

The SAN MATEO COUNTY ASTRONOMICAL SOCIETY

Jan. – March • 2022 Issue

783rd General Meeting: February 4

784th General Meeting: TBD

785th General Meeting: TBD



EVENT HORIZON

Founded in 1960, the San Mateo County Astronomical Society is a 501(c)(3) non-profit organization for amateur astronomers and interested members of the public. In nonpandemic times, visitors may attend Society meetings and lectures on the first Friday of each month, September to June, and Star Parties two Saturdays a month. All events are free for visitors and guests. Family memberships are offered at a nominal annual cost. Detailed membership information is found at <http://www.smcasastro.com/membership.html> where those who want can join via PayPal. Membership also includes access to our Event Horizon newsletter, discounted costs and subscriptions to calendars and magazines, monthly star parties of the Society and the College of San Mateo, field trips, social occasions and general meetings presenting guest speakers and programs. For additional information, please email us at SMCAS@live.com or call (650) 678-2762.

Membership forms are available near the end of this newsletter. The Membership Application form is on the back page.



James Webb Space Telescope Launched Christmas Day!

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SMCAS Application back page

PLEASE NOTE: CSM is still closed due to the pandemic.

Cover: Launching of the James Webb Space Telescope. *Photo by NASA.*

Below: Sculptor Galaxy or NGC 253. *Photo by SMCAS Board Member Michael Cooke.*



From the Prez

Hello All,

With the resumption of live Crestview Star Parties, the Board has decided to hold them separately from our monthly general meetings. The College of San Mateo has not said when on-campus hosting might resume, so our general meetings will continue to take place over Zoom, but we will shift them to Friday evenings, as they had been pre-COVID. We will normally try for the first Friday of each month but will adjust the dates as necessary to accommodate our speakers. Our normal meeting start time will be 8pm. When this meeting returns to an in-person gathering in the CSM Planetarium, we plan to precede it with our pizza and coffee social event starting at 7pm in CSM ISB building #36, Room 110.

We don't plan a general meeting in January. Our first of the year is planned for Friday, Feb. 4.

The Crestview Park Star Parties will continue as in-person events, instead of being streamed over Zoom. Our first of 2022 will take place on Saturday, January 29. Others are scheduled, so far, for February 26, March 5, March 26 and April 2, all weather-permitting and starting at sunset. Recall that Daylight Saving Time resumes on March 13.

We have an SMCAS Holiday Party set for Saturday, January 15, from 6pm to 9pm in the Fireside Room at the Crystal Springs United Methodist Church on Bunker Hill Drive. It will be a celebratory holiday potluck, so bring a few portions of your favorite goodies. Alcoholic beverages are welcome, and wearing masks is optional. Bring music if you have it.

Our following social event, the Vernal Equinox potluck, will also be at the Fireside Room, but will take place on Saturday, March 19, again from 6pm to 9pm.

I remind all members that we renew our memberships at year's end, and so it's time for those who choose to rejoin for the year 2022. It can be done through our PayPal link on the SMCAS website (www.smcasastro.com), by paying a Board member, or by sending a check to SMCAS at PO Box 974, Station A, San Mateo, CA 94403. I invite our members to rejoin, and our visitors to become members. A year's family membership costs (\$30) less than lunch, and a student membership only half that (\$15).

In my last "From the Prez", I revealed that our VP, Ed Pieret, had suffered a painful case of shingles (which was, at least, not as serious as that rattlesnake bite (!) he got in his garage a couple of years back). I also passed along word from Bill Lockman that his wife's cousin was in the ICU, suffering from a severe case of COVID-19. I urged all to join me in praying for their relief and recovery.

Well, our prayers were answered. Ed recovered rapidly and completely and, thankfully, Bill's relative came back from the brink, and I'm told, is on his way to a lengthy, but stable, recovery. Good luck and good health to all of you, as well as to your friends and families.

I invite any and all of you to contact me, or another Board member, if you have any questions, or if we can assist you in any way. Thanks again for supporting the San Mateo County Astronomical Society. We hope you've all enjoyed a truly wonderful holiday season. All the best to you and yours.



Mike Ryan

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Upcoming Events

PLEASE NOTE: CSM is still closed due to the pandemic. SMCAS in-person Star Parties have resumed at Crestview Park. [Click here to see the schedule.](#)

Saturday, January 15: SMCAS Holiday Party – 6pm to 9pm – Crystal Springs United Methodist Church, 2145 Bunker Hill Drive, San Mateo, CA 94402

Saturday, January 29: Star Party – at sunset (5:29pm) – Crestview Park, 1000 Crestview Drive, San Carlos, CA 94070. See page 20 for directions and guidelines.

Saturday, February 26: Star Party – at sunset (5:59pm) – Crestview Park

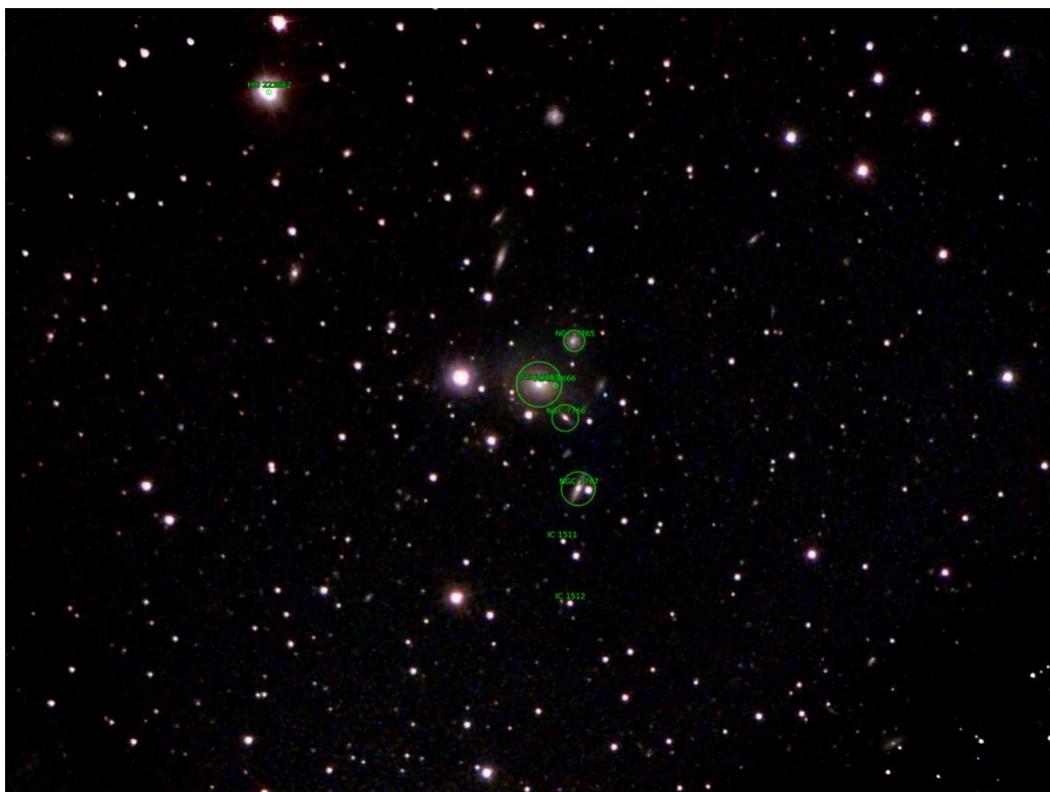
Saturday, March 5: Star Party – at sunset (6:06pm) – Crestview Park

Sunday, March 13: Daylight Saving Time resumes. Don't forget to change your clock. We will spring forward or move our clocks forward by one-hour.

Saturday, March 19: Vernal Equinox Potluck – 6pm to 9pm – Crystal Springs United Methodist Church

Saturday, March 26: Star Party – at sunset (7:26pm) – Crestview Park

Saturday, April 2: Star Party – at sunset (7:32pm) – Crestview Park



Galaxy cluster
Abell 2666, NGC
7768, NGC 7767,
NGC 7766, NGC
7765 and many
more. *Photo by
SMCAS Board
Member Michael
Cook.*

The James Webb Space Telescope: Great Science Launched on Christmas Day!

By Ken Lum

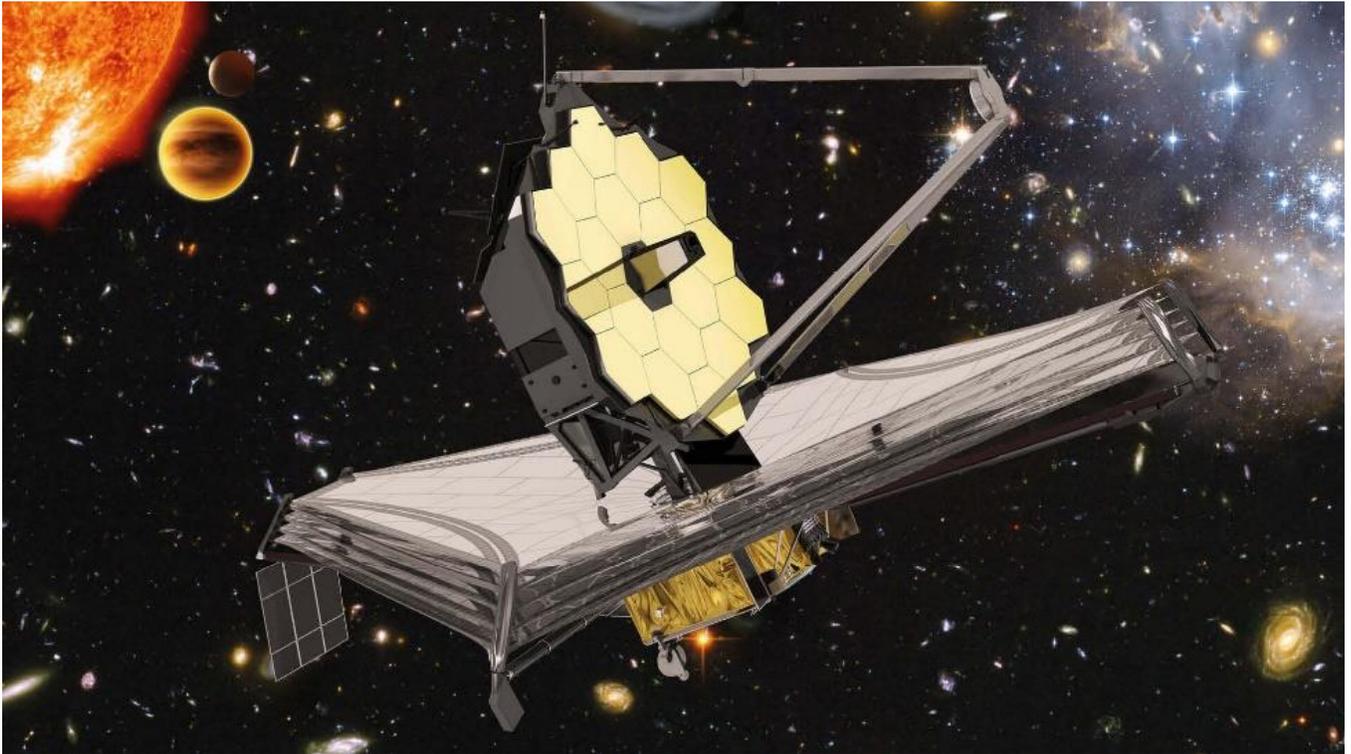


Figure 1 – The James Webb Space Telescope (*European Space Agency*)

Oh, my goodness, after **25 years** in development since 1996, the long-awaited launch of the **James Webb Space Telescope (JWST)** has finally happened flawlessly on Christmas morning! (Figure 1) In anticipation of this amazing event, **Dr. Thomas Greene** of NASA Ames and now also a member of the SMCAS, came on December 10 to describe how this incredible machine will deploy and what it will be anticipated to do.

After some 14 years of delays and major design changes from its initial proposed launch date of 2007, this successor to the Hubble Space Telescope was finally completed in 2016 and launched aboard a European Space Agency Ariane 5 launch vehicle from French Guiana on Christmas Day.

Because JWST, as deployed, is bigger than any launch vehicle available, the telescope was designed to fold up, origami-like, into a compact size to fit into the payload fairing of its rocket. (See Figure 2 on page 7.) Once released, JWST will unfold over about 6 months into a large, expanded structure that includes a multilayer sunshield to fulfill its mission. In the meantime, it will head out to Earth's second Lagrange point, or L2, for an orbit around the Sun about 1 million miles from Earth making it unserviceable by astronauts.

As built, the JWST **optical telescope element (OTE)** is a Cassegrain reflecting telescope of focal ratio of 20 with a 6.6 meter diameter segmented **primary mirror** (HST's primary

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The James Webb Space Telescope (cont'd)

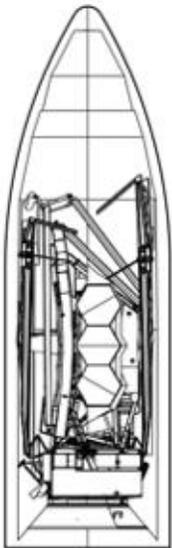


Figure 2 – JWST folded up in the Ariane 5 Payload faring. (NASA)

mirror is 2.4 meter diameter) and a single element convex **secondary mirror** of 0.74 meter diameter suspended on a tripod frame that unfolds when deployed to position the secondary along the optical axis above the primary. (Figure 3) Light from astronomical objects is collected by the primary and reflected up to and off the secondary and fed

down a central cylindrical light baffle mounted over a hole in the center of the primary. The primary mirror segments and the secondary mirror are mounted on computer-controlled actuators which allow fine adjustment of these mirrors to achieve optimal optical alignment.

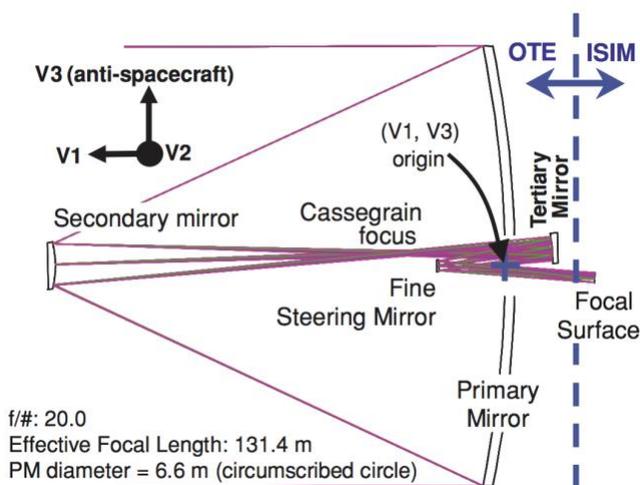


Figure 3 – Optical Telescope Element schematic. (Space Telescope Science

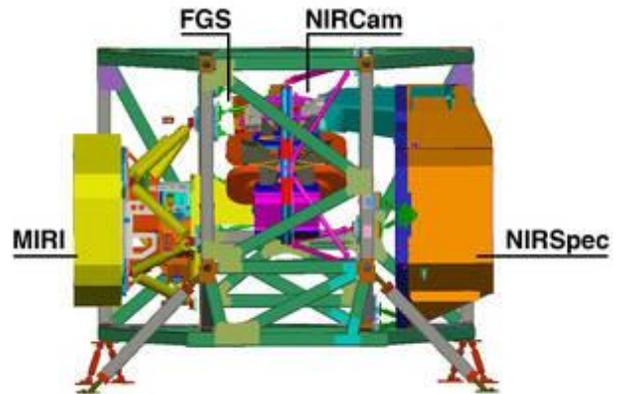


Figure 4 – Integrated Science Instrument Module with instruments. (European Space Agency)

The Cassegrain focal plane is positioned just above the top of the baffle, and the light goes past this focal plane to a **concave tertiary mirror** located behind the primary which corrects for imaging aberrations arising from the primary mirror. After being reflected from the tertiary mirror, the light is reflected off a flat **Fine Steering Mirror (FSM)** which provides rapid X-Y position tilting adjustments to stabilize the image in ways similar to how consumer digital cameras also do image stabilization.

Finally, after reflecting off the FSM, the light is sent to the area behind the primary known as the **Integrated Science Instrument Module (ISIM)** where the [Near-Infrared Camera \(NIRCam\)](#), [Near-Infrared Spectrograph \(NIRSpec\)](#), [Mid-Infrared Instrument \(MIRI\)](#) spectrograph and imager, and [Fine Guidance Sensor/Near InfraRed Imager and Slitless Spectrograph \(FGS/NIRISS\)](#) are located for collecting Infrared (IR) light for imaging and spectroscopy. (See Figure 4.) The detec-

(continued on page 7)

The James Webb Space Telescope (cont'd)

tors of all four instruments are cooled to reduce detector noise. NIRCам, NIRSpec, and FGS/NIRISS are cooled passively mostly with the aid of the large sunshield down to 37° K for sensitivity from 0.6 to 5 microns. However, the MIRI needs to be cooled further down to less than 7° K in order to be sensitive from 5 to 28 microns. Doing this requires a dedicated active “cryocooler” containing liquid helium that will eventually evaporate off limiting the lifetime of MIRI to 5.5 to 10 years. Although they are not so obviously visible, the JWST is powered by solar panels attached to the rear of the spacecraft.

As the names of the instruments suggest, JWST will observe astronomical objects in the near and mid infrared (0.6 to 28.5 micron light wavelengths) only. To optimize the telescope optics for IR and space operations, its mirrors are made from light weight beryllium and coated with gold (Wow!). Unlike the HST, JWST will not be able to observe in ultraviolet or visible light. This is because astronomers now consider the most interesting problems in future astronomical research will be best observed in IR as this type of light enables observing through interstellar dust clouds to see objects otherwise hidden behind these clouds. In addition, all the light from the early universe and its objects, such as galaxies and stars, are reddened due to the redshift arising from the expansion of the Universe. That makes IR to be the best type of light with which to observe the early universe.

So, according to Dr. Greene, observing in IR will allow JWST to pursue these major categories of investigation:

1. First Light and the Epoch of Reionization in the Very Early Universe (See Figure 5)

Following the Big Bang, from an age of 3 minutes to 20 minutes, the universe was as hot as the cores of present-day stars. Under these conditions, a fraction of newly formed ionized hydrogen atoms fused into helium nuclei and released gamma ray photons creating a condition of “**the whole Universe as a star**” for about 17 minutes.

About 240,000 to 300,000 years after this, the universe cooled enough from its expansion for free electrons to unite with protons and helium nuclei to form neutral atoms of hydrogen and helium. During this “**Era of Recombination**” the universe became transparent to the gamma ray photons released from the formation of these early helium nuclei and released its **First Light** as the **Cosmic Microwave Background (CMB)** because the short wavelengths of those early gamma rays ended up stretched out into microwaves due to the expansion of the universe by the time we observe them here on Earth.

Following the release of the CMB, there was a period, called the **Dark Ages**, where there was no source of light in the universe. Then, some 560 million years after the Big Bang the neutral hydrogen and helium formed in the early universe, which coalesced into monster **First Stars** of dozens to hundreds of times the mass of our sun. (Note the red arrow in Figure 5.) These stars rapidly burned through their

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The James Webb Space Telescope (cont'd)

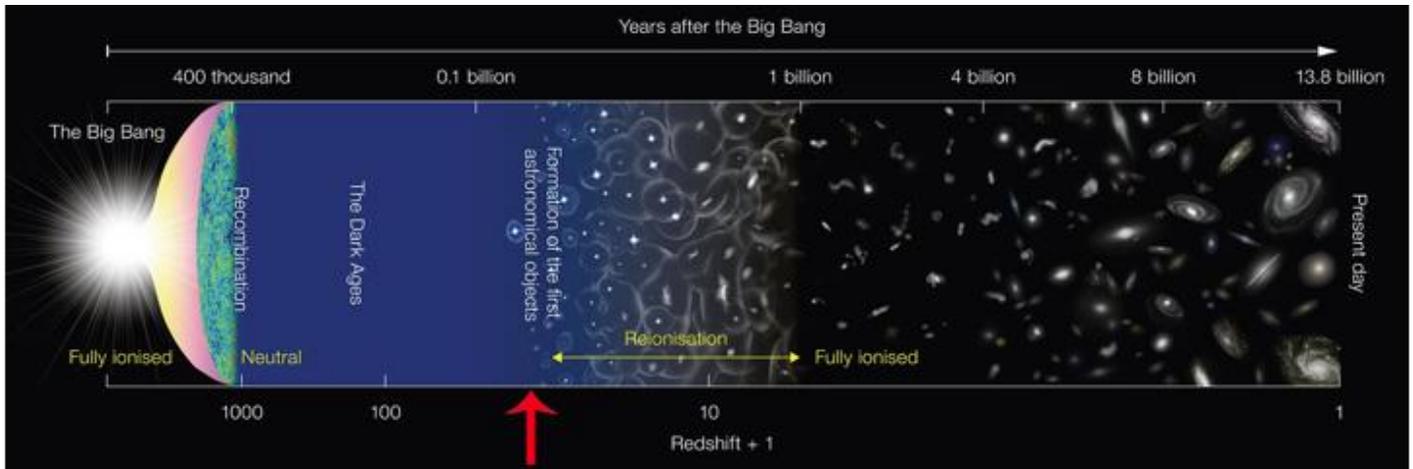


Figure 5 – Schematic of the history of the universe. (*European Southern Observatory*)

short lifetimes to release large amounts of ultraviolet that re-ionized the neutral hydrogen around them. It is hoped that JWST will allow us to see what the universe looked like during this **Epoch of Reionization** of giant, hot massive stars constantly going supernova.

2. Assembly and Evolution of Galaxies

The **Hubble Deep Field** views have already given us hints of the formation and evolution

of early galaxies in the Universe. (See Figure 6.) JWST is anticipated to help refine these observations further to give a more detailed **look** at how this happens.

3. Birth of Stars and Planets (See Figure 7)

Figure 6 – Hubble Deep Field. (*NASA*)



Figure 7 – Formation of Stars and Planets. (*European Southern Observatory*)

Stars and planets form within knots of gas and dust that obscure the views of their formation processes. It is expected that the IR capabilities of JWST will allow astronomers to see through the obscuring matter to get a better look at the mechanisms of their formation.

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The James Webb Space Telescope (cont'd)

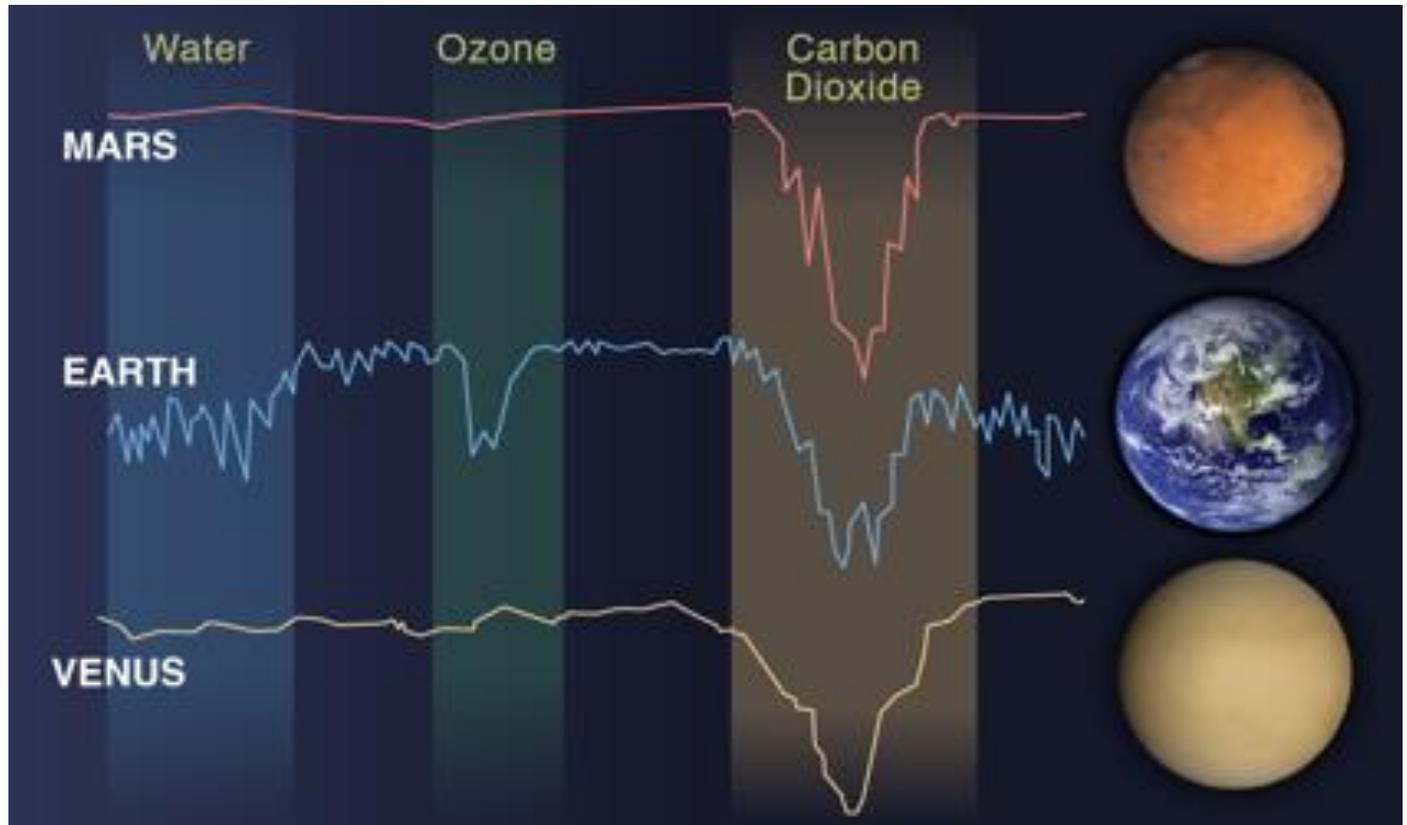


Figure 8 – Atmospheric spectra of Mars, Earth and Venue. (*Space Telescope Science Institute*)

4. Planetary Systems and the Origin of Life (See Figure 8)

JWST should allow astronomers to look spectroscopically into the compositions of exoplanet atmospheres in unprecedented detail with an emphasis on trying to detect gaseous signatures of life such as the free

oxygen and water which we see so much of here on Earth.

[Click here to watch this talk on SMCAS' YouTube channel.](#)

[Click here to watch the livestream of the JWST launch on NASA's YouTube channel.](#) ◆

Frank's Astrophotography Series: ASIAir Plus – Part 3

By Frank Seminaro

Last Event Horizon, I covered wiring and powering your astrophotography rig. Hopefully, it inspired you to explore taking a picture with your telescope. In this issue, we are going to cover part 1 of the heartbeat of my astro rig - The ZWO ASIAir Plus. I hope some of you received one of these in your Christmas stocking. In my opinion, this device is a game changer for astrophotography. Prior to purchasing one, I used a laptop to control all the functions necessary for astrophotography. These functions included a guide to the night sky, polar alignment, camera control, guiding, and focusing. Each function had many software and hardware vendors to choose from and they all had to work together perfectly in order to have a successful evening. Add in the bewildering MS Windows drivers aspect or the uniqueness of Mac OS and the chances of success went way down. The complexity kept many budding astrophotographers away. Along came ZWO Manufacturing and they filled the gap by creating an economical and easy to use device to consolidate all the functions plus eliminate the laptop.

The ASIAir Plus is based on the popular Raspberry Pi micro computer platform. The Raspberry Pi is popular with hobbyists for robotics, makers projects, etc. ZWO used the platform to create an all in one astrophotography powerhouse. They added a 4"x3"x3/4" aluminum case with a variety of connectivity ports. It requires a 12v DC source to power it up and has five 12v DC output ports. These ports are used to power your cameras, focuser and other devices you

ASIAIR Plus

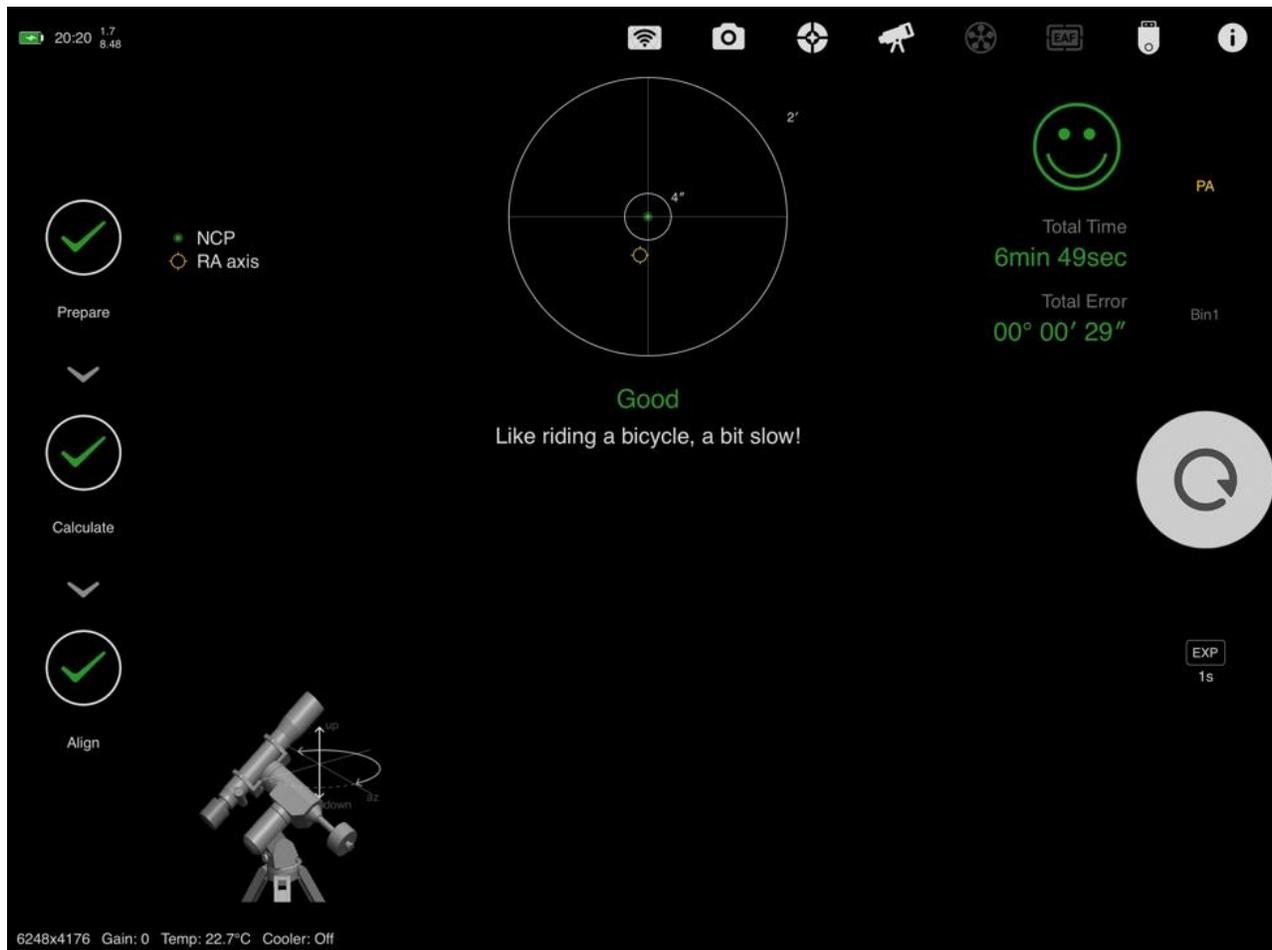


Behold the ASIAir Plus.

may have installed. It is not recommended to power your mount from these ports as the mount electronics may introduce interference into the cameras. Larger mounts may also draw too many amps for the ASIAir Plus to handle. The device also has four USB ports plus a gigabit ethernet jack for direct connection to your network. When I am in the field, I use the wireless feature that allows me to connect via an iPad, iPhone, or Android device from 50 feet away. The USB ports are used to connect to the main camera, guide camera, focusing motor and mount. While the ASIAir Plus will connect to most all equatorial mount manufacturers, it can only use ZWO cameras and focusing motor. This is a limitation if you already own another brand of brand of imaging and guide camera or CCD camera. ZWO does offer a wide array of CMOS astrophotography cameras. I described these cameras in an earlier article.

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Frank's Astrophotography Series: ASIAir Plus – Part 3 (cont'd)



Using the ASIAir Plus app for precision polar alignment.

On a typical night, I set up my rig completely and do a rough polar alignment. I use an iPhone app called PS Align Pro; the app has a feature that allows you to polar align your mount in the daytime. It works quite well and is available in the Apple App Store. Once my rig is roughly signed to Polaris, I turn on the mount and ASIAir Plus. I then use my iPad to open up the ASIAir app and connect to the ASIAir Plus Wi-Fi. I can now control everything I need to do for an imaging session from the iPad (iPhone and Android devices with an ASI app can also be used). If

I did my rough alignment properly, it should have Polaris somewhere in the frame of my main camera when the mount is at the home (or zero) position. I am now ready to start the precision polar alignment process via the ASIAir app. It is at this point the ASIAir Plus really shows why it is taking over the amateur astrophotography world.

In the next issue of The Event Horizon, I will cover the ASIAir app. It's important to note that I am in no way connected to ZWO or receive any compensation for this article. I simply love this device. ◆

Exploring the Local Universe with Space Telescopes

By Ken Lum

Wow, it has been all the way back to May 15, 2021, that we last had a formal talk from a professional astronomer at the SMCAS! Despite setbacks caused by the COVID pandemic, we are still active and hope to return to in-person meetings again by early next year given how relatively well we have been doing with the COVID pandemic in San Mateo County.

Our last formal talk, as I say, was in May and involved **Dr. Daniel Weisz** of UC Berkeley who generously came via Zoom to tell us about progress in the development of space telescopes over the past half century (that long already!).

The notion of a space telescope was first formally proposed in 1946 by Princeton astronomer, **Lyman Spitzer**. Dr. Spitzer continued lobbying for its building throughout the rest of his career until it was finally launched in 1990 as the 2.4 meter **Hubble Space Telescope (HST)**, named after American astronomer, Edwin Hubble, who discovered the extra-galactic nature of galaxies and the expanding universe in the 1920s and 1930s.



Figure 1 – Hubble Space Telescope (NASA)

Spitzer justified putting a telescope in space because it could:

1. Observe at wavelengths of light otherwise blocked by the Earth's atmosphere.
2. Allow observing at better resolution than possible from ground-based telescopes.
3. He also proposed classes of problems such a telescope would be especially good at tackling such as:
 - a. The structure of the universe
 - b. The structure of galaxies
 - c. The structure of globular star clusters
 - d. The nature of other planets

Unfortunately, after launch, the HST was discovered to have a misshaped main mirror giving blurry images. This error was fixed in 1993 with a servicing mission that installed a corrector mirror which successfully removed the blurring aberrations (with enormous relief!). Along with its robust construction, repeated servicing missions, and good management of this resource, HST continues to provide excellent service to the astronomical community for the past 30 years and beyond making many major discoveries far beyond the capabilities of ground-based instruments.

Dr. Weisz showed just two of these discoveries including the **Hubble Deep Field** photographs showing the presence of intact galaxies all the way back into the early history of the universe and a massive photo montage of about half the Andromeda galaxy (M31)

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Exploring the Local Universe with Space Telescopes (cont'd)



Figure 2 – Panchromatic Hubble Andromeda Treasury (NASA)

with a resolution all the way down to individual stars known as the **Panchromatic Hubble Andromeda Treasury (PHAT)**. (See Figure 2.)

The PHAT image was the first attempt at a comprehensive census of stars and other objects in a galaxy at high resolution that could be used for large scale statistical analysis and required a record 50 days of HST observing time spread over 4 years. The first step to doing this involved manually classifying all the different kinds of objects in

the image including stars, star clusters, nebulae, dust lanes, star forming regions, etc., in order to enable high resolution mapping of their distribution in the galaxy. However, this proved too exhausting, tedious and time consuming for the small team initially engaged, so Dr. Weisz's group issued an appeal for volunteers from the general public through a citizen science website called **Zooniverse** (<https://www.zooniverse.org>) to help with this task. This crowdsourcing organization

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Exploring the Local Universe with Space Telescopes (cont'd)

has helped with galaxy surveys, wildlife censuses and other big data science projects.

To their great surprise, some 30,000 volunteers stepped forward to do this classification work and turned in some 1.82 million object classifications in just 25 days! This ultimately resulted in catalogues of individual star brightness' of 117 million stars, 2,753 star clusters, and 2,270 background galaxies making for the largest such catalogues ever.

These catalogues have enabled a fine grain assessment of star formation and evolution dynamics in a major galaxy for the first time. One discovery by Dr. Weisz's team showed that the star formation regions of M31 had been active for at least some 500 million years, which is far longer than most star formation models of galaxy evolution predicted. Prior models predicted that these regions should have used up their gas and dust long ago and ceased their star formation earlier. This discrepancy has yet to be explained.

Another discovery was that M31 has some 25% fewer massive stars than the Milky Way. This has implications for the abundance of

Mapping Andromeda's Dust

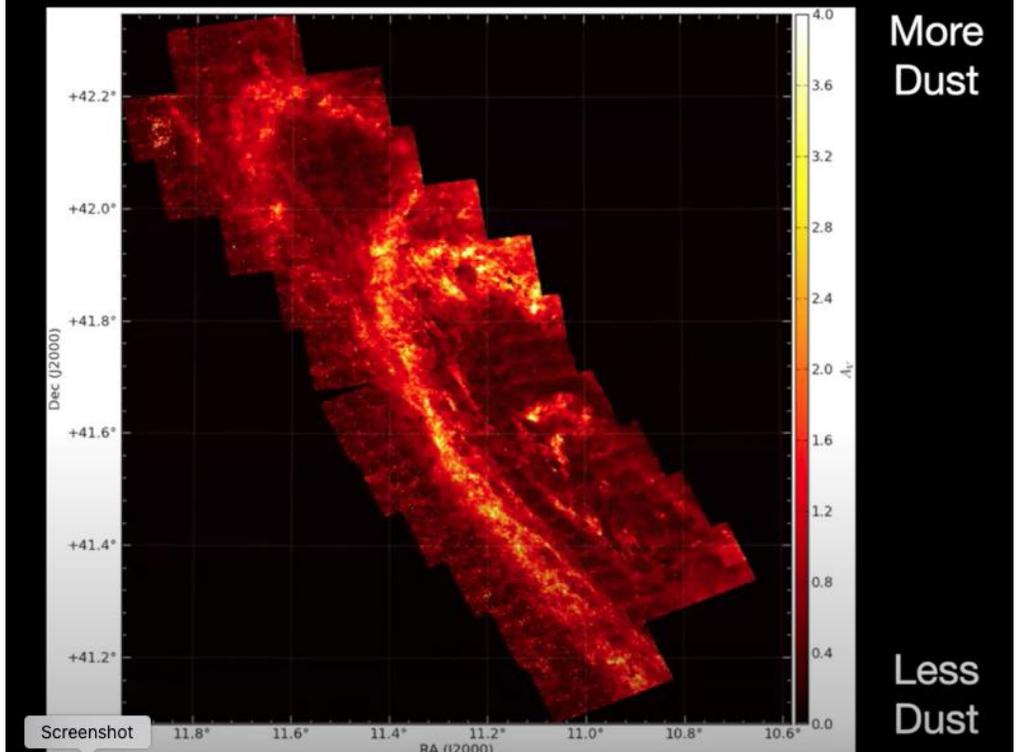


Figure 3 – Dust map of M31

heavier elements in M31 compared to the Milky Way as massive stars go supernova scattering these elements into the interstellar regions to form new stars, planets, etc. It may also say something about how the elemental abundance in galaxies evolves over time and how that may be tied to the initial conditions of galaxy formation.

Finally, this survey has provided the most extensive maps of interstellar dust of any galaxy. (See Figure 3.) This should be helpful in correcting for light extinction of star luminosity as individual stars are better characterized.

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Exploring the Local Universe with Space Telescopes (cont'd)

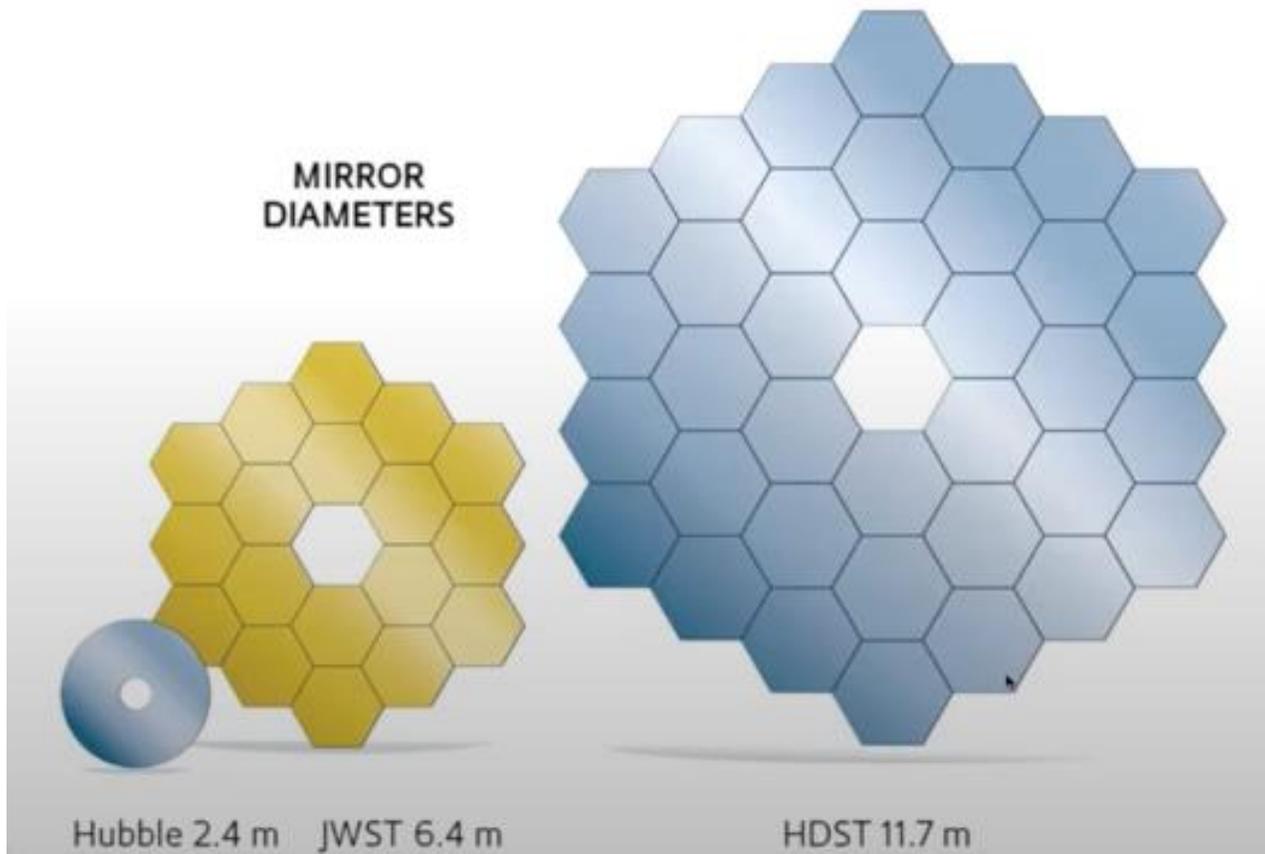


Figure 4 – Size Comparisons of HST, JWST and HDST.

In conclusion, while a deeper examination of this data is only getting started, Dr. Weisz and his team have found that:

1. Star formation is variable from galaxy to galaxy in space and time.
2. The abundance of different star types are almost certain to be different for different galaxies.
3. There is a great deal of messy dust that needs to be corrected for when characterizing the objects in a galaxy.

Currently, a similar high-resolution census of objects is now being carried out with the HST in a neighboring galaxy, M33 in Triangulum.

Thus far, about 1,300 star clusters have been found, and the object census is still ongoing.

Most anticipated for the immediate future is the launch of the long-awaited 6.4 meter diameter **James Webb Space Telescope** that was launched on Christmas morning! Even more ambitious is an 11.7 meter **High Definition Space Telescope** (HDST) which will extend these high resolution surveying capabilities to most observable galaxies. (See Figure 4.)

[Click here to watch this talk on our YouTube Channel.](#) ◆

The Greek Mythology of Orion, The Hunter

By Michelle Morales Torres

There are many different versions of Greek mythology of Orion but most agree that his father was Poseidon and his mother, Euryale, a daughter of King Minos. As the son of Poseidon, Orion had special abilities and features. He was gigantic and could walk on water. He was also described as being the most handsome man on Earth. Later, he would fall in love with Merope, daughter of King Oinopion. He tried to win the approval of the king by being the best hunter, but the king didn't want him as a son-in-law. Orion eventually forced himself upon Merope. The king was enraged and blinded Orion.

Orion learned that if he faced the rising sun at the farthest point east, his eyesight could be restored. However, he couldn't tell which way was east, but he could hear the hammering of the metalwork god, Hephaestus, who was working in his workshop in Lemnos. Hephaestus felt bad for Orion and had Cedalion, demigod of smelting ore, guide Orion to the rising sun and where Helios, the sun god, restored his sight.

Orion returned to the island of Chios to seek revenge on King Oinopion but his people hid him so that Orion couldn't find him. So, Orion moved on to the island of Crete. There he became the companions of Artemis, the Greek goddess of hunt and her mother, Leto, the Greek goddess of motherhood and modesty. Although it would be Orion's friendship with Artemis that would lead to his demise.

In one version that's very common, Orion is so excited to go hunting with Artemis and Leto that he boasts that he's going to kill every animal. Gaia, Mother



Earth, was so upset that she sent a giant scorpion to kill him. Both were placed in the stars but at opposite ends of the sky, so that when the constellation of Scorpius, the scorpion, is rising, Orion is usually setting.

There are a few different versions where Artemis kills Orion. In one, Eos, the Dawn Goddess, saw Orion and abducted him. When Artemis found the two of them together, she killed him. There's another story where Orion forces himself on one of her handmaids, so she kills him.

Another common version is when Artemis' brother, Apollo, tricks her into killing Orion because he was jealous with how close they were. He challenged her that she couldn't hit a moving target and picked one out in the sea, knowing it was Orion swimming. He was so far out that she couldn't see it was Orion and took her brother's challenge, not realizing that she killed Orion.

In some versions, Artemis places Orion in the sky and in others, Zeus does. ◆



NASA Night Sky Notes

Hunting the Hunter: Observing Orion

By David Prosper

If you are outside on a clear January night, it's hard not to notice one distinctive star pattern above all: **Orion!** While we've covered Orion in earlier articles, we've never discussed observing the constellation as a whole. Perhaps you've received a new telescope, camera, or binoculars, and are eager to test it out. Orion, being large, prominent, and full of interesting, bright objects, is a perfect constellation to test out your new equipment and practice your observing skills - for beginners and seasoned stargazers alike.

In Greek mythology, Orion is a strong hunter, with numerous legends about his adventures. Being such a striking group of stars, cultures from all around the world have many myths about this star pattern. There are so many that we can't list them all here, but you can find a wonderful interactive chart detailing many cultures' legends on the Figures in the Sky website at figuresinthesky.visualcinnamon.com.

What sights can you see in Orion? Look above the variable orange-red supergiant "shoulder star" Betelgeuse to find the stars making up Orion's "club," then move across from Betelgeuse towards the bright star Bellatrix (Orion's other "shoulder") and the stars of his bow and arrow - both essential tools for the Hunter. Many interesting sights lie near Orion's "belt" and "sword." Orion's belt is made up of three bright giant stars forming an evenly spaced line: Alnitak, Alnilam, and Mintaka. Move from the belt stars towards the stars Rigel and Saiph

(Orion's "feet" or "knees") to arrive at Orion's distinctive Sword, parts of which may appear fuzzy to your unaided eyes. Binoculars reveal that fuzz to be the famed Orion Nebula (M42), perched right next to the star Hatysa! Diving in deeper with a telescope will show star clusters and more cloud detail around the Nebula, and additional magnification brings out further detail inside the nebula itself, including the "baby stars" of the Trapezium and the next-door neighbor nebula M43. Want to dive deeper? Dark skies and a telescope will help to bring out the reflection nebula M78, the Flame Nebula (NGC 2024), along with many star clusters and traces of dark nebula throughout the constellation. Very careful observers under dark clear skies may be able to spot the dark nebula known as the Horsehead, tracing an equine outline below both the Belt and the Flame Nebula. Warning: the Horsehead can be a difficult challenge for many stargazers, but very rewarding.

This is just a taste of the riches found within Orion's star fields and dust clouds; you can study Orion for a lifetime and never feel done with your observations. To be fair, that applies for the sky as a whole, but Orion has a special place for many. New telescopes often focus on one of Orion's treasures for their first test images. You can discover more of NASA's research into Orion's stars - as well as the rest of the cosmos - online at nasa.gov.◆

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NASA Night Sky Notes

Hunting the Hunter: Observing Orion (cont'd)



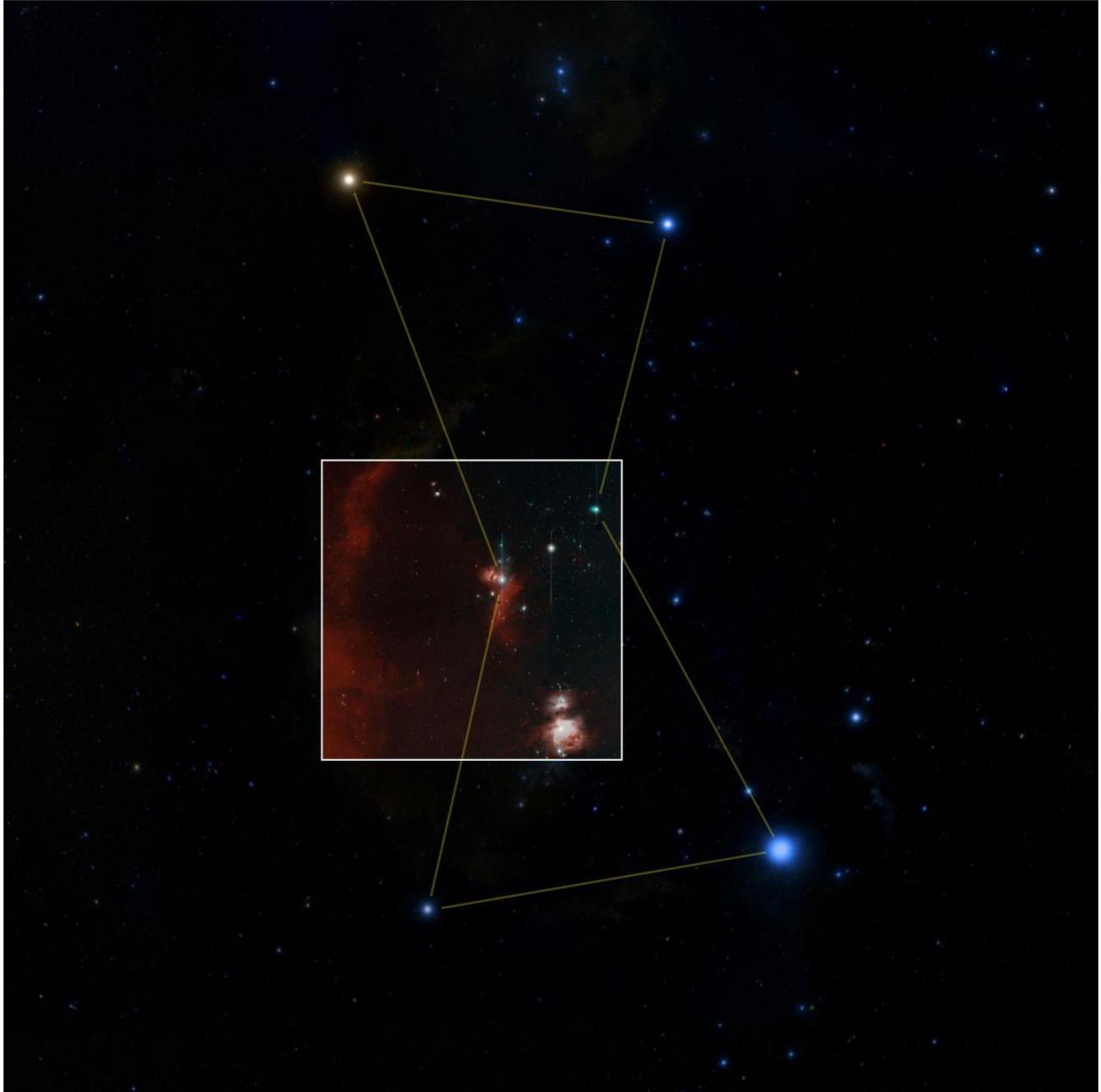
Northern Hemisphere observers can find Orion during January evenings in the east/southeast skies. Can you spot the Orion nebula with your naked eye, in Orion's sword? How does it look via binoculars or a telescope? What other details can you discern? Please note that some deep sky objects aren't listed here for clarity's sake. For example, M43, a nebula located directly above M42 and separated by a dark dust lane, is not shown. Orion's Belt and Sword are crowded, since they are star-forming regions! You can read more in our November 2019 article *Orion: Window Into a Stellar Nursery*, at bit.ly/orionlight. *Image created with assistance from Stellarium.*

(continued on page 19)



NASA Night Sky Notes

Hunting the Hunter: Observing Orion (cont'd)



The inset image is the “first light” photo from the Zwicky Transient Facility, a large survey telescope designed to detect changes in the entire night sky by detecting “transient objects” like comets, supernovae, gamma ray bursts, and asteroids. For many astronomers, amateur and pro alike, Orion is often the “first light” constellation of choice for new equipment! *Image Credit: Caltech Optical Observatories*

Directions to SMCAS Public Star Parties (Weather Permitting)

From Hwy 101 or El Camino: Take Brittan Avenue in San Carlos, west (toward the hills). Follow Brittan 2.3 miles (from El Camino) to Crestview Drive. Turn right on Crestview. In half-a-block, you will see a small, blue-posted sign with an arrow, indicating the entry road into Crestview Park. It lies between houses with addresses #998 and #1000 Crestview Drive.

From Highway 280: Take Edgewood Road exit. Go east (toward the Bay) about 0.8 miles. Turn left at Crestview Drive. Go 0.5-mile uphill to where Crestview meets Brittan. Again, drive the half-block, to the small blue sign on the right, and the entry road on the left.

From Hastings and Club Drives: From Belmont, take Carlmont Drive to Hastings Drive. Follow Hastings about 1.5 miles, first uphill, then down, to San Carlos where it becomes Witheridge Road, then ends a block later at Club Drive. Turn right and climb Club Drive to Crestview Drive. Turn left and continue some 2 miles, first up, then down past Leslie Drive, to the small blue Crestview Park sign on the left. Turn right into the Crestview Park entry road.

Crestview Park - San Carlos

Come on out, and bring the kids, for a mind-blowing look at the Universe!

Bring your binoculars, telescopes, star guides, and lounge chairs for some informal star gazing at Crestview Park.

Dress warmly and wear a hat. Only visitors with telescopes should drive in. Others should park on the street and walk in or arrive before dark so that car headlights don't affect the observers' dark adaptation. Bring small flashlights only, covered with red cellophane or red balloon.

These measures avoid safety issues of maneuvering in the dark, as well as ruining the night vision of the viewers.

Please don't touch a telescope without permission. And parents, please don't let children run around in the dark.

Note: If bringing a telescope and arriving after dark, please enter the Park with your headlamps and white interior lights off. **If you aren't bringing a telescope, whether before or after dark, please park along Crestview Drive, and walk in.**

Crestview Park is residential, adjacent to homes and backyards. Before inviting potentially noisy groups, please call Ed Pieret at (650) 595-3691 for advice and advisories. **Call Ed also to check the weather and 'sky clock' and to see whether the Star Party is still scheduled.**

Crestview Star Party schedule is here:

<http://www.smcasastro.com/crestview-park.html>

From San Carlos, take San Carlos Avenue to Club Drive, and climb to the 5-way intersection. Take the half-right to continue on Club Drive past Witheridge Road to Crestview Drive. Proceed as above to Crestview Park.



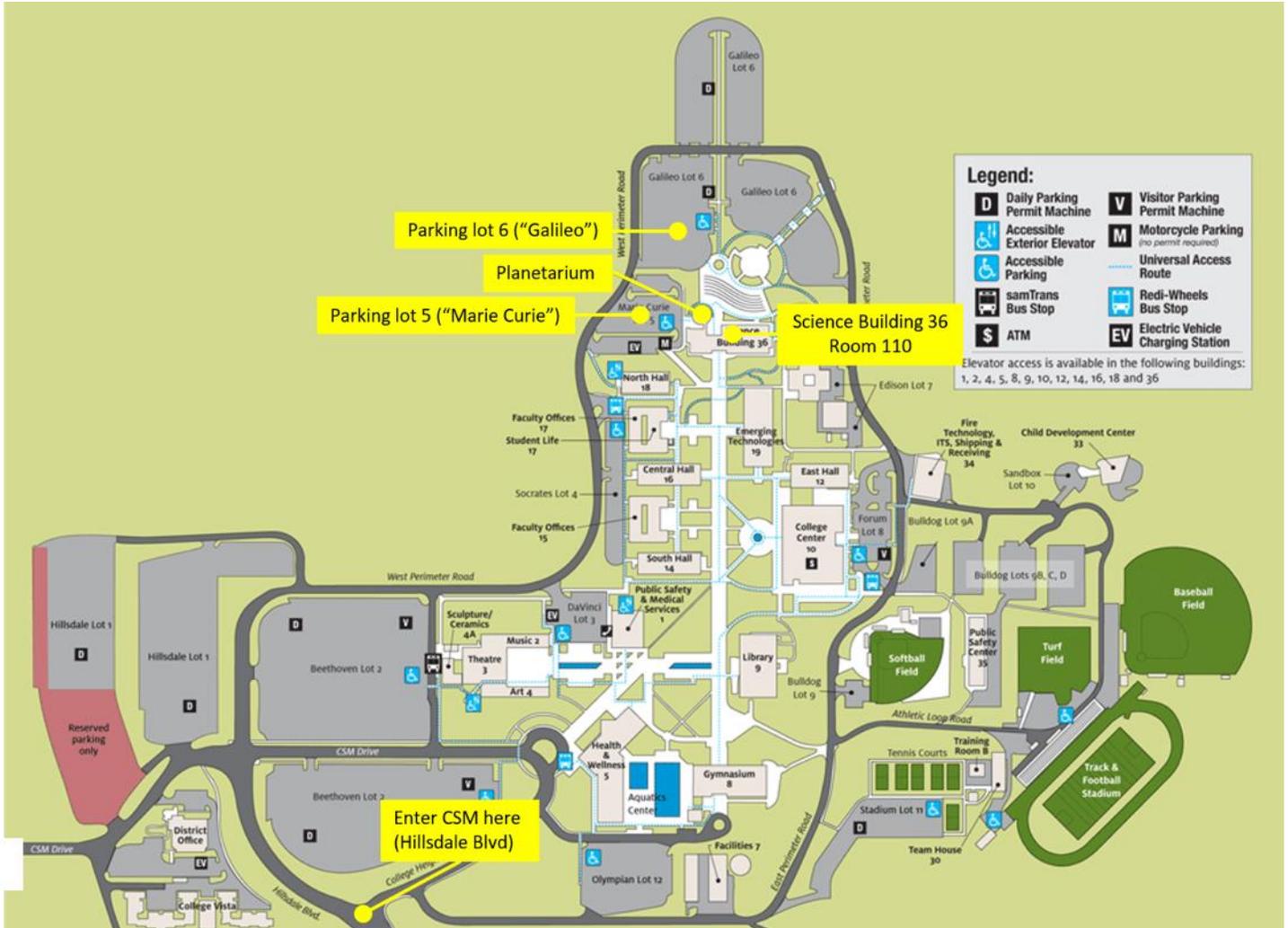
Directions to SMCAS Meetings at The College of San Mateo:

NOTE: CSM is closed due to the pandemic.

SMCAS events are online until further notice.

Directions to the CSM Planetarium for Meetings:

After exiting Hwy 92 at Hillsdale Blvd, climb the hill towards CSM, passing two traffic lights to the stop sign at the top of Hillsdale Blvd. Continue straight onto West Perimeter Road and follow it until you reach Lot 5, "Marie Curie", or Lot 6, "Galileo." Science (ISC) Bldg. (36) and the Planetarium lie straight ahead. Enter Bldg. 36 either through the door facing the lot or walk around the dome to the courtyard entrance. We meet in ISC room 110 for pizza and soft drinks one hour prior to the talk in the Planetarium (Pictured below.)





San Mateo County Astronomical Society

Membership Application

SMCAS@live.com; P.O. Box 974, Station A, San Mateo CA 94403; (650) 678-2762

rev 02272020

Become an SMCAS Member Today! Here's what you get:

- **Members Community**

Friendly advice and guidance from experienced recreational astronomers; access to SMCAS group emails, which provide general orientation information, announcements of astronomy events, file access and exchange.

- **SMCAS Events**

General meetings are held the first Friday of most months, at 7pm in the Integrated Science Center (ISC) Room and Planetarium in the Science Center (Bldg. 36) at the College of San Mateo (CSM), 1700 W. Hillsdale Blvd., San Mateo. Meetings include lectures and presentations on space science, an activity session, and refreshments (usually pizza).

We also offer stargazing two Saturdays a month, weather permitting. Visitors and those without telescopes are welcome; members are glad to share! SMCAS also has sponsored dark-sky campouts at Fremont Peak State Park, field trips to SLAC, KIPAC and Lick Observatory, plus **member-only events, including Star-B-Ques and quarterly potlucks.**

- **Subscriptions (free with your membership)**

The Event Horizon, SMCAS' newsletter, with SMCAS and member information, viewing tips and articles.

The Reflector, published quarterly by the Astronomical League, a national alliance of astronomy groups like SMCAS.

- **Significant Discounts on Equipment and Publications**

Discounts on purchases at Bay Area astronomical equipment retailer Orion Telescope Center, on sky calendars and ephemerides, and on such periodicals as *Sky & Telescope* and *Astronomy*.

- **Access to Loaner Equipment**

Use of SMCAS loaner telescopes and other astronomy equipment.

- **Sharing your Appreciation of Astronomy and Space Science with the General Public.**

Your SMCAS membership helps bring astronomy to interested lay people, especially students and children

Annual Dues: (SMCAS is a tax-exempt non-profit 501(c)(3). Dues may be tax deductible; consult your tax advisor):

\$30 Regular Family Membership; \$15 Student Membership

Every membership includes all members of your immediate family, (including your kids).

To join you can:

Send application (see reverse side), with payment, to: SMCAS, P.O. Box 974, Station A, San Mateo CA 94403.

- Bring the completed application and payment to a meeting or event and give it to any SMCAS officer.
- Go online at <http://www.smcasastro.com>, click on the Membership tab and pay via PayPal.

Membership Application on next page



San Mateo County Astronomical Society Membership Application

rev 02272020

SMCAS@live.com; P.O. Box 974, Station A, San Mateo CA 94403; (650) 678-2762

Date: _____ Please check one: [] New Member or [] Renewal

[] \$30 Regular Family Membership; [] \$15 Student Membership

All members, please indicate areas of interest below. New members, please complete entire form. Renewing members, please provide your name and any information that has changed in the last year.

We will list your name, address, email address, and phone number(s) in our membership roster unless you have checked the box preceding that information. The membership roster is distributed to active members only.

Each member's name and mailing address must be provided to the Astronomical League (AL), SMCAS' umbrella organization. If you don't want AL to have your phone number and email address, indicate below.

[] Name(s) _____ [] Email Address _____

[] Address _____

[] City & Zip Code _____

[] Phone Number(s): _____ [] Do not provide my phone number(s) to the AL.

[] Don't provide my email address to the AL. (Checking this means you can ONLY get **The Reflector** by regular mail)

Please check one: send **The Reflector** [] by mail, or [] by email.

Areas of Interest:

SMCAS encourages member involvement. We invite you to provide additional information about your interests, skills, occupation and prior experience. Please identify SMCAS projects and functions that you might like to help facilitate.

Please indicate which of the following activities might be of interest to you:

____ Star Parties - Do you own a telescope you can bring: Yes () No ()

____ General Meetings - Finding (or being) a Speaker. Official greeter. Set up or take down ISC or refreshments.

____ Family Science Day & Astronomy Festival (Usually at CSM the first Saturday in October).

____ Social Events - Equinoctial and Summer Solstice potlucks, Summer Star-B-Que, Holiday Potluck.

____ SMCAS Membership and Promotional Drives

____ Communications – 'Event Horizon' Newsletter, Website(s), Facebook page, group email, Publicity posting.

____ Educational Programs – School, museum and library star parties, Bay Area Astro teacher assistants.

Other/Comments: _____