. Orbiting around the protostar is a protoplanetary disk. Dynamic interactions between the cloud, the disk, and the protostar result in a slow deposition of matter onto the protostar until stability is reached in the form of a star. This stage of life is called the main sequence. A main sequence star is steadily converting hydrogen into helium by the process of nuclear fusion. Stars remain stable so long as the inward force of gravity is balanced by the outward force of gas pressure. When the fuel for fusion runs out, the star is no longer stable and begins to die. Stellar death can be one of the most violent physical phenomenon in the universe resulting in black holes with unimaginably high density, or it can be a gradual fading out process leaving behind nothing but its dense core shining with just the faintest of stored thermal energy.

October – George Silva, Bernie Young, and Paul Fucile. Topics TBD.

November - Dr. Larry Marschall, Gettysburg College. "Tiny bit of shakin' going on: Gravitational waves and the universe."

On September 14, 2015, two unusual observatories, one in Louisiana and another in Washington State, recorded the near-simultaneous arrival of gravitational waves. This was the first time these subtle distortions of space had been detected, though their existence was predicted by Albert Einstein a century earlier. The discovery, perhaps the most remarkable and challenging astronomical measurement of the century, opened up a new way for astronomers to study the universe. We'll give some background on the nature of these odd ripples in the cosmos, and explain how, by observing changes on the earth's surface that are smaller than the nucleus of an atom, astronomers are now able to study some of the most powerful events in the universe-- the collisions of black holes millions of light years away.

December - Dr. Kenneth Brink, WHOI. Title TBD.

January – Dr. Frank Primini, HSCfA. Title TBD.

August CCAS Meeting minutes (Including Main Speaker talk precis)

Cape Cod Astronomical Society - Minutes of the August 3, 2017 meeting

Attendance: ~ 50

The meeting was held at the Dennis-Yarmouth High School Library.

August's speaker was Dr. Antony Stark, astronomer from the Harvard-Smithsonian Center for Astrophysics. The topic was "Star Formation in the Milky Way and Beyond."

Preamble: many topics of astronomy are highly complex. However, that does not mean it is incomprehensible. All who are interested can learn.

Our galaxy, the Milky Way, is made of gas, dust, stars, black holes, dark matter and dark energy.

Stars form in molecular clouds where gas and dust is most dense. These are primarily in the spiral arms of the galaxy. Physics dictates that star formation is inevitable in molecular clouds.

The interstellar medium (ISM) is the matter that exists between the stars and includes ionic, atomic, and molecular gas as well as dust and cosmic rays.

The Stratospheric Terahertz Observatory II (STO-2) in Antarctica is examining the life-cycle phases of the ISM, particularly the star-forming phase. Using a balloon to launch the instrument into the stratosphere, STO-2 can observe wavelengths not detectable on the ground.

Galaxies are dynamic. They build up, collide, and join together resulting in conglomerations of material.

An important component of galaxies is the dark matter halo. Extending far beyond the visible "edge" of a galaxy, dark matter is a non-interacting heavy particle making up the majority of the mass of a galaxy.

The Milky Way's closest neighbor, our companion galaxy, is Andromeda (M31). If Andromeda were bright enough to be seen in its entirety, it would appear several times larger than the moon in the sky.

A galactic rotation curve is a plot of stellar orbital velocity as a function of distance from the galactic center. For spiral galaxies, these measurements are used to determine mass. The nature of these curves cannot be explained solely by the presence of visible matter. Therefore we can infer the presence of dark matter.

Not all radiation from space is detectable from the surface of the earth. Some wavelengths are absorbed at different levels of Earth's atmosphere. Stars emit primarily in the visible. Radio and visible wavelengths do reach the ground. That is why we have ground-based telescopes for radio and optical, and space-based telescopes for gamma ray, X-ray, and infrared.

The antarctic atmosphere is particularly permeable to high radio frequency because it is cool and dry. This is where STO conducts molecular spectroscopy to observe interstellar dust.

GUSTO is planned to launch from Antarctica in 2022. It will collect emission line data for carbon, oxygen, and nitrogen.

The AST/RO submillimeter-wave telescope, located in Antarctica, operates year round processing large amounts of spectroscopic data from the Milky Way and Magellanic Clouds. It creates large-scale maps of CO and fine structure lines of CI. Additionally, AST/RO produces 3-D Data cubes of various emission lines. These are attempts to understand the complicated kinematics at work in our galaxy.

To determine the thermodynamic properties of molecular clouds AST/RO creates LVG models which use measurements of optical depth and excitation to estimate temperature and density in a given region of a cloud.

Gas flows down a potential well of energy as it orbits around the center of the Milky Way. Under tidal forces this creates rings of stability where gas accumulates. These rings will destabilize at high densities. If critical density is met, the gas will coagulate into giant clouds and fall into the galactic center resulting in a starburst.

Observing the most distant galaxies can be difficult. However, in special cases, a proximal galaxy can lens a more distant galaxy making it appear brighter. The farther away a galaxy is the closer we come to the time of the big bang. Recently, the largest and most distant cluster galaxy was discovered at a redshift of z = 6.9.

Business Meeting:

The society has revived the Communications Committee. This group is concerned with heightening interest and involvement among the local community. Possibilities for advertising CCAS events include newspaper, posters, flyers, web, TV and radio.

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The next order of business is the August solar eclipse. Joel Burnett drafted a press release for the event and read it aloud so that the group could offer suggestions on how to improve it. The article states that CCAS invites the public to a star party on August 21st. This party will include a safety briefing, opportunities to view the eclipse with special sunglasses, lectures, tours, and more ways to get involved.

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More on the eclipse event:

- Jim Lynch to give lectures
- Gale to operate 16" telescope
- Hank and Mary Lou to operate cameras
- Run-through this Sunday

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The meeting was adjourned at 9:00pm.

Respectfully submitted,
Katherine Sisson, CCAS Secretary

Star Parties

Winter season once per month "QUARTER MOON SATURDAY STAR PARTIES", **all open to the public**, begins September 23rd, 8:30-10:30PM.

From September thru June, we will have one regularly scheduled Star Party each month taking place at 8:30-10:30pm on the Saturday closest to the date of First Quarter Moon (about 7 days old).

From July through August, we will have three or four 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 remaining schedule for "Star Parties" through December, 2017; **the public is invited**:

Saturday, September 23

Saturday, October 28

Saturday, November 25

Saturday, December 23

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 spite 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 half way 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 dutch-treat 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).