Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers January 2022

Events: General Meeting, Monday, January 10, 2021, at the Ronald H. Roberts Temecula Library, Room B, 30600 Pauba Rd, and/or ZOOM, at 6:00 PM.

- **IFI & Gallery by Clark Williams**
- **JWST Update**
- **Refreshments by TBD- Volunteer?**

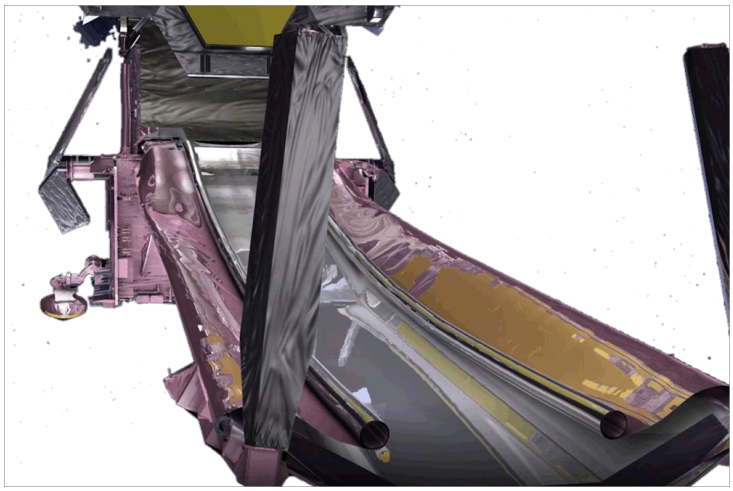
Star Parties at South Coast Winery every Friday evening in January.

For upcoming school Star Parties check the Calendar on the web page.

WHAT'S INSIDE THIS MONTH:

Send newsletter submissions to Paul Kreitz <pkreitz@sbcglobal.net> by the 20th of the month for the next month's issue.

JWST Sunshield Deployed



Check https://webb.nasa.gov/content/webbLaunch/whereIsWebb.html for current status.

General information:
Subscription to the TVA is included in the annual $25 membership (regular members) donation ($9 student; $35 family).

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Secretary: Deborah Baker <geedeb@gmail.com>
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Cosmic Comments – Jan 2022

By Mark Baker

2021 was definitely the Year of the Youngling for TVA… it's not that we "star geezers" backed off in our efforts, but we definitely were blessed to have so many youths get involved and enhance the program throughout the year!!!

Aryan became a fixture at most events, often commandeering a scope (i.e., Deborah's "Cannon") and searching the cosmos for objects to share, and he also "dragged out" many of his fellow HS students to our activities. He utilized TVA resources like Ray Stann, Dr Breann Sitarski, and myself in pursuit of developing his own research projects, which I hope we hear about in an upcoming meeting…

The Western Science Center representatives, twins Arjun and Yudhister, supported many events with their 10" Dob including Hurkey Creek, Lake Skinner, and South Coast Resort… and they were a great help at the WSC daytime Science Days, especially with solar observing. Neither of them shy away from asking hard questions, challenging theory, and Yudhister even did a TedX talk on math education…

And of course, the Berkeley Boys, Michael and Sam, were a great summer resource for us, helping out with scopes and mentoring observers until they returned to school. They even took a loaner scope back up to Cal just so they don't get "rusty" in an application sense while they pursue learning more of astrophysical theory…

We have had several primary age youths repeatedly bring their families out to look at the sky, ask questions of import for them, and engage in dialog advanced beyond their years in many cases… such is the stuff that edifies us all.

So here's hoping TVA can build on their involvement in 2022, and recapture our school programs, where they can inspire and motivate other younglings to follow suit and Look Up…and yes, the mantra still holds - "The Stars Are Calling, So We Must Go"!!! Or at least pave the way for those that follow…

Clear, Dark Skies my Friends…

Looking Up Redux – January 2022

Compiled by Clark Williams
from these sources:
SeaSky.org
Wikipedia.com
in-the-sky.org
The American Meteor Society, Ltd.
cometwatch.co.uk
NASA.gov
TVA App (2.0.1296)
FullAndNewMoon App (2.0)
Starry Night Pro Plus 8
SkySafari 6 Pro
Stellarium
timeanddate.com/astronomy
https://www.fourmilab.ch/earthview/pacalc.html

ALL TIMES ARE LOCAL PACIFIC TIME (PST / PDT) UNLESS NOTED OTHERWISE

Times are given in 24-hour time as: (hh is hours, mm minutes, ss seconds)
hh:mm:ss or hhmmss
hhmm+ (time of the next day)
hhmm− (time of the previous day)
hhmm (seconds not shown)
yyyymmddThhmmss (Full date as: year month day Time separator hours minutes seconds)

Moon Phases for the month by date:

Monday	**the 17th**	**@ 1549 FULL in CANCER**
Tuesday	**the 25th**	**@ 0542 THIRD QTR in VIRGO**
Sunday	**the 2nd**	**@ 1034 NEW in SAGITTARIUS**
Monday	**the 31st**	**@ 2147 NEW in CAPRICORNUS (Black Moon)**
Sunday	**the 9th**	**@ 1012 First QTR in PISCES**

Apogee comes on 2022-01-01 @ **1501 – 405,804 km (252,155 mi)**
Perigee comes on 2022-12-04 @ **0202 – 358,793 km (222,473 mi)**

2022 has: (12) new moons, (13) 1st Qtr moons, (13) Full moons, (12) 3rd Qtr moons
(1) Blue moon and (0) Black moons

Daylight Savings: Starts: 2022-Mar-13 : Ends: 2022-Nov-06

Luna: Luna is Waning Crescent on the first of the month, headed for NEW on the 2nd rising at **0551**, transiting at **1050** and setting by **1549**. Luna by mid-month is 97% illuminated, Waxing gibbous. Rising at **1505** and

transiting at **2238** and setting at **0611+**. By the-end-of-the-month Luna is New, rising at **0639-** transiting at **1146** and setting by **1653**.

Highlights: (distilled from**: SeaSky.org** and **Clark's planetary Orrey** program[s]**)**

January 2 - New Moon. The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 1034. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.

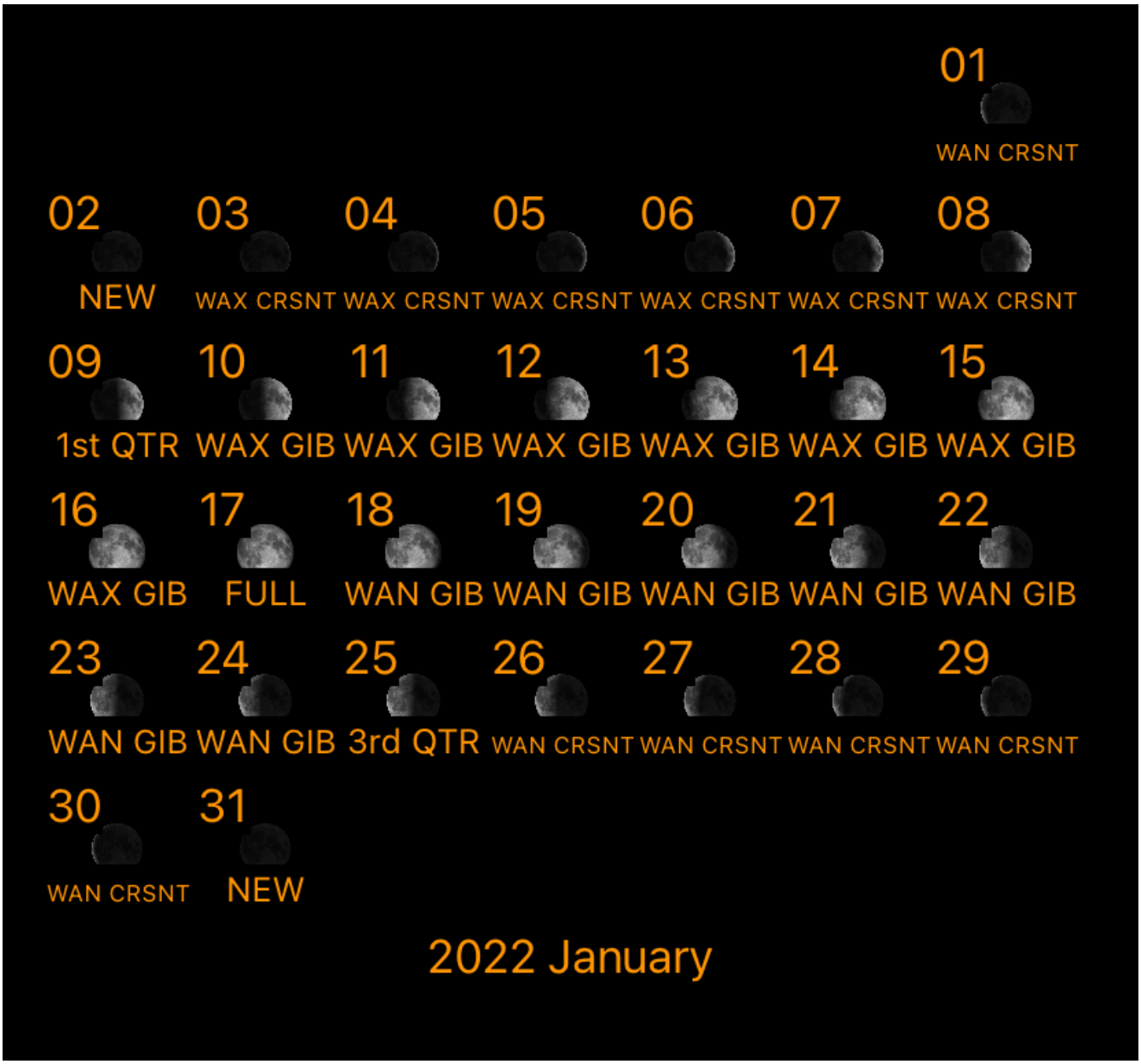
January 3, 4 - Quadrantids Meteor Shower. The Quadrantids is an above average shower, with up to 40 meteors per hour at its peak. It is thought to be produced by dust grains left behind by an extinct comet known as 2003 EH1, which was discovered in 2003. The shower runs annually from January 1-5. It peaks this year on the night of the 3rd and morning of the 4th. The thin, crescent moon will set early in the evening leaving dark skies for what should be an excellent show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Bootes, but can appear anywhere in the sky.

January 7 - Mercury at Greatest Eastern Elongation. The planet Mercury reaches greatest eastern elongation of 19.2 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the evening sky. Look for the planet low in the western sky just after sunset.

January 17 - Full Moon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 1549. This full moon was known by early Native American tribes as the Wolf Moon because this was the time of year when hungry wolf packs howled outside their camps. This moon has also been known as the Old Moon and the Moon After Yule.

Algol minima: (All times Pacific Time)

01/02/2022	**1631**
01/05/2022	**1320**
01/08/2022	**1009**
01/11/2022	**0658**
01/14/2022	**0348**
01/17/2022	**0037**
01/19/2022	**2126**
01/22/2022	**1816**
01/25/2022	**1505**
01/28/2022	**1154**
01/31/2022	**0843**


01
WAN CRSNT
02
NEW
03
WAX CRSNT
04
WAX CRSNT
05
WAX CRSNT
06
WAX CRSNT
07
WAX CRSNT
08
WAX CRSNT
09
1st QTR
10
WAX GIB
11
WAX GIB
12
WAX GIB
13
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14
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15
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16
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17
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19
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21
WAN GIB
22
WAN GIB
23
WAN GIB
24
WAN GIB
25
3rd QTR
26
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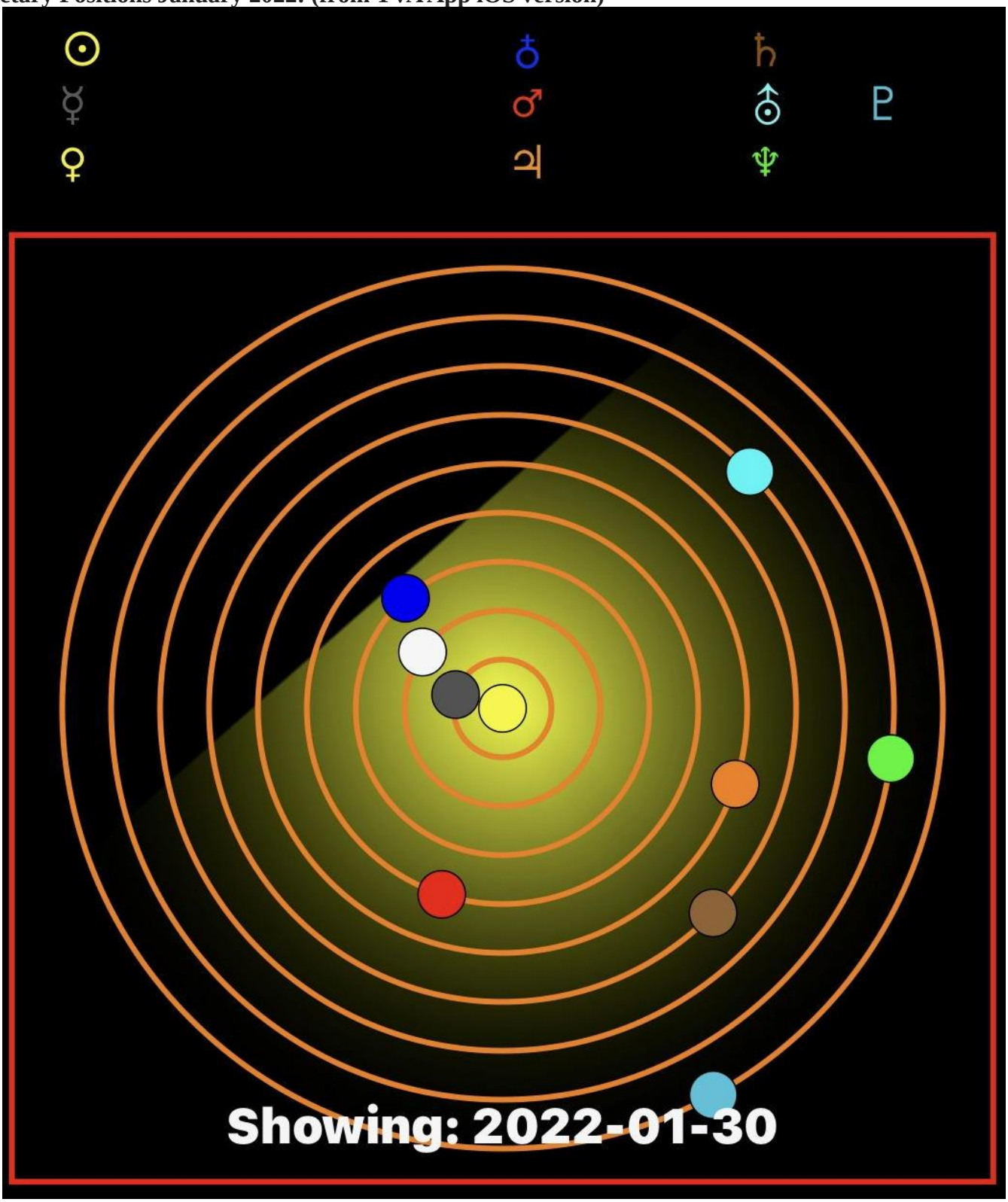
NEW
2022 January

Planets:

Planetary Positions January 2022: (from TVA App iOS version)



- **Mercury:** Mercury is an evening object in the beginning of the month, setting by **1813** preceded by sunset at **1653**. Mercury by mid-month remains an evening object., setting at **1814** after sunset at **1705**. By the 31st Mercury is a morning object rising by **0537** and sunrise is at **0644**.
- **Venus:** Is the Evening Star on the first of the month, setting by **1751**, preceded by sunset at **1653**. By mid-month Venus is a morning object rising at **0552** followed by sunrise at **0651**. By the 31st Venus is rising at **0432** followed by sunset at **0644**.
- **Mars:** Mars is a morning object on the first, rising at **0452**, followed by sunrise at **0651**. By mid-month Mars is rising at **0443** preceding sunrise at **0651**. End-of-month finds the Warrior rising at **0432** with sunrise at **0644**.
- **Jupiter:** Jupiter is an evening object on the first of the month visible from about **1800** until it sets at **2046**. By mid-month Jove is setting at **2004**. Come the end of the month Jupiter is setting by **1919**.
- **Saturn:** Saturn is leading Jupiter during January. Saturn is visible from about **1800** until it sets at **1915**. Saturn by mid month is setting at **1828**. By the end-of-the-month Saturn is **lost to the Sun**.
- **Uranus:** On the first of the month Uranus is transiting by **1940**, and does not set until **0224+**. By the ides Uranus will transit at **1844** setting at **0128+**. End-of-month finds Uranus transits at **1738**, setting at **0021+**.
- **Neptune:** Neptune is leading Uranus during January. Neptune transits at **1630** in the beginning of the month and does not set until **2220**. By the 15th Neptune is not setting until **2127**. By the-end-of-the month Neptune is visible an hour after sunset (**1652**) and sets at **2224**.
- **Pluto:** Pluto is an evening object on the first of the month; Pluto doesn't set until **1755** following sunset at **1653**. By mid-month Pluto is lost to the Sun. By the 31st Pluto is now a morning object, rising at **0602** followed by sunrise at **0644** .

Asteroids:

- Still a dearth of asteroids. I searched for asteroids in 2022 with a reasonable magnitude; say less than or equal to +10 in January there is nothing except the regulars: Juno, Vesta. Hebe, Eros and Herculina. So consult your local planetarium software or try: **https://www.asteroidsnear.com/year?year=2022**

Meteors:

- Quadrantids Meteor Shower is back! **See *Highlights* (above).**

Comets: come in various classifications:

- 1) Short Period comets – further broken down into:
  - Halley Type: The Halley Types are believed to come from the Kuiper Belt and have periods in excess of 20-years.
  - Jupiter Type: The Jupiter types have a period less than or equal to 20-years.
  - Short period comets in January have a near circular orbit or an elliptical orbit. The latter being far more common.
- 2) Long Period comets – thought to originate from the Oort cloud these comets have periods of over 200 years and have random inclinations around the celestial sphere.

The brightest visible comet this month is at Magnitude 15.8; comet C/2021 D2 (ZTF). On the 15th it will be at Mag +15.8. Its circumpolar; at 2100 on the 15th you can find it at:
AZ: 000° 46' 14.3” / Alt: +19° 50' 18.3”.

Deep Sky:
Notes:

L/Z abbreviation for ALT/AZ
R/D abbreviation for Right Ascension/Declination
α is right ascension
δ is declination
In each case, unless otherwise noted, you should look for the following on or about the 15th Day of January 2022 at 2100 PDT and you will have about 20 minutes of viewing time total.

One especially for Paul this month; an interesting nebula.

- M16**:**

Illustration 1:By ESO – http://www.eso.org/public/images/eso0926a/ CC BY 4.0 https://commons/wikipedia.org/w/index.php?curid=7338740

The Eagle Nebula A.K.A.: Messier 16 or M16, and as NGC 6611, and also known as the Star Queen Nebula and The Spire, is a young open cluster of stars in the constellation Serpens, discovered by Jean-Philippe de Cheseaux in 1745–46. Both the "Eagle" and the "Star Queen" refer to visual impressions of the dark silhouette near the center of the nebula, an area made famous as the "Pillars of Creation" imaged by the Hubble Space Telescope. The nebula contains several active star-forming gas and dust regions, including the aforementioned Pillars of Creation. The Eagle Nebula lies in the Sagittarius Arm of the Milky Way. (Wikipedia)

M17:

Illustration 2: By ESO/INAF-VST/OmegaCAM. Acknowledgement: OmegaCen/Astro-WISE/Kapteyn Institute – http://www.eso.org/public/images/eso1119a/

The Omega Nebula, also known as the Swan Nebula, Checkmark Nebula, Lobster Nebula, and the Horseshoe Nebula (catalogued as Messier 17 or M17 or NGC 6618) is an H II region in the constellation Sagittarius. It was discovered by Philippe Loys de Chéseaux in 1745. Charles Messier catalogued it in 1764. It is by some of the richest starfields of the Milky Way, figuring in the northern two-thirds of Sagittarius. (Wikipedia)

January is great for both viewing and imaging.
Spend some time outside with your scope. Winter is here.

For now – Keep looking up.

RANDOM THOUGHT
By Chuck Dyson

HOW AND WHAT WILL JAMES WEBB SEE?

Hopefully when this article comes out the James Webb Space Telescope (JWST) will be safely on its way to a stable orbit around the L2 point just a little over 1.500,000 kilometers from Earth, that is 3.9 times the Earth/Moon distance. While taking a leisurely 30 day cruise to the L2 destination the telescope will unpack itself and if you are a betting person and want to bet on a malfunction occurring then I suggest that you bet on the solar shade, the telescope's heat shields, not deploying completely. Even though we have been bombarded with information on how tricky the folding and unfolding of the mirrors, primary and secondary, is going to be the solar shield will be trickier to accomplish and just as critical to the operation of the telescope. When what you are observing in the infrared spectrum heat is the equivalent of sky glow for the telescope doing the observing; so, the heat shields, (there are five) must be deployed and spaced properly to obtain the desired reduction of the Sun's energy on the Webb telescope for maximum operational efficiency. The goal is to reduce the 1372 watts of energy per square meter that the shield receives on the Sun side to 0.02 watts on the telescope side, or as one astronomer said "If the shields were your suntan lotion it would have a SPF of ten million". To do this the plastic film on the Sun side must not melt at its 85° Celsius (C) operating temperature and the plastic film on the dark side must not become brittle and break at -223° (C); in addition, all of the plastic films must not tear under the tension of deployment in order to work properly. If the heat shields deploy partially or if the five shields are not able to be spaced properly then the telescope may still be partially operational but some of the mission goals may be out of reach.

Let us just presume that the solar shield has deployed successfully and completely and we are arriving at the L2 location. L2 is the spot 1.5 million kilometers from our hot Earth where the gravity of the Earth and the Sun are equal and in line with each other. This will enable the JWST to stay on station and on target with very little expenditure of fuel, think longer service life. Unfortunately, JWST cannot be exactly at the L2 point because that point is in the Earth's shadow and there would be no light for the solar panels; so, JWST will be in a small circular orbit around the actual L2 point this will use more fuel than just being at the actual L2 point but will still, hopefully, allow the mission to be extended from its present five year life to a ten year life.

As soon as the heat shield is out the telescope will start its own deployment but by deploying the heat shield first the telescope will already be starting to cool to its nominal operating temperature of -223° C. The telescope will reach the -223°C temp after 77 days of cooling; however, the spectroscope that operates in the longest infrared wavelengths will require another 19 days of active cooling with helium to reach its operating temperature of -266°C, that is just 7° C above absolute zero!

The mirrors on the telescope are made from the metal beryllium because it is lighter than glass and is very rigid, holds its shape exceedingly well even when ground very thin, and has a better low temperature coefficient thermal expansion when compared to glass. And as an added bonus, despite the fact the JWST has 5.6 times the surface area of the Hubble, the JWST

beryllium mirrors weigh in at 113 kilograms less than Hubble. As a final touch the JWST mirrors are coated with a gold film, not because NASA was rich enough to do it, but because gold is the best reflector coating for infrared telescopes. In summary, the JWST is designed and constructed to only be an infrared telescope and will be deployed at a location that is compatible with its operational goals.

The JWST will make its observations with four main instruments, the first of which is the Near-Infrared Camera (NIRCam). This camera will operate in the red end of the visible spectrum and the near infrared, and thus the acronym NIRCam, and will employ a chronograph to block out the direct light from a star in order to optimize the view of the star's planet forming dust ring.

Working with NIRCam is the Near-Infrared Spectrometer (NIRSpec). Just as the name suggests this is not a photographic camera but a dedicated spectrograph that can work on objects both near (red visible light) and far (infrared spectrum) and has the capability to record the spectrographs of up to 100 objects at the same time because it has a Micro Shutter Assembly (MSA) installed over the photographic chip. The MSA is a system of 250,000 really small, hinged plastic plates on a grid and the plates can be opened or closed by changing their electrical charge. When a researcher wants to record the spectra of multiple objects at one time then the plates over the objects of interest are kept open and all others are closed, thus blocking their light, and very clean spectrographs of the desired objects can be obtained.

Our final optical instrument, but not our final instrument, is the MidInfraRed Imager (MIRI). The MIRI will look at the longest IR waves that the JWST is capable of seeing and will look back the farthest in time. The MIRI will not play well with the other two imaging systems because they are happy at 50° C over absolute zero but MIRI, in order to see clearly the longer IR waves must be at no more than 7Ȝ° C over absolute zero and so must have an accessory active cooling system and stay away from the warmer imagers. The reader should realize that "warmer" in this system does not imply a summer day at the beach. The MIRI spectrograph can "see" close relatively cool objects emitting only longer wave photons or "hotter" objects billions of light years away who's photons have been stretched, red shifted to much longer wave lengths.

Our final instrument is a bit of a house keeping one and a processing unit for the other three. The Fine Guidance System/Near-InfraRed Imager and Slitless Spectrograph (FGS/NIRISS) (yes, this is our last and longest NASA loved acronym). Despite the fact that The James West mirror has over six times the surface area of Hubble it will still need to stare at objects for over a hundred hours to accumulate enough photons to create the images and spectrographs for researchers. For those hundred hours JWST must stay exactly on target or the objects being imaged will slip under some of those closed micro shutters and the image will be lost; therefore, the FGS will be the most important instrument on James Webb. The light from the objects that FGS is focused on will come through the NIRISS and be broken up into its spectral components. The slitless spectrograph is not your father's spectrograph. The slitless spectrograph has a grism (grating prism) and unlike the slit spectrograph where only a small sliver of the light entering the detector is passed on to the spectrograph, in the slitless spectrograph all light from all sources is broken up into spectra. This can get verry messy very quickly; so, in order to prevent messiness the incoming light can be filtered to a narrow range of wavelengths and/or

light from the unwanted can be eliminated by closing the micro shutters over the unwanted sources.

OOPS! I almost forgot. The very first telescope component to be deployed, 31 minutes after launch to be exact, will be the solar panels. The JWST has only enough battery power for three hours of operation; if the solar panels do not deploy then five hours after launch there will be a new asteroid in near Earth orbit, and that's really bad.

What will the JWST actually look at? Anything that radiates photons in the infrared. Do you want to look at rocky objects, formed at the birth of our solar system, in the Kuiper belt or the L4 and L5 Lagrange points of Jupiter; no problem. Want to go farther, out to hundreds of light years, and look at the atmospheres of planets whose orbits carry them in front of their suns from our perspective; no problem. Researchers are especially interested in these planets because when they are in front of the star their atmospheric spectra are added to the star's spectra and when the planet is in back of the star it is absent.

James Webb will obtain very detailed exo planetary spectrographs this way. Researchers are very interested in hycean exo planets. Hycean is a created word that means hydrogen/ocean and refers to planets that are super-Earths or mini-Neptunes (the most common type of exo planet found to date), and recent modeling indicates that some of these types of exo planets may have conditions that could support life. Do you want to see what solar systems that are just starting to form look like? The NIRCam and the NIRSpec will team up to make you the happiest researcher on the planet. Do you want to go all the way,12.5 billion years ago, back to the first light in the universe and see how the first stars and galaxies formed? The MIRI was built specifically to do just that. Even though infrared goes through dust way better than visible light there is some of it that gets absorbed and if you are looking through 12.5 billion light years of universe there is a lot of dust along that photon's path. The longer the photon's wavelength the less likely it is to be absorbed and MIRI is designed to look for those lucky long wavelength survivors of that journey.

James Webb will address so many of cosmologies' big questions that it is easy to see why so many in the science community are excited about the pending launch and so scared that that it may not go off perfectly.

Let's ALL keep our fingers crossed until the first images come in from L2!

Cheers,
Chuck

Another Look

By Dave Phelps

January 2022
New moon Jan 2 Wolf Moon
New moon Jan 31 Black Moon

We have been spending a lot of time in the third and fourth hours of right ascension recently, and it seems that won't change much going forward this month... except with one notable exception. It has been my intent to take another look at those constellations that are earlyish evening for us. It seems that many of our star parties began at evening twilight and faded off by midnight, though now, it seems, I'm only good till about nine.

The exception this month will be Auriga because I associate Auriga with Perseus. We are also going to travel south to Taurus, Eridanus and Fornax and pick up a few faint and fuzzies.

As I mentioned before, Idyllwild has a good negative southern horizon. Back then the only lights were the distant San Diego light dome and by midnight any extraneous lights seemed to have calmed down. In Anza, and those of you in the mountains outside San Diego and especially those fortunate few with their homes in Hawaii or Cabo will be able to find the Fornax Dwarf, maybe.

Fornax is another one of those "modern" constellations with modern names, Fornax- the Furnace. I don't really know how to tell you to get there. Have dark skies, dark adapted eyes, a faint red light to see your planisphere and follow a line down from the Perseus waterfall. Once you've identified the 3rd and 4th magnitude stars that make up α and β Fornacus look 4.5 telrad fields south and a little east of Beta and you will find the location of the Fornax dwarf near the two Lamba λ's. You may not see it. It is difficult in amateur telescopes even though it has a surface brightness of 9. Surface brightness… that's a sham inflicted upon us poor amateurs to give us false hope that we might actually be able to see that blasted object. Good luck. Thanks to Wikipedia for the image of the Fornax Dwarf

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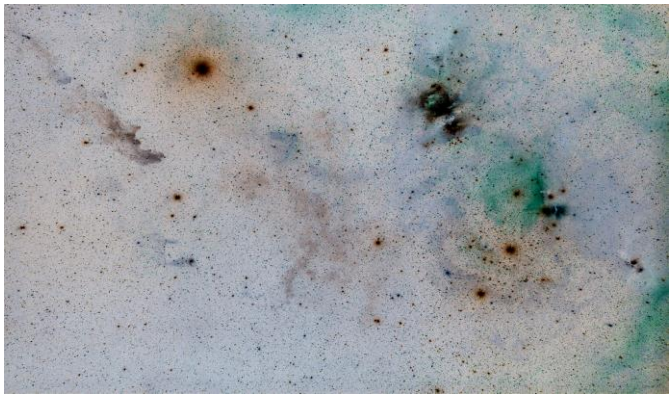
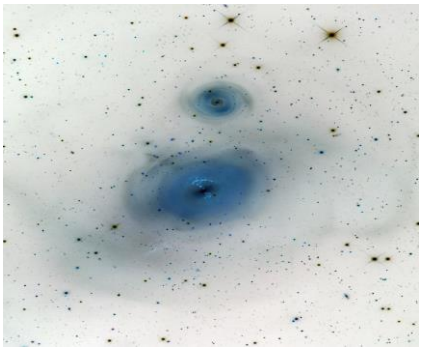
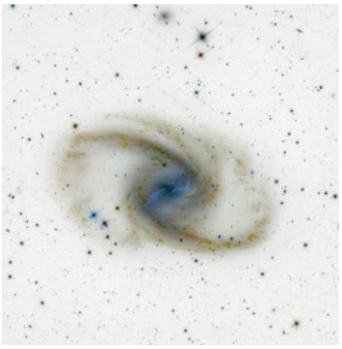


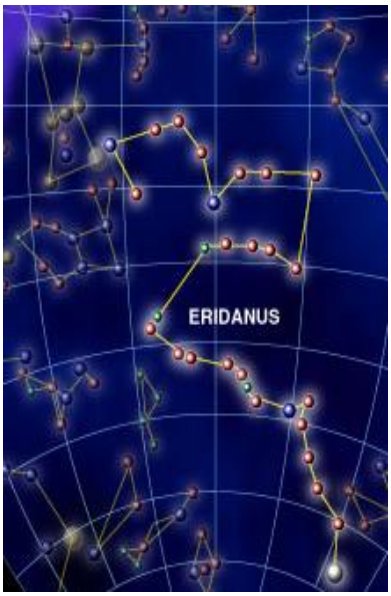
Once you've added the Fornax "System" to your life list, move your Telrad about three fields towards the left, that is towards Canis Major and put a wide angle eyepiece in your scope. You will see practically the whole Fornax Cluster in your one degree field of view. Ellipticals, Barred, Spirals, Edge on, they're all there, and almost all at 11th magnitude or fainter. If you are up to the task, pull out a finder chart and check out NGC 1316, Fornax A, a bright radio source and NGC 1365, an 11th magnitude version of a terrific barred spiral. No, I did not see the bar,



Fornax A is 9th magnitude, so it should be identifiable in your moderate backyard telescope. Big scopes show a resemblance to Centaurus A. APOD posted a pretty remarkable image last January. Thank you to APOD for the images of NGC 1365 and Fornax A

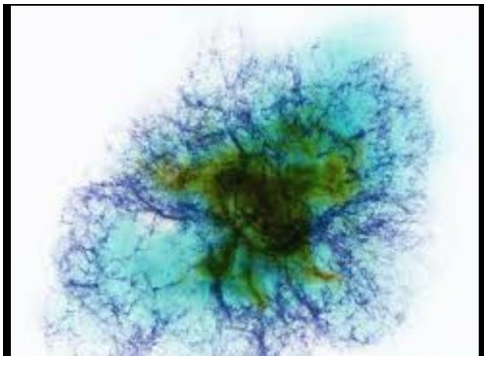


My total interest in Eridanus was limited to seeing how far down I could follow its stars into the muck at the horizon. Not all that far as I remember. Then, it seems, all at once we are inundated with images of the Witch Head Nebula as if it were our fault we haven't been taking snapshots of it all these years. I checked my memory, my atlases and my books and have found no special identifying characteristics that tells me I let a big one get away. Still, I spent many hours at or around M42 searching out neighboring objects and never once looked for the Witches Head. It is definitely a photographic object, a reflection nebula, big at 3x1 degrees, and visually it is 13th magnitude, I expect a biggish telescope and filter. It's right next to Rigel, so I guess it will have to go into the bucket.



Eridanus is one of the 48 Greek constellations, first catalogued by the Greek astronomer Claudius Ptolemy in the 2nd century BCE. It is associated with the Greek myth of Phaëton and usually depicted as a river flowing from the waters poured by Aquarius. The constellation's name was later used as a Latin name for the river Po in Italy. In Sanskrit, Eridanus is called *srotaswini*, which means "current or "course (of a river)." (Thank you to the interweb for the last paragraph and highly massaged graphic and the awesome wide field.)

If you go back far enough, you can usually find some sort of connection to the name and lore of the Pleiades and the Hyades. The Pleiades is thought to come from the Greek gerund "to sail" and the Hyades probably marked the beginning of the rainy season. Did the rising of the Pleiades mark the time of the year when it was customary for the merchant and fishing boats to safely leave harbor? How about the Hyades weeping for their brother marking the beginning of the rainy season. Surely the lore of the two

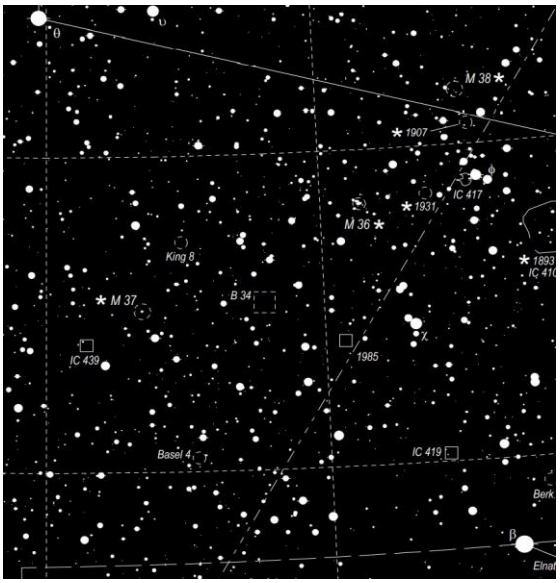


asterisms goes back thousands of years. Cuneiform in Mesopotamia identified the sisters by seven (7!) dots. The Old Testament has three references where the Pleiades are named, the Indian references are too confusing and the Japanese have named a car after them. Go figure. The honors, though, probably go to the Persians who named a Shah's wife after them. One reference I read said they go back 100,000 years. I don't need to say a lot about them. All of us have tried to take a picture using your old 35mm, some more successfully than others. Mine pretty much stink. What I remember best about them, however, is the night at RTMC years ago when a pair of 5" binoculars was set up on the telescope field. The cluster and the nebulosity around the cluster was one of the more beautiful things I ever seen through a telescope.

The Pleiades and the Hyades are in Taurus and Taurus is a really big constellation. Stretching from Cetus west to Auriga, who shares a star, to Gemini. It has the Pleiades, Hyades, Aldebran, Open Clusters, Supernova remnants and a variable nebula. This month though, I think we'll stick with one, M1, the Crab nebula. If β is the star at the end of the northern horn, then ζ Zeta is the star at the southern, closest to Gemini and Orion.

We all know about the Chinese who describe a "guest" star a thousand years ago. It's not too hard to find. A degree of so from Zeta ζ and rather bright at 8th magnitude. I don't think I've ever seen any colors, though maybe one of you can take a spectroscopic image that will pull some up. The Crab is very radio active. Its core is a pulsar that shine like the dickens in the radio frequencies and Hubble has found outward waves moving from the core. An interesting historical note is that it was the Crab that inspired Messier to start a list of comet looking objects. I still remember the special feeling I had the first time I found it.

If we go to the end of the other horn we find β Aurigae, or Elnath, the Horn star shared between Taurus and Auriga. Auriga is a fortunate constellation for us. It is far enough north to be easily visible and it has a bunch of really cool objects. A supernova remnant, open clusters, nebula and a wild variable star lighting the nebulosity around it.



Let's travel from Elnath to Capella. You will find Simeis 147, a big, hard to find supernova remnant. Instead of star hopping you can Messier hop from the open clusters M37, M36 and M38. From there to open cluster NGC 1907. Very near are reflection nebulas NGC 1931 and difficult but impressive IC 417. There is more to find as we hop to IC 405, the Flaming Star Nebula. This nebula was a destination before it was ever named because we though AE Aurgae was a Wolf-Rayet star. It's not, but it is very hot, very blue and very energetic. It lights up the gas giving us a reflection and emission nebula. Very cool indeed.

Our last object this month has been described as "enough different from something to be nothing". It's Barnard 34, a dark hole in the Milky Way close to M37. Its finder chart is below. I believe that you will find it a challenge. Thank you to APOD for the image of IC 405 and Deep Sky Hunter the finder chart to B 34

Dark Skies, Dave Phelps

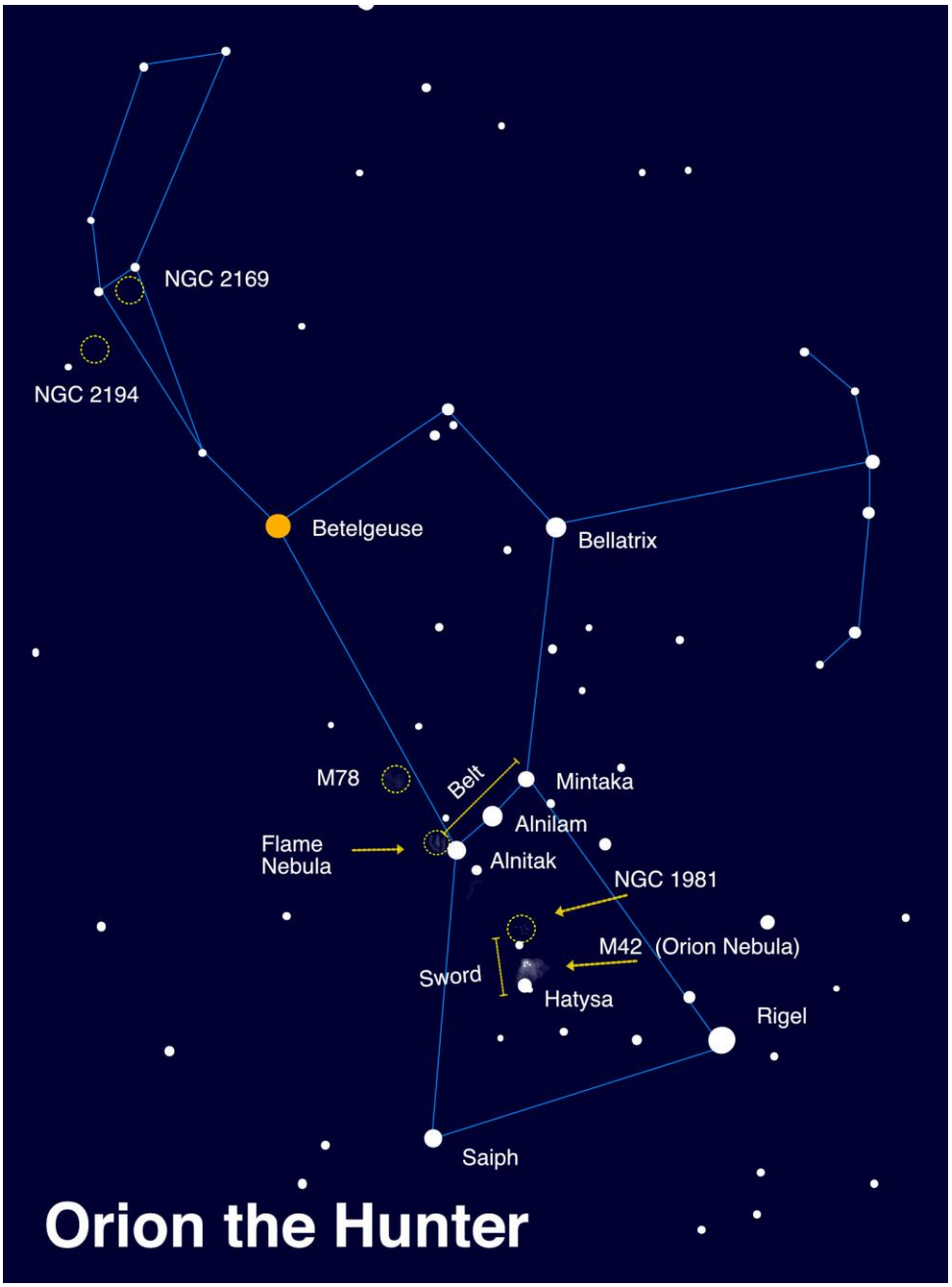
Hunting the Hunter: Observing Orion
By David Prosper – NASA - JPL

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.



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.

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

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