Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers January 2023

Events: General Meeting, Monday, January 9,2023, at the Ronald H. Roberts Temecula Library, Room B, 30600 Pauba Rd, and/or ZOOM, at 6:00 PM.

- **IFI & Gallery by Clark Williams**
- **"Ingenuity … Lest we forget"**
  - **by Mark Baker**
- **Refreshments by Kathleen Hefley**
- **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.

The City of Wildomar presented TVA with a plaque in appreciation for the Star Parties we provide for the city. Accepted by John Garrett who performs the star party presentations. This is a reflection of the fantastic work John does for the club.

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: Bill Hawk billyb577@gmail.com
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Cosmic Comments –January 2023

By Mark Baker

Anyone who knows me recognizes that I am a lifelong “Water Boy” as I have espoused that water in every form is not just a terrestrial feature, but is everywhere inside the heliosphere and throughout the Universe as well. And yes, that means that there is water on Mars, in ever increasing quantities as new revelations arise…

Along these lines, an obscure theory was proposed back in 2006 based on research in 2001, that there are even geysers on the Red Planet, especially in the southern polar region. Did you know there are GEYSERS?? These become more obvious, frequent, and more intense as Winter gives way to Spring… the after effects have intrigued us for decades as they show as dark, if not black, residuals on the slopes of the dunes until the “water” sublimates with continued warming. They disappear with the return of colder temperatures and the cycle starts all over again…

However, water alone doesn’t explain the phenomenon and it is now being widely accepted that Life may be involved… microbial at best, and even bacterial perhaps, but when ALL related research is comprehensively reviewed, the possibility becomes quite weighty!!!

Now I for one, as with water everywhere, firmly believe that Life may be just as pervasive… and I have stated emphatically that I believe Mars not only had Life, but that it still does!! My curiosity as to what lies at the bottom of Valles Marinaris is overwhelming… but like everything else in the Cosmos, we just don’t know how to look for it – yet!!!

One of the joys of the South Coast Star Parties for me is the dialogs that we are privileged to enjoy… we have had some great discussions of the What If nature, and I appreciate all those that have participated, even if my brain hurt afterwards.

So, thank you TVA… I am in your debt for such experiences if nothing else. And our communities also benefit from all such “out of the box’ ponderings…can’t wait to see where we get to this year!!!

Clear, Dark Skies my Friends…

Looking Up Redux – January 2023

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 7 (7.6.3.1373)
SkySafari 6 Pro (6.1.1)
Stellarium (0.18.2)
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:

Friday	the 6th	@1509 FULL in GEMINI
Saturday	the 14th	@1811 THIRD QTR in VIRGO
Saturday	the 21st	@1254 NEW in OPHIUCHUS
Saturday	the 28th	@0720 First QTR in ARIES

Apogee comes on 2023-01-08 @ **0120 – 406,458 km (252,561 mi)**
Perigee comes on 2023-01-21 @ **1259 – 356,569 km (221,562 mi)**

2023 has: (12) new moons, (12) 1st Qtr moons, (13) Full moons, (12) 3rd Qtr moons
(1) Blue moon and (0) Black moons

Daylight Savings: Starts: 2023-Mar-12 : Ends: 2023-Nov-05 (traditional) CA keeps PDT year-round

Luna: Luna is waxing gibbous on the first of the month, headed for Full on the 8th rising at **1306**, transiting at **2006** and setting by **0313+**. Luna by mid-month is waning crescent at 42% illumination. Rising at **0021**- and transiting at **0603** setting at **1144**. By the-end-of-the-month Luna is waxing gibbous, rising at **1256** transiting at **2029** and setting by **0405+**.

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

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. This year the nearly full moon will block out most of the fainter meteors. But if you are patient, you may still be able to catch a few good ones. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Bootes, but can appear anywhere in the sky.

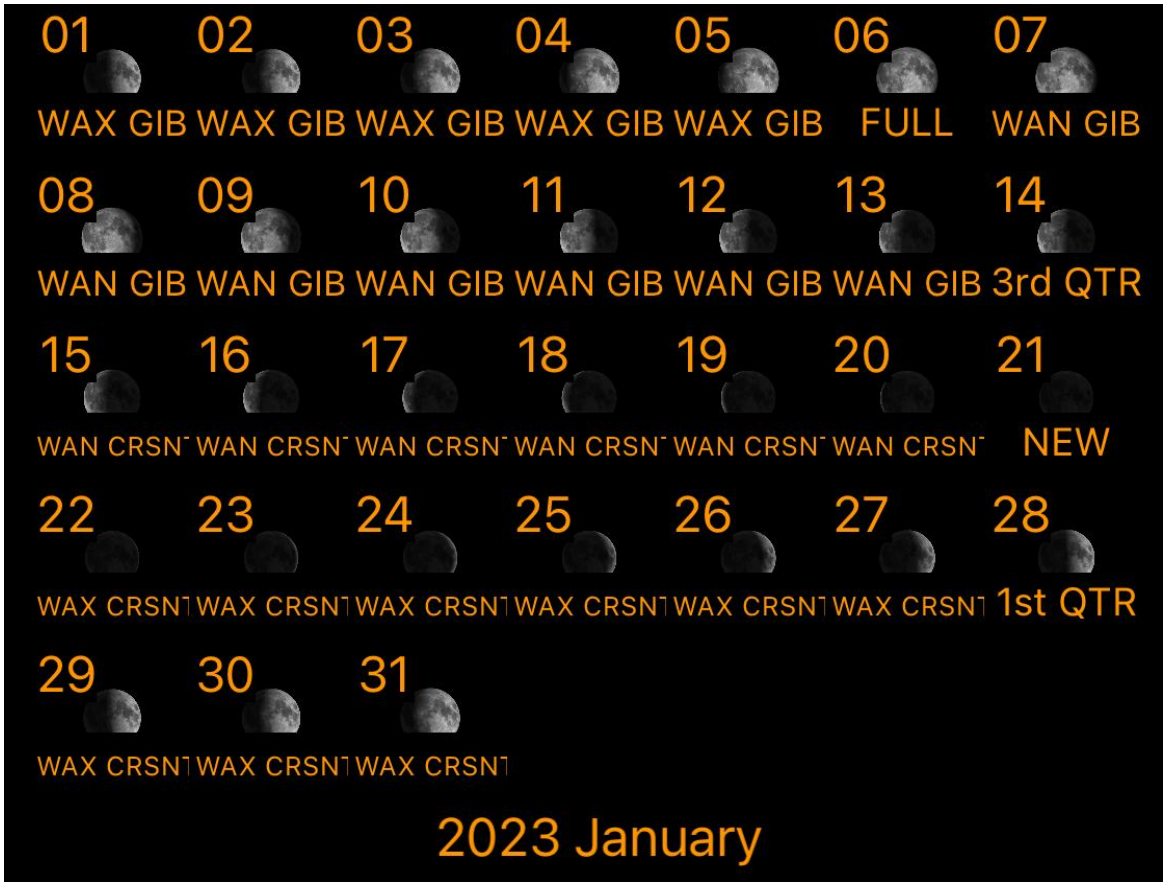
January 6 - Full Moon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at **1509**. This full moon was known by early Native American tribes as the Wolf Moon because this was the time of year when hungry wolf packs howled outside their camps. This moon has also been known as the Old Moon and the Moon After Yule.

January 21 - 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 1255. 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.

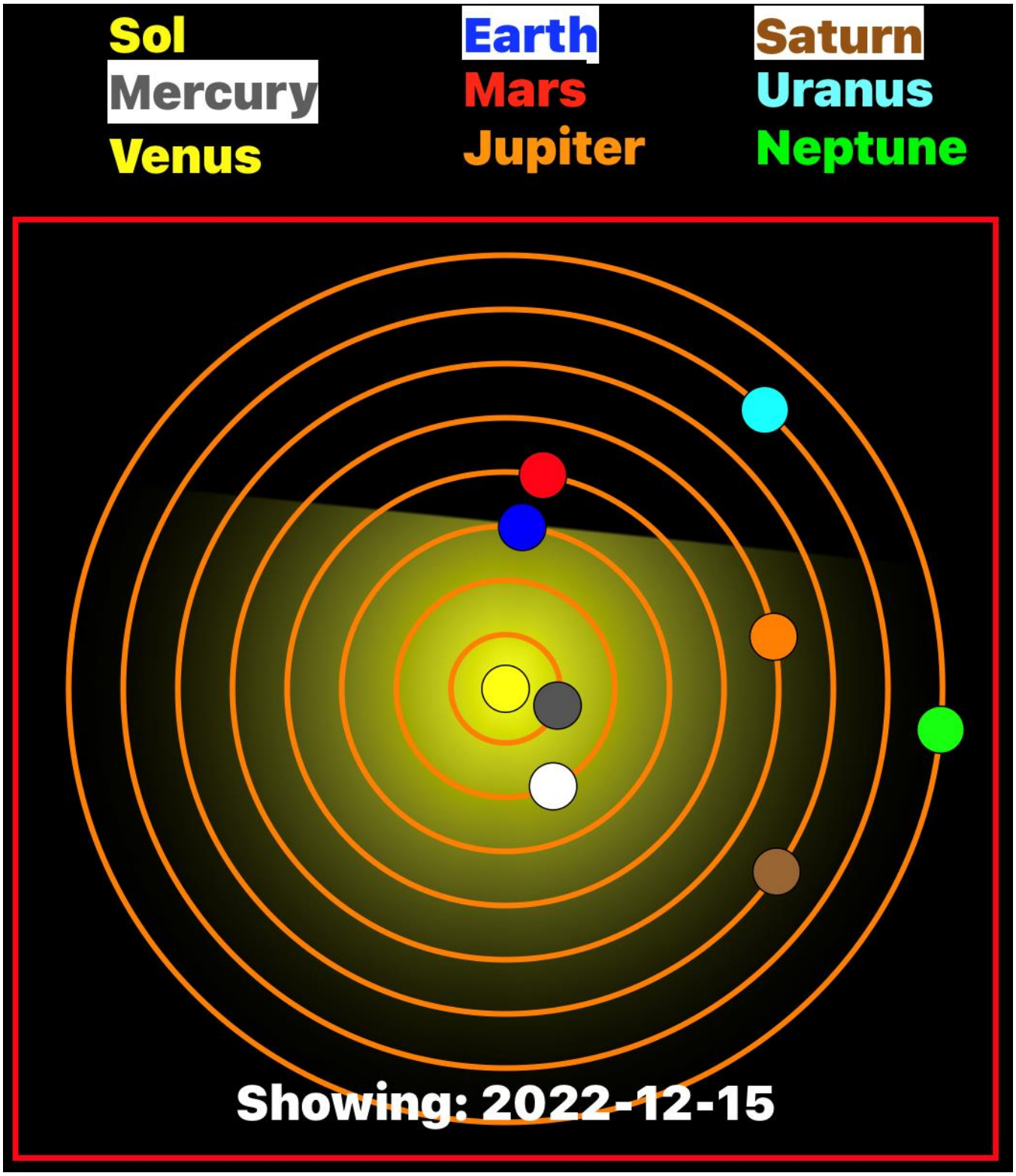
January 30 - Mercury at Greatest Western Elongation. The planet Mercury reaches greatest western elongation of 25 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the morning sky. Look for the planet low in the eastern sky just before sunrise.

Algol minima: (All times Pacific Time)

01/01/2023	**1942**
01/04/2023	**1631**
01/07/2023	**1320**
01/10/2023	**1009**
01/13/2023	**0659**
01/16/2023	**0348**
01/19/2023	**0037**
01/21/2023	**2127**
01/24/2023	**1816**
01/27/2023	**1505**
01/30/2023	**1155**



Planets:
Planetary Positions January 2023: (from TVA App iOS version)



- **Mercury:** Mercury is a morning object in the beginning of the month. It is illuminated at 78% and -0.35 apparent magnitude. Mercury rises at **0520** with the sun following at **0652**. Mercury by mid-month is in a much better position for viewing. Mercury is still a morning object rising at **0557** with the .Sun rising at **0651**. By the 31st Mercury has "fallen" in toward the Sun again making it riskier to view. The Sun rises at **0644** and Mercury rises at **0633**. You're not going to see Mercury in the early morning glow. Wait until next month.
- **Venus:** Is the Evening Star on the first of the month, setting by **2035**. Venus is 55% illuminated and has an apparent magnitude of -4.36. By mid-month Venus is setting at **2050.** By end of month Venus sets at **2056**.
- **Mars:** Mars is back in the sky and growing brighter as an evening object. On the first of the month Mars is rising at **1807**, transits at **0118+** and the sun doesn't rise until **0652**+ Perfect for imaging and viewing. By mid-month Mars is rising at **1645**, transits at **0001+** and doesn't set until **0716+**. End-of-month finds the Warrior rising at **1519** transiting at **2238** and setting at **0557+**. All month long Mars is in a good position to view or image.
- **Jupiter:** Jupiter is an evening object on the first of the month rising at **1442**, transiting at **2147**. and setting at **0452**+. By mid-month Jove is rising at **1342**, transiting at **2047** and setting at **0352+**. Jupiter will be encumbered by the waning gibbous Moon at 94% illumination. Come the end-of-month Jupiter is peeking above the horizon by **1237**, transiting at **1941** and setting at **0246**+.
- **Saturn:** Saturn is an evening object on the first of the month and won't be visible until about **1753**. Saturn sets at **2150**. Saturn by mid month is well visible by **1745. Saturn sets at 2000**. By the end-of-the-month Saturn is easily visible by **1800** and in conjunction with an 8% illuminated waxing crescent Moon. Saturn sets at **2005**.
- **Uranus:** On the first of the month Uranus is an evening object rising at **1306**, transiting at **1953** and not setting until 0241**+**. Uranus is being chased by an 80% illuminated waxing gibbous Moon. By the ides Uranus is rising at **1210**, transiting at **1858** and setting at 0145**+**. Uranus' apparent magnitude is 5.71 and with dark skies should be a naked eye visible object. End-of-month finds Uranus rising at **1108**. and transiting at **1755** and setting at **0042**+. Uranus competes all night with an 80% illuminated waxing gibbous Moon.
- **Neptune:** Neptune in the beginning of the month rises at **1046** transits at **1639** and sets at **2231**. By the 15th Neptune rises at **0952**, transits at **1545** and sets at **2138**. By the end of the month Neptune is battling an 82% illuminated Moon. Neptune rises at **0850**, transits at **1443** and doesn't set until **2037**.
- **Pluto:** Pluto on the first of the month is very near Venus from our perspective and too close to the Sun to be visible safely. By mid-month Pluto is virtually invisible. By the 31st Pluto has moved into being a morning object and is invisible

Asteroids:

- Still a dearth of asteroids. I searched for asteroids in 2023 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=2023

Meteors:

- Geminids Meteor Shower. (see Highlights above)

- Ursids Meteor Shower. (see Highlights above)

Comets: come in various classifications:

- 1) Short Period comets – further broken down into:
  - Halley Type: The Halley Types are believe 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 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.

No comets of interest this month at time of writing.

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 2023 at 2100 PDT and you will have about 20 minutes of viewing time total.

Lets take a look at some favorite objects (at least for me):

- **NGC 2261:**

llustration 1: By Judy Schmidt from Fresh Meadows, NY, USA - Hubble's Variable Nebula - NGC 2261, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=59932663

I believe today that Edwin Hubble would be classified as a Creep. He was not very nice to...well...anyone. He certainly acted disgracefully to his colleagues There is a story about this Nebula that is told beautifully by Curtis Croulet; ask him to tell you the story sometime. NGC 2261 (also known as Hubble's Variable Nebula or Caldwell 46) is a variable nebula located in the constellation Monoceros. The nebula is illuminated by the star R Monoceros (R Mon), which is not directly visible itself. (Wikipedia)

Illustration 2: By Hewholooks - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=5216981

- **NGC 7789:**

  NGC 7789 (also known as Caroline's Rose[4] or the White Rose Cluster) is an open cluster in Cassiopeia that was discovered by Caroline Herschel in 1783. Her brother William Herschel included it in his catalog as H VI.30. This cluster is also known as the "White Rose" Cluster or "Caroline's Rose" Cluster because when seen visually, the loops of stars and dark lanes look like the swirling pattern of rose petals as seen from above. (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

THE END OF THE ROAD FOR CHEMICAL ROCKETS?

In 1914 a young Robert Goddard became fascinated with space and the possibility of mankind being able to go into space. Goddard later claimed that while he was up in a tree looking at the sky he had his epiphany, but I suspect that he could have been just a little influenced by the Wright brothers and I know, by his own admission, that he was greatly influenced by H.G. Wells book of 1898 "The War of The Worlds". The 17 year old Goddard reasoned "If they can come here then we can go there" and his desire to build a rocket that could go there was borne.

Unfortunately for the young Goddard in the 1920's if you were not working in physics of aeronautical engineering or quantum mechanics, especially all of those crazy ideas promoted by Einstein and friends, you were more or less doing worthless or worse yet crackpot physics. When Goddard submitted a review of the work he had done with a $5,000 grant given to him by the Smithsonian he suggested that rockets could someday be used to reach the Moon; professional colleagues and no less a science authority than the New York Times newspaper heaped scorn and condemnation upon him for the comment. Stunned and shocked by the public comments of others Goddard retreated from the public eye and with very little encouragement from the science community, except from one Charles Lindberg, and precious little financial support except from the Smithsonian and the Guggenheim Foundation, Goddard went on to do the following:

- Showed that rockets would work in a vacuum, NYT are you listening?

- Measured the thrust efficiency of solid propellent engines and realized that the efficiency was only 4%. By using de Laval nozzles and redesigning them he increased the engine efficiency to 63%. Realizing that there was still too little energy to get to space with solid fuels Goddard started work on liquid rocket fuels. March 16 1926 Goddard's first successful liquid rocket fuel flight. The fuel for the first flight was gasoline and liquid oxygen (RP-1/LOX fuel used today). During the first flight part of the rocket engine nozzle melted; so Goddard started developing fuel cooling methods for the rocket nozzle and, yes, we still use his fuel cooling of the nozzle today.

- Patented the concept of the multiple stage rocket.

- Developed turbine fuel pumps for the liquid fuels.

- Designed and made an operational prototype of an ion thrust engine. In 1917 at the Mt. Wilson Observatory, chosen because it was considered a very secure area, Goddard worked on a small rocket launcher that could be shoulder fired by a single person (This project was not brought to fruition in WWI but in WWII became the Bazooka).

In the late 20's and 30's Goddard worked on two systems to control rockets. One was a gyroscope controlled metal vanes in the rocket exhaust and the other was steerable rocket motor that was gyroscope controlled. During WWII the U.S. government was still not interested in rockets but it was interested in Jet Assisted Take Off (JATO) motors to help loaded military planes take off. Goddard and his team developed a motor using hypergolic compounds, two chemical compounds that spontaneously ignite when they come into contact, that had thrust control. It was an upgraded version of this engine that powered the Bell X-1 and Chuck Yeager to supersonic speeds.

On September 8 1944 both the U.K. and the U.S.A. became very interested in Goddard's research because the first German V-2 rocket had just hit London. Although authorities did not know it at the time the rocket used Goddard's turbo fuel pumps, motor design, gyroscopic rocket control system, and was programed with Goddard's improved version of Tsiolkovsky's rocket equation.

In 1944 Goddard was dealing with terminal throat cancer and died on August 10 1945 but at least he lived to see his theories vindicated and his work appreciated. It was not until 1969 when the apollo astronauts were on their way to the Moon did the New York Times print a correction of its 1920 column savaging Goddard saying that the paper regretted any errors that were in the column.

After WWII the rocket craze was on; however, there was nothing new under the sun because all rockets were based on Goddard's designs. The rocket engines have gotten more powerful over time but not because they are more efficient but because they are bigger (burn more fuel). Rocket motors today still operate at about 60% efficiency, the same as Goddard's rockets of the 1930's (that is not a bad efficiency for an engine as your car engine operates on about 30% efficiency, on a good day).

In 2009 the band Timbuk3 released a video of their song "My Future's So Bright (I Gotta Wear Shades)" and in the video there is a segment that shows a TV set strapped to the back of a donkey who delivers the TV set to the band's location and for me this video is the perfect metaphor for today's space program. Starting in 1958 the U. S. has launched ever bigger and ever more sophisticated satellites into and beyond Earth orbit all of them on the back of the same donkey rockets.

If we look at the history of our rocket programs, we see that the Saturn 5 program using RP-1/LOX (kerosene and liquid oxygen) fuel had a payload that was 1.5% of the rocket's takeoff weight and cost 1.5 billion dollars per launch (in 2020 dollars) and was not reusable. Also, with the Saturn 5 engines if you went to the Moon and found that you needed to top off your tanks in order to get home that was a no-go because there is no oil on the Moon to make your kerosene.

The Space Shuttle program used liquid Helium/LOX fuel (Helium/LOX gives you more push per pound of fuel but is much harder to handle (Helium is liquid at 20 Kelvin {that's 20 degrees above absolute zero and is really hard to get to and stay at) Oxygen is liquid at 90 Kelvin). The Space Shuttle had a payload of 3.5%, more than double that of Saturn but the Solid rocket boosters and the shuttle itself were reusable and this resulted in a cost per launch of 1.6 billion dollars. Recovering and refurbishing space craft is, perhaps, not as cost effective as NASA had hoped.

OOPS! MY BAD. That 3.5% payload rating for the Space Shuttle was for low earth orbit at 250 miles up; however, if we ask the shuttle to deliver cargo to geosynchronous orbit at 22,236 miles up, higher but still

short of the Moon, the payload capacity goes to 0.11% and the Saturn rocket doesn't look so bad. The Artemis (SLS) rocket, based on one launch, has a payload to the Moon capacity of 1.1% (the weight of the SLS system payload is greater than the weight of the Saturn system payload but the SLS is much heavier so the payload of the SLS is a smaller percentage of the rocket weight) and the cost per launch is "only" 4.1 billion dollars.

So why isn't any part of the SLS designed to be reusable, as this would surely help reduce the cost? Starting with the solid fuel boosters: the cost of producing one has dropped so much that the cost of ocean recovery is now more expensive than the cost of production, burn'em and dump'em Clyde. Also some of the SLS solid fuel boosters are actually left over from the shuttle program and are at the end of their useful life so they can be used on one last flight and then discarded. The main stage of the SLS (the core stage) is actually a combined first and second stage on other rockets. The SpaceX rocket recovers the first stage only; that stage is at an altitude of 49 miles and a speed of 6,340 miles per hour and is recovered 400 miles down range. The United Launch Alliance with its new Vulcan rocket plans to recover only the rocket motor package (90% of the cost of the first stage), using an inflatable heat shield, at rocket speeds up to 12,400 mph. [Note: Just so we all have some idea about the heat that is generated by stopping things, a 1960 Lincoln Continental at 5,150 lbs. going from 70mph. to 0 generates enough heat to melt a pound of steel].

The SLS core stage at separation is traveling at 18,000 mph. (just a little faster than orbital speed) and is 100 miles up. At 6,340 mph SpaceX can just point the rocket engines in the direction of travel and fire them to slow the 1st stage down and the heat from friction will do the rest and not melt the engines. At 12,400 mph ULA must fire the engines to decelerate, separate the engines from the fuel tank, rotate the engine package so that the engines are not facing forward, and then deploy the inflatable heat shield because at these speeds the engines will be damaged by heat, and finally deploy a parachute to slow the engines enough where a helicopter can snag them in midair. The SLS core stage at 18,000 mph would require a complete rigid heat shield to permit it to safely return to Earth. The practical thing to do would be to make the top end of the fuel tank a heat shield; unfortunately when objects are traveling through denser and denser air they want to go heavy end first and the end of the fuel tank is the light end so this reentry configuration results in a highly unstable arrangement that just wants to tumble and tear itself apart, Short answer there is no cheap/easy way to get that sucker back to Earth.

Now there are potential new players in the race to the Moon and Mars game. First and foremost is SpaceX. One must say potential because all of SpaceX's flights as of today have been with rockets using the Merlin 1 series of engine and they use RP 1/LOX fuel, another nod to Goddard, but the new and as yet not flight tested raptor engine is a Methane (CH4/LOX) fueled engine. A Methane/LOX engine is more fuel efficient than a RP 1/ LOX engine but not quite as efficient as a Helium/LOX engine, but Methane is a liquid at only 111K where Helium must be cooled to 20K before it is liquid so the CH4/LOX engine wins on ease of use issues. Both engine systems win over the RP-1/LOX system because both use fuel that can be manufactured on site at the Moon or Mars.

This "Make your rocket fuel on site" idea is fraught with potential and real complications and definitely remains to be seen if it is at all practical. The greatest advantage that Musk and the SpaceX Starship/Merlin engine have is that they have been from the outset designed to be reusable. Elon Musk has prophesied, as he is want to do, that a Star Ship launch will eventually cost ten million dollars; others,

looking at the system from a distance, have predicted a cost of 150 million to 250million, if everything works exactly as planned. Even if these figures are low SpaceX still beats NASA's cost per launch.

No matter what rocket design different engineers come up with there is only so much energy that can be released from each ton of fuel (I use ton rather than pound in order to emphasize just how much energy is required to get into outer space) and chemical rockets are just not practically capable of scooting people around the solar system. Radiation resistant mechanical space probes yes/people no.

Perhaps an all chemical rocket approach to space should have ended with the Shuttle program, but it did not. Today NASA is reminding everyone and anyone that will listen that they have been looking at nuclear power for over 60 years, off and on with more off than on. Nuclear Thermal Propulsion (NTP) rockets are rockets that use the hot reactor core to heat a gas up and eject it out the engine exhaust and in bench tests these engines have demonstrated a specific impulse (the amount of push that you get from one pound of fuel) the is just shy of 2X the absolute best specific impulse from a chemical rocket, and that is just for starters.

Today the U.S., Russia, and China appear to be the active players in nuclear powered rockets and satellites. Both Russa and the U.S. have sent fission reactors into space. Russia powered satellites and the U.S. powered, in 1968, a prototype ion drive engine with a fission reactor. Neither country now powers its satellites this way. Russia, it appears, has attempted to launch a NTP rocket but it failed at launch, Russia also has an announced program to produce nuclear powered rockets, but the exact status of the program is not known. China says "We are developing nuclear rockets" but no details no comments, by unnamed sources, and no leaks; so, no one knows the actual status of the program.

The U.S. has funded studies on three different ideas, all paper at this time. ATOMOS a private startup company in the U.S. is pursuing a fission powered ion engine satellite to reposition satellites, a space tug, in low Earth orbit in order to extend their operational life. This is to be a for profit service. We're getting there but slowly.

As costs mount and if we really want to send manned missions to other planets with reasonable time scales all space programs will need to develop at least a hybrid program of chemical ground launch to atomic space tug that is either a NTP unit or a nuclear ion drive unit and a development program with consistent, reasonable, and sustained funding would be more reasonable than our current stagger, stop, start programs that congress seems to love.

All Opinions expressed in this rant, masquerading as a thought, are mine and no others.

My neighbor Jack Morris, a retired rocket engineer, reviewed the article for me and made the following comments and reading suggestions.
The two primary parameters in rockets:
Specific Impulse: The push you get from a pound of fuel.
Specific Thrust: The total push your engine gives you per pound of rocket weight.
Chemical Rockets: High specific thrust but lousy specific impulse.
Ion Rockets: High specific impulse but lousy specific thrust.
Nuclear rockets: Somewhere in between chemical and ion.
We need both high specific impulse and specific thrust: It is not available yet.

REFERENCES:
Rocket Propulsion Elements; Ninth Edition; Author: Sutton & Biblarz
Fundamentals of Aerodynamics; Second Edition; Author: Roger R. Bate et al.
Ignition! An Informal History of Liquid Rocket Propellants; Author: John D. Clark

Unlike the first two references Ignition! Can be read and enjoyed without reviewing calculus first.

CHEERS, CHUCK

Another Look January 2023

By Dave Phelps

2023 January Another Looks Notes
Full moon January 6, New moon Saturday, January 21
Other names are Wolf Moon, Stay Home Moon and Quiet Moon. Moon After Yule.
Native American names are Severe Moon and Center Moon.

As a constellation, Canis Minor has only been around for a couple thousand years. As a constellation, Procyon, under various names, has been around four thousand years, at least. Canis Minor made Ptolemy's Almagest in the 2nd century CE, but way before that the Egyptians used Procyon to clock the rising of Sirius who clocked the rising of the Nile. The Nile was not the only waterway that benefited by the ancient clock. The Tigris-Euphrates in Asia Minor, the Padma in India and the Yangtze in China all rose and fell to one extent or another annually clocked by the calendar of the stars.

Another river marked by the ancient people is the river in the sky, the Milky Way. Rising a half hour before Sirius, Procyon was an important time marker. Not only floods, but seasons, winds, monsoons, and snow melt were tracked by even the poorest people using the sky as their only calendar.

Canicula, fourteen thy stars; but far
Above them all, illustrious through the skies,
Beams Procyon; justly by Greece thus called,
The bright forerunner of the greater Dog

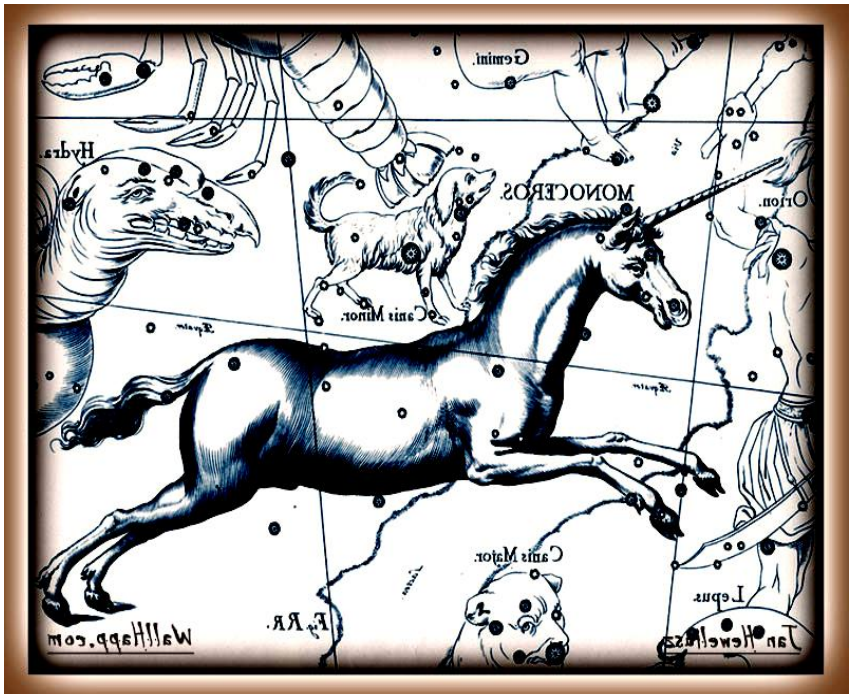
http://lynx-open-ed.org/OERs/Urania%27s-Mirror-Full-Page-Version.pdf

Procyon comes from the Greek "before the dog" and has been part of a modern constellation only since then. Canis Minor has for the most part a grisly history usually resulting in someone dying or getting eaten. β Beta Canis Minoris is named Gomeisa which means teary eyed or maybe bleary eyed. Gomeisa and Canopus are sisters weeping for their loved one and placed in the sky in remembrance. Procyon is a double. 1st magnitude Procyon A has as a companion, 13th magnitude Procyon B. If you're in for a bit of a challenge, it is said that Procyon B is more difficult than Sirius B because of the greater magnitude differential. One for the bucket list. There are a couple of other stars of interest in CanMin. Most interesting is Luyten's star, located between δ and η on the chart. It's a little brighter than 10th magnitude and quite red. It also has two confirmed planets. Delta δ Canis Minoris is also interesting because of three stars of 5th magnitude close enough to see in your low power field. NGC 2485 is a 13th magnitude spiral galaxy. It has very diffuse spiral arms and a starlike nucleus, tough to see. Burnham did not list N2485 but did list γ and η as doubles with large magnitude differences.

In the early 1600's Cartographers began drawing maps and celestial globes from and for returning

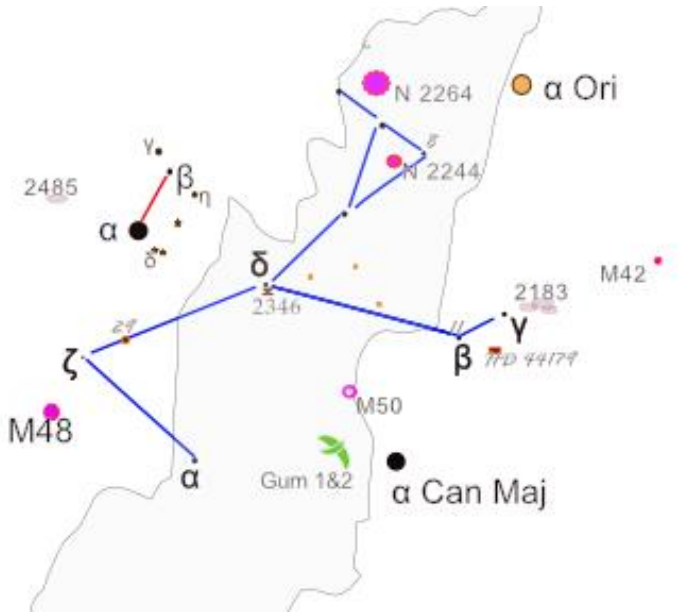
seamen whose perilous journeys around the globe used stars and natural landmarks as navigation guides. These guides were especially important in the southern hemisphere with no north star nor time keepers to keep them oriented. Portugal, Spain, France, Belgian, Holland and Great Britain all claimed territory and they wanted to know where it was and how to get there so they could begin their exploitation.

"a very ferocious beast, similar in the rest of its body to a horse, with the head of a deer, the feet of an elephant, the tail of a boar, a deep, bellowing voice, and a single black horn, two cubits in length, standing out in the middle of its forehead." Pliny



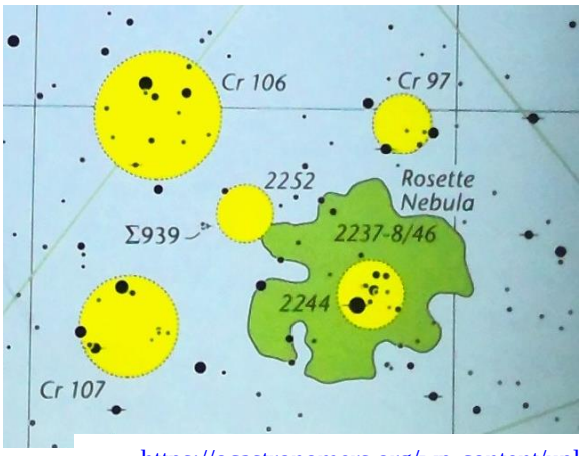
In the late 1500's cartographers used the journals given them by the surviving sea-darers and began making maps and globes. When you look at the globes the critters on them are backwards. That was because you were to imagine yourself inside the globe looking out. Being naturalists, these artists, cartographers, and globe makers pulled from the natural world, as they knew it, for inspiration. They covered the newly found sky and the blank areas in the known sky with a veritable menagerie of animals and birds. They drew new constellations of Bees, Birds, Lizards, Goldfish, Snakes and even a Triangle and a Cross. A decade later another globe was made showing even more wild and woolly subjects and natural features, of whom, only Camelopardalis and Monoceros remain.

On a poorish kind of night, maybe with a few streetlights thrown in, you probably won't see Monoceros. It's there; between Betelgeuse and Procyon is a sprinkling of 4th magnitude stars and one naked-eye nebula. Living as it does mostly in the Milky Way, Monoceros has open star clusters,



a globular, several interesting variable and multiple stars and two of the finest deep sky objects up there.

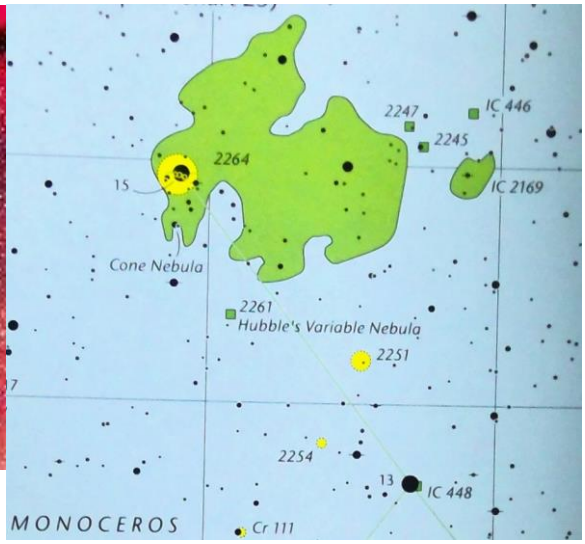
Back in the mid 80's, just before Halley's Comet, I met a fellow at RTMC who had intense knowledge and a telescope. His name is Dana Patchnik and he showed me the Rosette in a 17.5 inch telescope. It is huge. Twice the size of the full moon and apparent even without filters. Screw in that filter, though, and you are wowed. Monoceros is wonderful. It has 36 Collinder's, more than any other constellation. It has two spectacular nebula with star clusters attached and sprinklings of small clusters and nebulae throughout its constellation boundaries.



https://ocastronomers.org/wp-content/uploads/2018/12/ROSETTE-NGC2244.jpg **Credit Philip R. Stagnitto**

There are five NGC's in or with the Rosette. NGC 2244, Caldwell 50, is the Open Cluster you see in the center and was discovered by Flamsteed in the 17th century. NGC's 2237, 2238, 2239 and 2246 are pieces of the nebula. Sprinkled around the Rosette are several open clusters. Collinder 104 is next to 107, 106 and 97. You have to be something of an open cluster fan to scope these out. The conventional wisdom is to use wide field and low power, a biggish telescope will blow right through them. A friend of mine named Harv Pennington, made a viewer where he looked down through a pair of binoculars into a flat mirror that reflected the object to the eye. If you look up Project Moonwatch on the internet you will see all the different spotting scopes they used back then to follow our new satellites. If ever I decide to spend some time on open clusters, I think I'll find a flat and a decent finder and cobble one together.

It's an interesting project to try to identify what parts of the nebula and what small sprinkling of stars is defined by an NGC or a Collinder number. This is a crowded piece of space, Simbad **http://simbad.u-strasbg.fr/simbad/sim-id?Ident=Rosette+Nebula** has a very good photo of the whole area. It will help you pick out the individual clusters and even Struve 939, a nice triple star system.
Using Sky and Telescope's *Pocket Sky Atlas* is also a good place to start. It is from the *PSA* that I copied these charts. **Ray Stann** at **https://www.temeculavalleyastronomers.com/photo-gallery.html**



North of the Rosette is NGC 2264, the proper name for the Christmas Tree. The entire nebula has by itself not been given a nickname, surprisingly. Instead it is usually referred to by its two distinct features, the Cone Nebula and the Christmas Tree Cluster. The entire nebula will take the visual observer an hour to explore. I think the Christmas Tree cluster is beautiful. It shines and it sparkles, it points to the Cone, it is visually remarkable.

As most any chart will show you, there are many objects to explore around the Christmas Tree. NGC 2247 has several distinct neighbors including NGC 2245, IC 447 and IC 448.
Between the two nebulae is Basel 7, another really sparse open cluster, and a couple more Collinders.

My favorite outlier is Hubble's Variable Nebula, NGC 2261. Hubble was one of my hero's. Using the biggest telescopes and making the best astrophotographs during a career that spanned over 30 years, Hubble is an ideal professional for a young astronomer to model himself or herself after in their imagination.

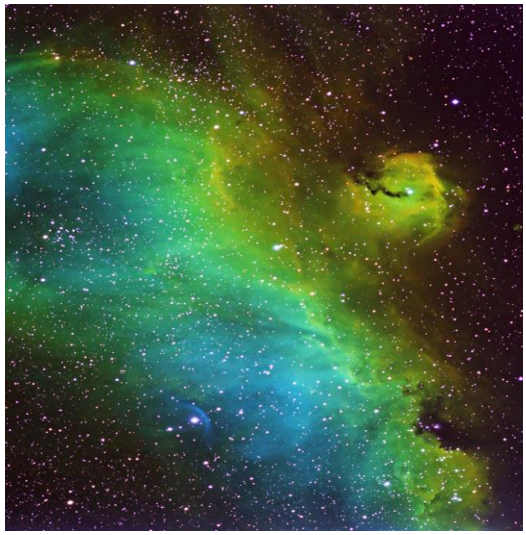
It might take a little time to find the nebula. It's bright enough, about 9th magnitude, but kinda diffuse and, once you've found it, a little unimpressive. It would be a fun project, especially for those of you with CCD cameras, to take magnitude estimates every month for the next year or two and make your own light curve, then you can publish it in this newsletter.
As the image of the region around the Cone and the Christmas Tree points out. there is a huge mass of bright nebulosity broken up by dark nebula. We can identify IC 447 as well as NGC's 2254, 2264 and NGC 2251. IC 446 and IC 447 is 7th magnitude so it can be found but much of your success in the area depends on your filters and your patience. This is a SII-NII-Ha image and can be found at:
https://cs.astronomy.com/asy/m/nebulae/488643.aspx

I keep seeing the image of the Christmas Tree in my mind's eye as I'm writing this. Golly, but it's beautiful. It even has a little tree topper, the tip of the cone.
http://simbad.u-strasbg.fr/simbad/sim-id?Ident=Christmas+Tree+Cluster

https://ocastronomers.org/wp-content/uploads/2018/12/NGC-2264-.jpg

This 2010 image by OCA member Jeff Malrose show the Christmas Tree and its nebulosity beautifully.
IC 447 is also interesting because it has been named Dreyer's Nebula. This is the John Lewis Emil Dreyer of the NGC and IC catalogs. It seems EE Barnard (another of my hero's) found the nebula and reported it to Dreyer. Barnard then referred to it as Dreyer's 447. We have since then called it Dreyer's Nebula, not Barnard's.

There is an unusual protostar and a planetary in Monoceros that are easy to find and unusual to look at. NGC 2346 is a planetary nebula right next to delta δ. It is 9th magnitude and squarish. HD 44179 is a protoplanetary nebula right near beta β, It's also 9th magnitude and squarish. I have never looked for it, but visually there should be a double star at the center of the nebula blown out by the astrographs much like the Trapezium is hidden in M42. It will be interesting to see it that's the case.



Slip over to gamma γ from beta β for another group of fainter nebulosities that are brighter knots in a much larger nebula. NGC's 2182, 83, 85 and 70 are all within a couple of degrees of gamma γ. NGC 2185 is the root of the cluster with several stars making up their own open cluster. The nebulae are strung out on a line, should be fun identifying the individual members. Click on the hypelinks for additional images.

https://www.flickr.com/photos/97807083@N00/4968216264 2/in/dateposted/ and
http://www.caelumobservatory.com/gallery/n2183.shtml

In the south of Monoceros, near the border with Canis Maj., is alpha α Monoceros, the brightest star in Monoceros at a skosh brighter than 4th magnitude. Down there further south, Monoceros has more objects of interest: M50, NGC 2506 the area around Gum 1 and Gum 2 and the Seagull.

M50 and NGC 2506, Caldwell 54, are typical open clusters of the visual magnitude ilk. They are rather sparse, M50 is 6th magnitude and N2506 is 7th. M50 will, of course, be easier to see since it has five times the stars of N2506.
https://ocastronomers.org/wp-content/uploads/2018/12/IC2177_SCH_02212012_01.jpg

A Telrad field south of M50 will put you right at the left wing of the Seagull nebula, IC 2177. A little better than half the Seagull is in Monoceros, the balance in Canis Major. NGC 2335 is at the crest of the left wing, is 7th magnitude and is centered by a brighter star. NGC 2343 is also an open cluster

located in the hollow created by the left wing and body of the seagull. This whole area is active HII regions, so all you will see unfiltered is the open clusters and a little diffuse nebulosity. Gum 1 is the head of the seagull. Colin Gum did his work from Mt. Stromlo observatory in the 1950's. It is heartbreaking to remember that firestorm in 2003 that destroyed 75 years of telescopes, records, and hard work. ***https://en.wikipedia.org/wiki/File:The_Seagull_Nebula,_IC_2177_March_2021.jp***

Dark Skies
Dave Phelps

Spot the Messenger: Observe Mercury

by David Prosper (NASA/JPL)

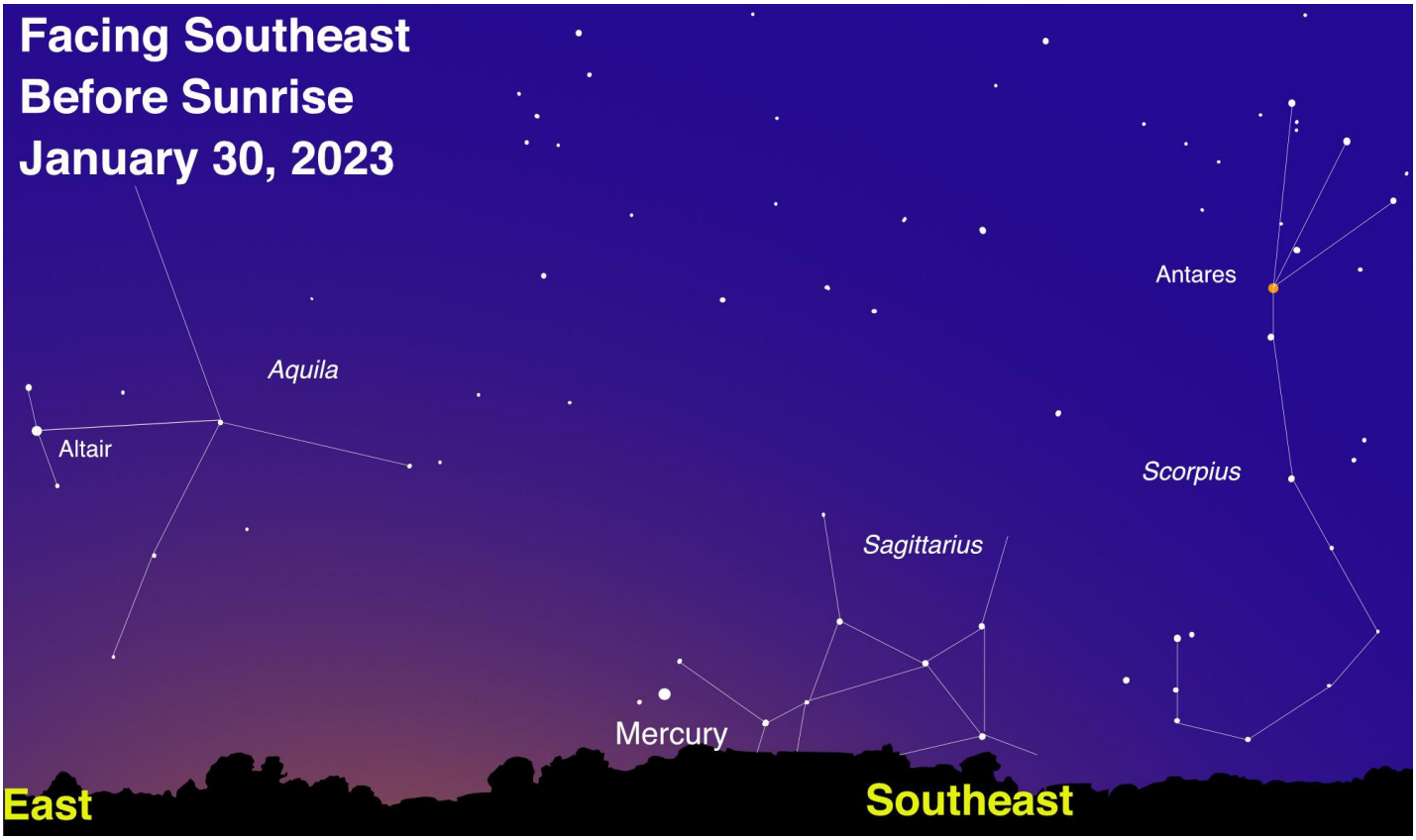
Most planets are easy to spot in the night sky, but have you spotted Mercury? Nicknamed *the Messenger* for its speed across the sky, Mercury is also the closest planet to the Sun. Its swift movements close to our Sun accorded it special importance to ancient observers, while also making detailed study difficult. However, recent missions to Mercury have resulted in amazing discoveries, with more to come.

Mercury can be one of the brightest planets in the sky – but also easy to miss! Why is that? Since it orbits so close to the Sun, observing Mercury is trickier than the rest of the "bright planets" in our solar system: Venus, Mars, Jupiter, and Saturn. Mercury always appears near our Sun from our Earth-bound point of view, making it easy to miss in the glare of the Sun or behind small obstructions along the horizon. That's why prime Mercury viewing happens either right before sunrise or right after sunset; when the Sun is blocked by the horizon, Mercury's shine can then briefly pierce the glow of twilight. Mercury often appears similar to a "tiny Moon" in a telescope since, like fellow inner planet Venus, it shows distinct phases when viewed from Earth! Mercury's small size means a telescope is needed to observe its phases since they can't be discerned with your unaided eye. Safety warning: If you want to observe Mercury with your telescope during daytime or before sunrise, **be extremely careful**: you don't want the Sun to accidentally enter your telescope's field of view. As you may already well understand, this is extremely dangerous and can not only destroy your equipment, but permanently blind you as well! That risk is why NASA does not allow space telescopes like Hubble or the JWST to view Mercury or other objects close to the Sun, since even the tiniest error could destroy billions of dollars of irreplaceable equipment.

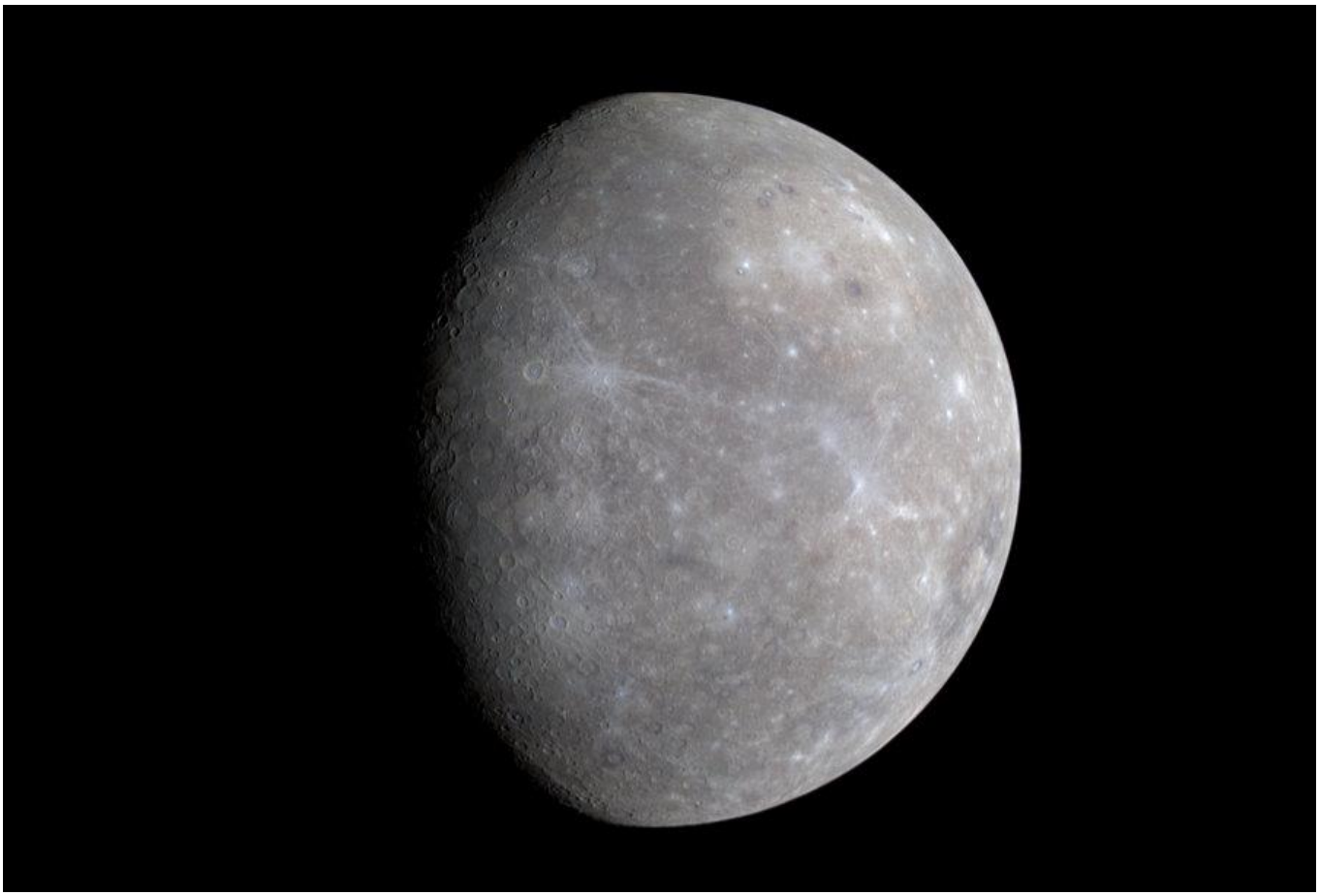
Despite being a small and seemingly barren world, Mercury is full of interesting features. It's one of the four rocky (or terrestrial) planets in our solar system, along with Earth, Venus, and Mars. Mercury is the smallest planet in our solar system and also possesses the most eccentric, or non-circular, orbit of any planet as well: during a Mercurian year of 88 Earth days, the planet orbits between 29 million and 43 million miles from our Sun – a 14-million-mile difference! Surprisingly, Mercury is **not** the hottest planet in our solar system, despite being closest to the Sun; that honor goes to Venus, courtesy its thick greenhouse shroud of carbon dioxide. Since Mercury lacks a substantial atmosphere and the insulating properties a layer of thick air brings to a planet, its temperature swings wildly between a daytime temperature of 800 degrees Fahrenheit (427 degrees Celsius) and -290 degrees Fahrenheit (-179 degrees Celsius) at night. Similar to our Moon, evidence of water ice is present at Mercury's poles, possibly hiding in the frigid permanent shadows cast inside a few craters. Evidence for ice on Mercury was first detected by radar observations from Earth, and follow up observations from NASA's MESSENGER mission added additional strong evidence for its presence. Mercury sports a comet-like tail made primarily of sodium which has been photographed by skilled astrophotographers. The tail results from neutral atoms in its thin atmosphere being pushed away from Mercury by pressure from the nearby Sun's radiation.

NASA's Mariner 10 was Mercury's first robotic explorer, flying by three times between 1974-1975. Decades later, NASA's MESSENGER first visited Mercury in 2008, flying by three times before settling

into an orbit in 2011. MESSENGER thoroughly studied and mapped the planet before smashing into Mercury at mission's end in 2015. Since MESSENGER, Mercury was briefly visited by BepiColombo, a joint ESA/JAXA probe, which first flew by in 2021 and is expected to enter orbit in 2025 - after completing six flybys. Need more Mercury in your life? Check out NASA's discoveries and science about Mercury at solarsystem.nasa.gov/mercury/, and visit the rest of the universe at nasa.gov.



Mercury reaches maximum western elongation on the morning of January 30, which means that your best chance to spot it is right before sunrise that day! Look for Mercury towards the southeast and find the clearest horizon you can. Observers located in more southern latitudes of the Northern Hemisphere have an advantage when observing Mercury as it will be a bit higher in the sky from their location, but it's worth a try no matter where you live. Binoculars will help pick out Mercury's elusive light from the pre-dawn glow of the Sun. Image created with assistance from Stellarium



Mercury is hot, small, and heavily cratered across its gray surface, as seen in this image from NASA MESSENGER. Mercury is the most heavily cratered planet in our solar system, since it lacks either a substantial atmosphere or geologic activity to erode surface features like craters - similar in certain aspects to the surface of our own Moon.

Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Source: https://solarsystem.nasa.gov/resources/439/mercurys-subtle-colors/

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