Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers September 2022

Events: General Meeting, Monday, September 12, 2022, at the Ronald H. Roberts Temecula Library, Room B, 30600 Pauba Rd, and/or ZOOM, at 6:00 PM.

- **IFI & Gallery by Clark Williams**
- **Planetary Seismology – Mars and Luna by Mark Baker**
- **Refreshments by the Sanchez Family**

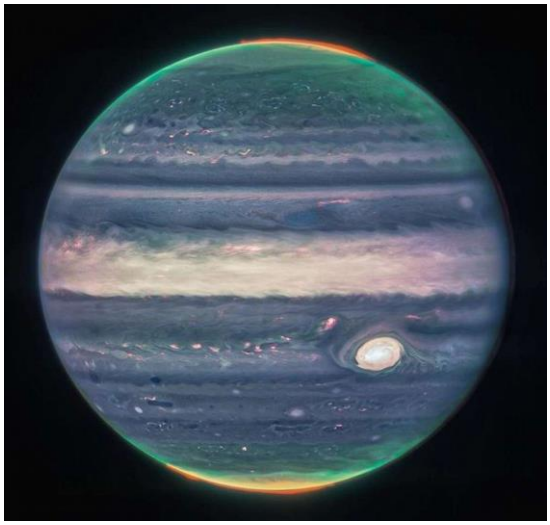
Star Parties at South Coast Winery every Friday evening in September. For upcoming school Star Parties check the Calendar on the web page.

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 Jupiter Image-

On 8/22/2022 NASA released this image of Jupiter, taken in near infra-red. The Great Red Spot is clearer than in my telescope.



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

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Cosmic Comments – September 2022

By Mark Baker

Few humans, if any, have any concept on just how large the Cosmos really is… if I put the relationship in seconds, this might give you a better feel for things. Or maybe not…

One Million seconds is about 11 DAYS…
One Billion seconds is about 31.5 YEARS…
And one Trillion seconds equals almost 31,689 YEARS…

Transferring our relationship perspective to miles, you should get a better feel for the vast distances out there… and understand why we break things down into measurements more easily grasped!! For example, the distance from the Sun to Earth is called an Astronomical Unit (AU) … it's easier to grasp nearby distances if we think of Jupiter as being 5.2 AU from the Sun rather than 500 million miles, or Saturn being 9.6 AU rather than 850 million miles. But once we get out of our neighborhood, we need other terms that are easier to understand…

You can follow the progress of Voyager 1 and you will note it is approaching 22 Light HOURS away… yup, that's it after all this time!!! Look it up if you want to know how many miles that is… not enough fingers and toes for sure!!!

It sure is easier to consider something ONE light year away rather than SIX TRILLION MILES, but that doesn't include too many things!! The nearest star to us, Proxima Centauri, is 4.5 light years away, which is an easy thing to file away in our minds… do the math for miles, and it suddenly becomes inconceivable!!!

Nowadays, we toss around light years by the thousands, millions, and even billions like we comprehend what that means… we don't!! But the units of measurement we use bring it into focus so we can "relate" at least…

It brings great joy at Star Parties to toss all manner of numbers around out there and help edify our neighbors and selves… how far it is, how old it is, how bright it is, etc. All such dialog helps to get people to Look Up and wonder, and that wonder leads to the next scientific breakthroughs… so who knows what your efforts for TVA will lead to!!! Keep up the great work…

Clear, Dark Skies

Looking Up Redux – September 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 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:

Saturday	**the 10th**	**@ 0300 FULL in AQUARIUS**
Saturday	**the 17th**	**@ 1453 THIRD QTR in TAURUS**
Sunday	**the 25h**	**@ 1455 NEW in VIRGO**
Saturday	**the 3rd**	**@ 1108 First QTR in OPHIUCHUS**

Apogee comes on 2022-09-19 @ **1446** **– 404,555 km (251,371 mi)**
Perigee comes on 2022-09-07 @ **1818** **– 364,490 km (226,484 mi)**

2022 has: (13) new moons, (13) 1st Qtr moons, (12) Full moons, (12) 3rd Qtr moons
(0) Blue moon and (2) Black moons

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

Luna: Luna is waxing crescent on the first of the month, headed for 1st quarter on the 3rd rising at **1135**, transiting at **1659** and setting by **2224**. Luna by mid-month is 68% illuminated. Rising at 2136 and transiting at **0444+** setting at **1158+**. By the-end-of-the-month Luna is rising at **1144** transiting at **1645** and setting by **148**.

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

September 10 - 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 **0300**. This full moon was known by early Native American tribes as the Corn Moon because the corn is harvested around this time of year. This moon is also known as the Harvest Moon. The Harvest Moon is the full moon that occurs closest to the September equinox each year.

September 16 - Neptune at Opposition. The blue giant planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. It will be brighter than any other time of the year and will be visible all night long. This is the best time to view and photograph Neptune. Due to its extreme distance from Earth, it will only appear as a tiny blue dot in all but the most powerful telescopes.

September 23 - September Equinox. The September equinox occurs at **2255**. The Sun will shine directly on the equator and there will be nearly equal amounts of day and night throughout the world. This is also the first day of fall (autumnal equinox) in the Northern Hemisphere and the first day of spring (vernal equinox) in the Southern Hemisphere.

September 25 - New Moon. The Moon will located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at **1455**. 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.

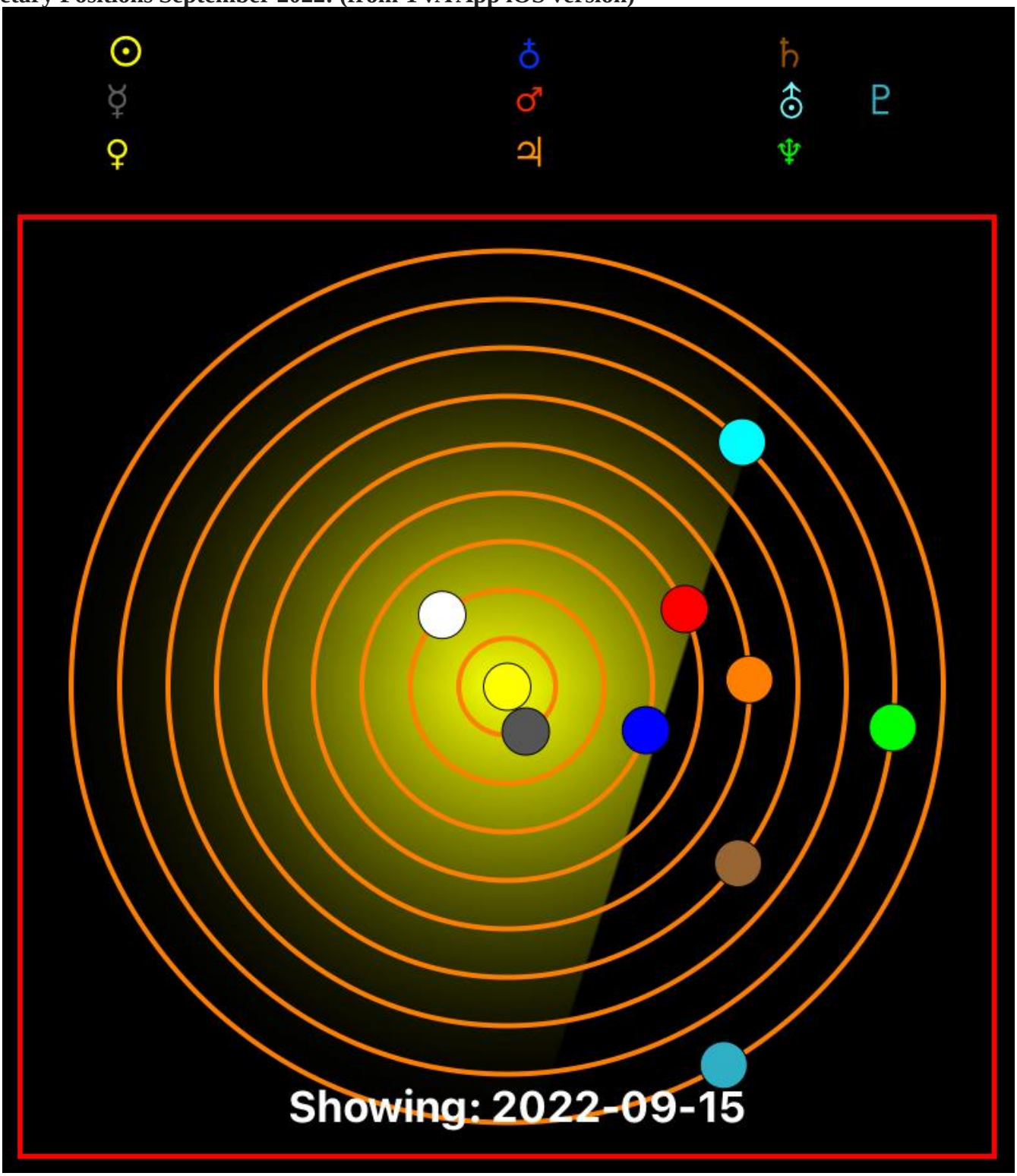
September 26 - Jupiter at Opposition. The giant planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. It will be brighter than any other time of the year and will be visible all night long. This is the best time to view and photograph Jupiter and its moons. A medium-sized telescope should be able to show you some of the details in Jupiter's cloud bands. A good pair of binoculars should allow you to see Jupiter's four largest moons, appearing as bright dots on either side of the planet.

Algol minima: (All times Pacific Time)

09/03/2022	1028
09/06/2022	0716
09/09/2022	0405
09/12/2022	0054
09/14/2022	2142
09/17/2022	1831
09/20/2022	1519
09/23/2022	1208
09/26/2022	0857
09/29/2022	0546

Planets:

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



- **Mercury:** Mercury is an evening object in the beginning of the month. It is illuminated at 43%

and 0.45 apparent magnitude. Mercury rises at **0831** with the sun preceding at **0621**. Mercury transits at **1421** and sets at **2011**. Mercury by mid-month is still an evening object rising at **0744**, transiting at **1329** and setting at **1944**. By the 30th Mercury rises at **0542** and sets at **1757**.

- **Venus:** Is the morning star on the first of the month, rising by **0516**, with sunrise at **0621**. By mid-month Venus is rising at **0546** followed by sunrise at **0631**. By the 30th Venus is rising at **0613** followed by sunrise at **0641**.
- **Mars:** Mars is back in the sky as an evening object; on the first rising at **2324**. By mid-month Mars is rising at **2254**. End-of-month finds the Warrior rising at **2218**.
- **Jupiter:** Jupiter is an evening object on the first of the month rising at **2023**. By mid-month Jove is rising at **1924.** Come the end-of-month Jupiter is peaking above the horizon by **1820**.
- **Saturn:** Saturn rises at **1817** on the 1st. Saturn transits at **2336**.and doesn't set until **0458+**. Saturn by mid-month rises at **1719** and transits at **2238**. By the end-of-the-month Saturn is easily visible by **2000** and transits by **2136**.
- **Uranus:** On the first of the month Uranus is an evening object rising at **2218.** By the ides Uranus is rising at **2122**. End-of-month finds Uranus rising at **2022**.
- **Neptune:** Neptune is rising at **1950** in the beginning of the month. Neptune transits at **0144+**. By the 15th Neptune rises at **1854**. Neptune transits at **0048+**. By the end of the month Neptune is rising at **1754** and transits at **2347**.
- **Pluto:** Pluto on the first of the month is at 14.38 apparent magnitude and rising at **1700**. It won't be truly visible until well after sunset at **2030**. Pluto transits at **2159**. By mid-month Pluto is rising at **1808** but again the sun will interfere with viewing until around **2015**. Pluto transits at **2103**. By the 30th Pluto is probably not visible until it transits at **2003**. Pluto sets at **0102+**.

Asteroids:

- Still a dearth of asteroids. I searched for asteroids in 2022 with a reasonable magnitude; say less than or equal to +10 in September 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**
- There is one asteroid you might try finding and/or imaging this month: (216) Kleopatra asteroid in Pegasus Visual Magnitude is +9.9. Its size is only 0.1 arcsecond. It is 99.5% illuminated on the 15th at 2100. Rising 1727, transiting at 0003+ and not setting until 0634+.

Meteors:

- Delta Aquarids Meteor Shower. (see Highlights September 28-29 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 September 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.

One comet of interest this month.

Comet **C/2017 K2**., a comet in **SCORPIUS**, visual magnitude +6.6 on the 15th of September 2022 at **2100**. It rises at **1225** but doesn't set until **2145**.

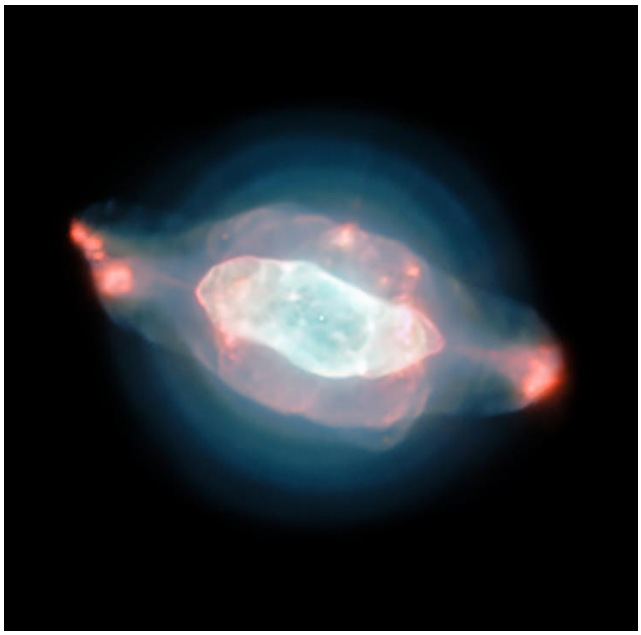
Deep Sky:

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 September 2022 at 2100 PDT and you will have about 20 minutes of viewing time total.

Let's take a look at some fun objects (at least for me):

Saturn Nebula – NGC 7009**:**



llustration 1: By ESO/J. Walsh - http://www.eso.org/public/images/eso1731a/, CC BY 4.0, https://commons.wikimedia.org/w/index.php?curid=62801409

The Saturn Nebula (also known as NGC 7009 or Caldwell 55) is a planetary nebula in the constellation Aquarius. It appears as a greenish-yellowish hue in a small amateur telescope. It was discovered by William Herschel on September 7, 1782, using a telescope of his own design in the garden at his home in Datchet, England, and was one of his earliest discoveries in his sky survey. The nebula was originally a low-mass star that ejected its layers into space, forming the nebula. The central star is now a bright white dwarf star of apparent magnitude 11.5. The Saturn Nebula gets its name from its superficial resemblance to the planet Saturn with its rings nearly edge-on to the observer. It was so named by Lord Rosse in the 1840s, when telescopes had improved to the point that its Saturn-like shape could be discerned. William Henry Smyth said that the Saturn Nebula was one of Struve's nine "Rare Celestial Objects".
The Saturn Nebula is a complex planetary nebula and contains many morphological and kinematic sub-systems in three dimensions. It includes a halo, jet-like streams, multiple shells, ansae ("handles"), and small-scale filaments and knots. The ansae are expanding non-radially from the central star. Although the ansae are most prominent in the Saturn Nebula, they are also visible in other planetary nebulae, including NGC 3242, NGC 6543 and NGC 2371-2. (Wikipedia)

Little Dumbbell Nebula – M76:

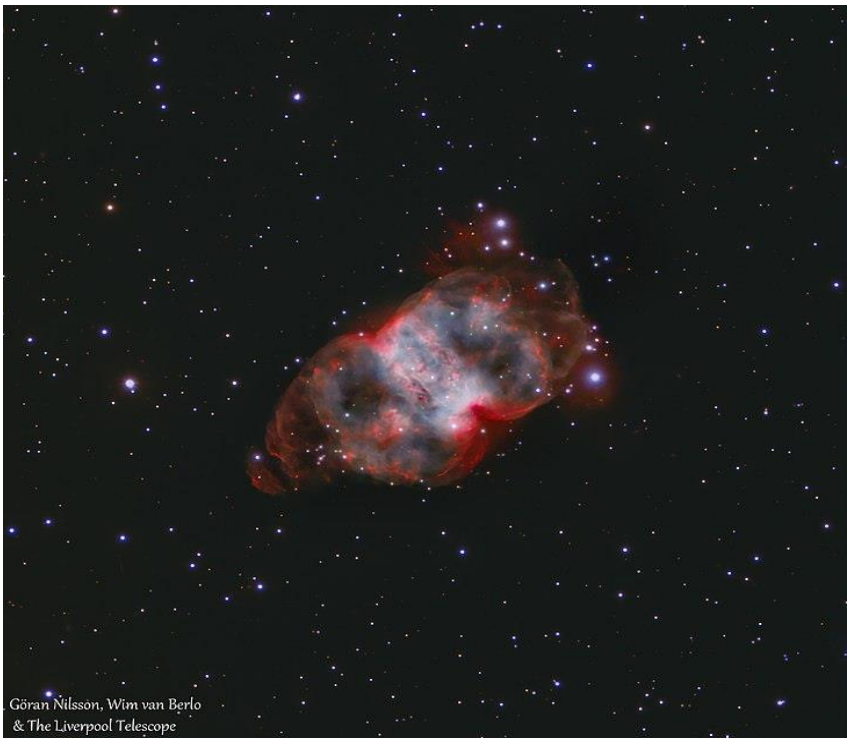


illustration 2: By Göran Nilsson, Wim van Berlo & The Liverpool Telescope - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=63294916

The Little Dumbbell Nebula, also known as Messier 76, NGC 650/651, the Barbell Nebula, or the Cork Nebula, is a planetary nebula in northern constellation Perseus. It was discovered by Pierre Méchain in 1780 and included in Charles Messier's catalog of comet-like objects as number 76. It was first recognized as a planetary nebula in 1918 by the astronomer Heber Doust Curtis. However, there is some contention to this claim, as Isaac Roberts in 1891 did suggest that M76 might be similar to the Ring Nebula (M57), being instead as seen from the side view. The structure is now classed as a bipolar planetary nebula (BPNe), denoting two stars which have burst, leaving neutron star or white dwarf remnants and luminous envelopes. Distance to M76 is currently estimated as 780 parsecs or 2,500 light years, making the average dimensions about 0.378 pc. (1.23 ly.) across.

The total nebula shines at the apparent magnitude of +10.1 with its central star or planetary nebula nucleus (PNN) at +15.9v (16.1B) magnitude. The UV-light from the nucleus is growing a luminous nebula as its envelope, and has the surface temperature of about 88,400 K. Factoring in the solar system's movement and focussing on whether more approaching or parting, it is not receding, having radial velocity of −19.1 km/s.

The Little Dumbbell Nebula derives its common name from its resemblance to the Dumbbell Nebula (M27) in Vulpecula. It was originally thought to consist of two separate emission nebulae so bears New General Catalogue numbers NGC 650 and 651. (Wikipedia)

September is great for both viewing and imaging. Spend some time outside with your scope. Summer is fading and Fall is coming.

For now – Keep looking up.

RANDOM THOUGHT

By Chuck Dyson

SPACE JUNK #2

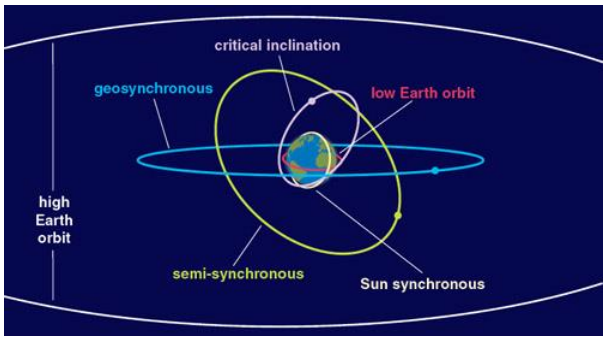
We are not living in a democracy, we are living under a tyrannical system that keeps us on the Earth. If you think I am kidding or spouting crazy thoughts try and get off of the Earth.
Gravity, even though it is an incredibly weak force when compared to electromagnetism, (electromagnetism is 1000000000000000000000000000000000000000 (10X40) times stronger than gravity) is still strong enough to keep us firmly glued to the surface of the Earth our entire lives; just you try to jump into space. Didn't get very high did you? And that's why we have rockets and use them to get into space, sort of. We call it the international space station (ISS) but at an altitude of 254 miles it is really the upper atmosphere station. Note: If the ISS was not boosted every month to gain back the altitude that it had lost then it would only stay in orbit for one to two years; however, the little bit of atmosphere that is around it helps to reduce the astronaut's exposure to the hard space radiation. This radiation also plays havoc with plastics, electronic components, as well as people.

When placing a satellite into orbit around Earth there are a large number of factors that come into play that determine exactly where and at what altitude that orbit will be.

As amateur astronomers we often look into the sky and marvel how clear and transparent it is, but we cannot see in infrared and we definitely cannot see the x-rays of the electromagnetic energy spectrum. However, just as soon as we started to get satellites into orbit, we discovered the Van Allen radiation belts. There are two sometimes three of them. The Van Allen belts "capture" high energy cosmic ray particles that enter the Earth's magnetic field by causing them to spiral down the magnetic field lines and not hit the Earth's atmosphere directly. While this is a good thing for me and you, since it reduces our exposure to deep space radiation, it is a bad thing for any satellite the happens to orbit inside the two belts and get an extra dose of radiation.

As I have already mentioned, gravity, compared to the three forces is incredibly weak, but unfortunately our chemical rockets are also incredibly weak. I know, I know those huge, fire spouting, noise producing rockets look really powerful but in reality, if you are really lucky, what you are seeing is a thing that is 10% rocket body, 80% fuel, and 10% payload. And this 10% payload only happens if you are launching from the equator to the East and going for Low Earth Orbit (LEO) which is an altitude of 300 to 600 miles. If you are launching from a latitude other than the equator, (Cape Canaveral), or if you launch in any direction other than due East, (Vandenberg), or if you want to go higher than LEO, (geostationary orbit (GTO) is 22,000 miles up), then all of these factors will require more fuel and will reduce your payload to orbit. To give you just a little idea of how much the mass of your payload can change depending on the orbit the Atlas 401 rocket (a very popular variant of the Atlas rocket) will lift 9,767 kilos of payload to LEO but only 4,750 kilos of payload to GTO.

Because the amount of payload that we can lift into orbit decreases rapidly for our rocket design we want to use the most economical orbit that we can find and still accomplish our satellite function goals. This scenario naturally results in satellites of similar functional design from different countries operating in the same space neighborhood; with each “new kid” on the block comes a fresh supply of space junk from parts of the rocket to the neighborhood. Some of the upper stages of the booster rockets also wind up in orbit and can have residual fuel in them that can, over time, cook off and blow the booster body into hundreds or thousands of new pieces of junk and each piece has a slightly different orbit, and all of this becomes a cloud of particles that can then impact an operational satellite.



, Fig 1 Types of Orbits


Fig. 2 Debris cloud

Another increasing source of space junk is the testing of antisatellite rockets on a nation’s old defunct satellites. If a country chooses to do a test on a high altitude satellite, then the junk cloud can stay in orbit for decades. If the test is conducted on a low altitude satellite, 250 to 350 miles of altitude, then the debris will mostly deorbit in ten years. The most recent antisatellite test was by Russia in 2021 when they were unhappy with the support of The Ukraine by America. The satellite was in an intersecting orbit that was close to the orbit altitude of the ISS but not at the exact altitude. The Russian politicians, on the ground, claimed that there was absolutely no chance of any debris hitting the ISS; however, the astronauts, including the Russian cosmonauts, all went into their escape pods or safe room until the debris cloud was actually safely passed, two days’ time. At this time there is an estimated 10,000 tons of hardware in various orbits around Earth.

With the advent of private companies launching satellites there will be new challenges to the junk control problem in space because junk control costs money and private companies like profit. Space X has been approved for 12,000 Starlink satellites and at 53 satellites per launch that is 227 launches. Space X is requesting approval for another 30,000 satellites which will require another 566

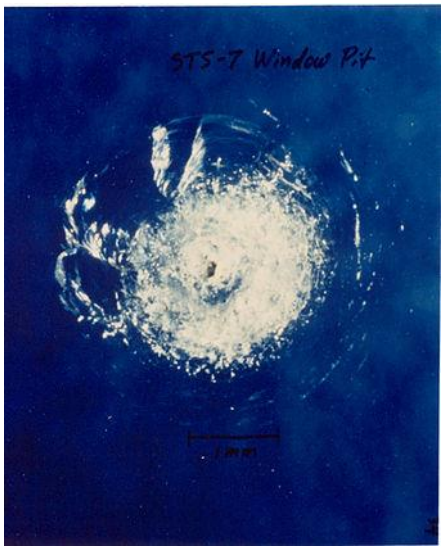


Fig 3 damage to the space shuttle Challenger’s window by a fleck of paint.

launches (On average the world's governments launch 99 satellites per year). Elon Musk is planning to launch a lot of junk into space.

The final hazard to satellites and astronauts is the naturally occurring particles that whizz past and around our planet. To get an idea of what the natural hazard rate around Earth is NASA place the Long Duration Exposure Facility (LDEF) in orbit at 275 miles altitude in 1984 and retrieved it in 1990 (5.7 years later) at 175 miles of altitude, a good example of LEO orbital decay. The satellite was inspected for changes and deterioration of different materials on its surface and for evidence of meteoric impacts. The satellite displayed evidence of over 20,000 micro impacts.

We now have large numbers of satellites that we want to be in a few specific orbits around the planet and that means that although space is large we will be concentrating space junk in small areas and our chances of a satellite/ junk interaction, OK a crash, are going to go up. Our only saving grace is that over time thanks to gravitational perturbations of orbits and atmospheric drag, at LEO orbits, our space junk will deorbit itself. The big question is "Are we putting junk into space faster than it is deorbiting?" A recent study by a team of Italian astronomers suggested that in the LEO region the answer is not yet but at higher orbits where orbital decay takes longer, (America's Vanguard 1 satellite launched in 1960 will deorbit in 2200), the answer is yes.

In 1978 a NASA engineer named Donald J. Kessler published a paper describing how, with increasing junk density, there would be increasing junk versus junk, and satellite collisions will become so frequent that operating satellites in that region of space becomes impractical. This scenario is now called the Kessler syndrome and some studies suggest that it could become a reality in as little as 100 years from now, I do not know if the studies factored in the Space X Starlink satellites as Musk does seem to have a habit of accelerating timelines.

Do we have any examples of the Kessler syndrome in action? Just get yourself a small telescope and look at Saturn and then ask yourself "Do I want to send a satellite into that ring?" An extremely prudent answer to that question would be a firm "NO!" and that's why all satellites that have gone to Saturn have strictly avoided the ring area and just for good measure NASA even avoids the much thinner ring system of Jupiter.

The biggest reason to not put this problem on the back burner of space priorities is the staggering cost of cleaning up space after we junk it up; although, if you hate the space program and want the monies spent elsewhere space junk is a good way to end NASA and its budget. And that is my sad thought of the month.

Cheers, Chuck

Become a NASA Partner Eclipse Ambassador!

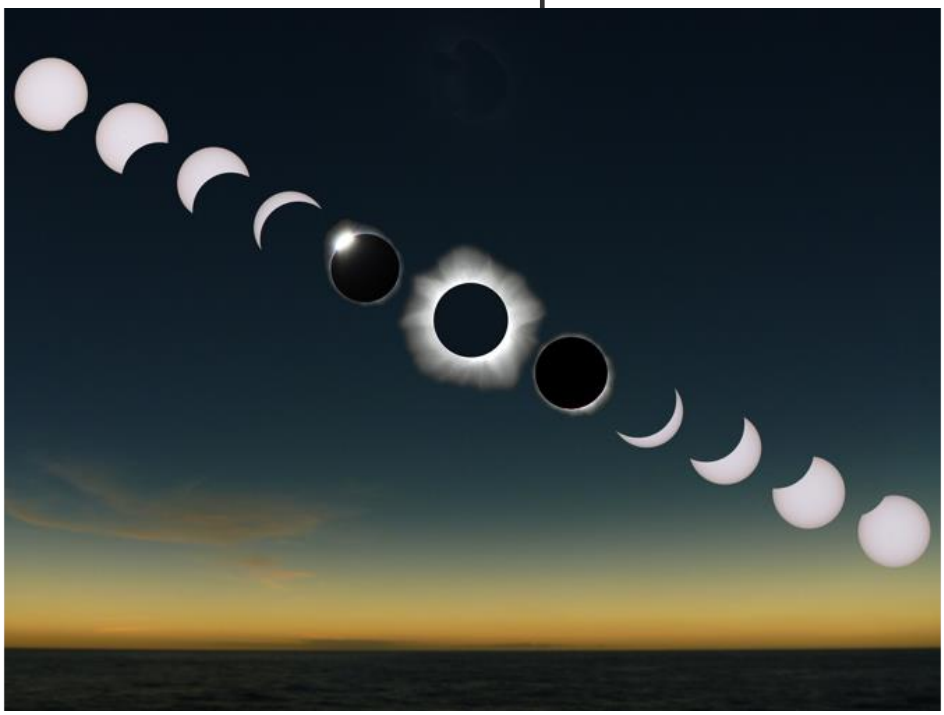


Image Credit: R Fienberg, 2012

Make a difference in your community while celebrating solar science: apply now to become an official
NASA Partner Eclipse Ambassador!

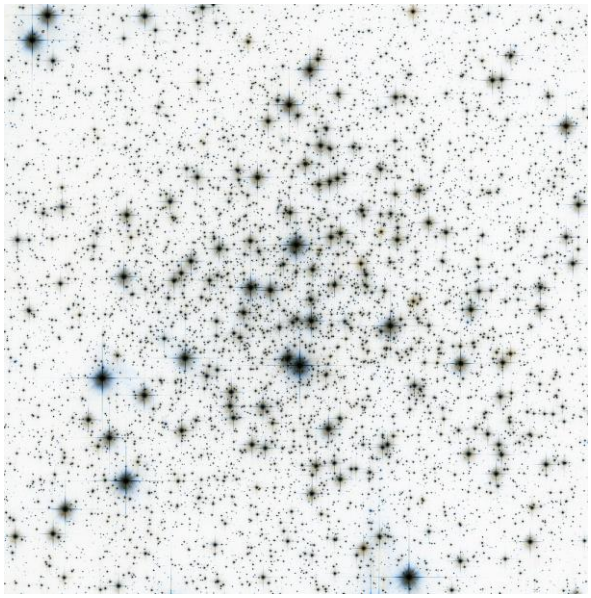
In 2023 and 2024, both an annular and total solar eclipse will each cross the United States. Through an exciting new partnership, NASA is partnering amateur astronomers with undergraduate students to engage 500 underserved communities off the central paths of the eclipses, both before and between these incredible events.

Partner with a local undergraduate student and train together with others across the country in a three week workshop. Learn new tools and techniques for explaining eclipses and inspiring awe. Then, engage underserved audiences in your community with effective outreach! You will receive a toolkit full of materials to enhance your outreach, including hands-on activities and hundreds of safe solar viewing glasses!

As a NASA Partner, you will be partnered with local organizations that will connect you to underserved communities, and recognized for your commitment to public astronomy engagement with a special badge and certificate. Your efforts will be supported by a dedicated team at the Astronomical Society of the Pacific, who are committed to helping everyone enjoy the wonder and science of solar eclipses, everywhere!
Learn more and apply today at **eclipseambassadors.org**

Another Look September, 2022

By Dave Phelps



New moon Sept. 25th, Full moon 10th, New moon Aug 27
Astronomical twilight 2005 PDT
First day of Autumn: **Thursday, September 22, 2022 at 6:03 pm PDT**

September Full Moon this year will be the Harvest Moon since it is the full moon nearest the equinox.

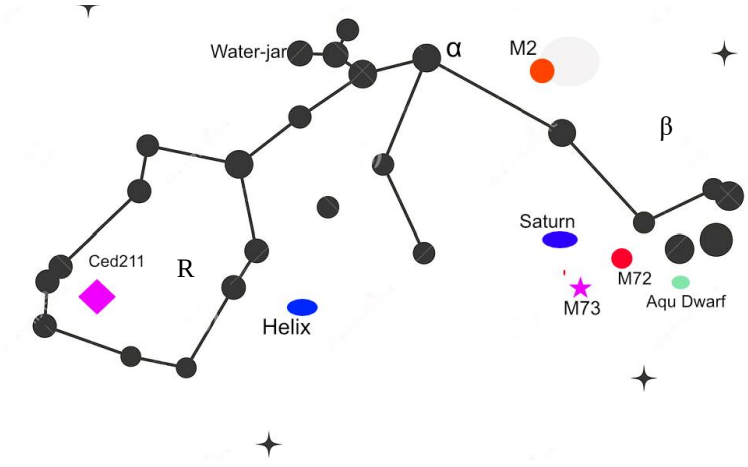
Traditionally the full moon in September is the Corn Moon, while Celtic and Old English names are Wine Moon, Song Moon, and Barley Moon

The Age of Aquarius

The Reverend T. W. Webb, edited by Margaret Mayall, describes Aquarius as “a dull looking-constellation, but well repaying telescopic research”.***Celestial Objects for Common Telescopes Thomas William Webb, 1859*** No time like the present to take a look for ourselves.

Beta Aquarii β, is a visual multiple star that was used as test for the early achromatic lenses. The b and c component are 11 and 12 magnitude and under a minute from their 2nd magnitude primary, making it tough to see. Beta has a very old history. Its name is Salalsuud, meaning luck of lucks from the Arabic. The Chinese called it and its neighbors the First Star of Emptiness. The Hindus pointed to that area as the mansion of the “Deities of Earthly Abundance” and very far back along the Euphrates, it was called the Star of Mighty Destiny. This earliest name may be what led to the early modern Latin: *Lucida Fortunæ Fortunarum* which translates to *the brightest of luck of lucks.*

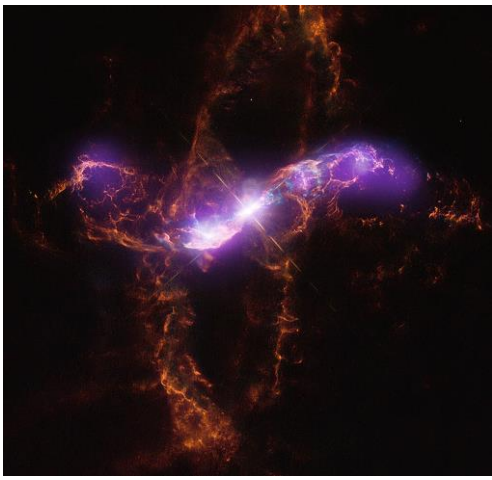
(https://en.wikipedia.org/wiki/Beta_Aquarii)



Aquarius contains another famous supergiant star: Sadalmelik, (Alpha Aquarii α), and a number of notable deep sky objects: the globular clusterαs Messier 2 and Messier 72, the asterism Messier 73, and the Aquarius Dwarf Galaxy,

The Aquarius Dwarf is 14th magnitude and very diffuse. It can be found only six minutes of arc east of M72 and a half a degree south. Its notable because in this era of an expanding universe, the Aquarius dwarf has a blue shift and is coming our way. Thank you to the ***Hubble Space telescope for this image:*** https://en.wikipedia.org/wiki/Aquarius_ Dwarf

In the eastern region of Aquarius is Variable star R Aquarii. R is a red giant that changes brightness between 5th and 12 magnitude, a cycle that takes over a year. R also has a companion. A white dwarf whose shared orbit is about 44 years, but it's a ghost, it can't be seen.



Sven Cederblad was a **Swedish astronomer** who published his catalogue of "bright diffuse galactic nebulae" as a thesis in 1936. He listed two hundred and fifteen nebulae in his catalog. R is surrounded by Cederblad 211. Ced 211 is an emission nebula probably caused by a nova explosion from the dwarf that we think was recorded by the Japanese in 903AD.

Image Credit: X-ray: NASA/CXC/SAO; Optical: NASA/STScI, Palomar Observatory, DSS; Radio: NSF/NRAO/VLA; H-Alpha: LCO/IMACS/MMTF

The history and mythology around Aquarius goes back thousands of years to the civilizations that grew up around the Euphrates and the Nile. The Babylonians had a god who was depicted holding a vase.

The Egyptians imagined Aquarius pouring water from his jar flooding the Nile in the Spring. Rain meant life, the rivers flooding brought new soil and new life to the fields.

Flooding and its relationship to new life are found in history back through the eras of Gilgamesh, Nimrod, through early Egypt and the Pharaohs, into Greece and in our Judeo-Christian writings.

Our most recent tie to Aquarius goes back only a few thousand years to the Greeks.

Aquarius portrays Ganymede, a young man stolen by Zeus and taken to Mt. Olympus to serve as his cup-bearer, ie: slave. Zeus he did this by changing himself into an Eagle, represented by Aquila. The day came when Ganymede had enough and stole all his wine and water and poured it out, flooding the earth and giving the world rain**.**

The Abduction of Ganymede (c. 1650), by Eustache Le Sueur (Ganymede (mythology) - Wikipedia***)***

The other image is from a rare globe made by Vincenzo Coronelli in the late 1600's. The title is ***Globe Céleste de Coronelli*** and I copied it from ***https://www.wallhapp.com/urano/globe-celeste-de-coronelli-1683.***

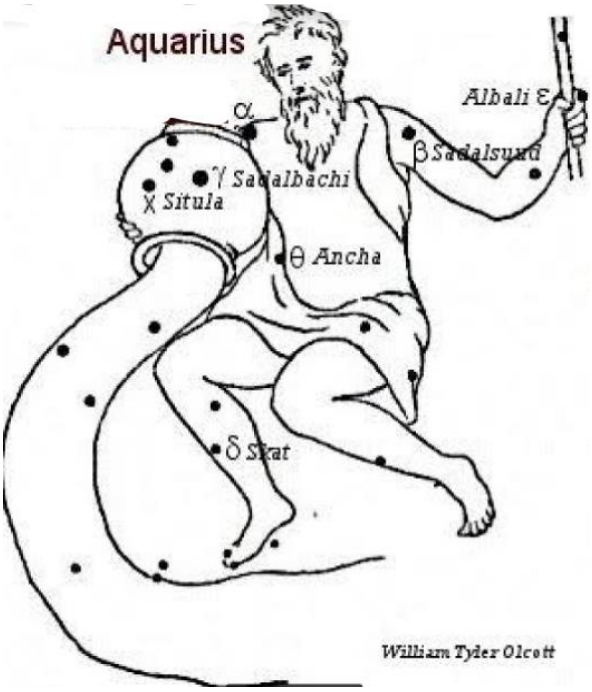
We talked about Ced 211 and the Dwarf, but another curious case in Aquarius is M73. It makes me wonder about the quality of the seeing in 18th century Paris as well as the quality of the optics Charles Messier commonly used. His main telescope was a 4" doublet but his favorite was a 7.5" Gregorian. Long focal lengths were common in that era to mitigate the realities of silver coatings, metal mirrors and less than ideal figuring by pin hole and gas light. Messier's original description of M73 was a star cluster surrounded by nebulosity. In later observations using his much larger telescope, Herschel did not find any nebulosity nor a cluster to identify. New measurements have found that the stars of M73 have differing proper motions and distances from us and are not conjoined, leaving M73 as a fairly famous asterism.

Both M73 and M72 are 9th magnitude but you will find that M72 is a nice class IX globular.

Closer to the center of Aquarius is NGC 7009, Caldwell 55 and nicknamed the Saturn Nebula. It's an 8th magnitude planetary with ansae. ESO has a terrific image as does APOD who closed out 1997 with a wonderful show of planetaries. N7009 was Dec. 30.

Saturn, M72 & M73 and the dwarf are grouped together, sorta, near the hand of Aquarius: Epsilon ε and Mu μ. Further up, north of Beta β you will find M2, third magnitude and class III, a big, bright, really nice globular and a helpful finder to the three stars that make up the Waterjar: Pi π, Zeta ζ, and Gamma.γ. Alpha α, marks the right shoulder of Aquarius, as noted it is named Sadalmelik. Alpha α lies between the Water Jar and M2.

On the other side of Aquarius, are a couple of objects worthy of your time. Firstly, is the Helix Nebula, NGC7293, Caldwell 63. Similar in size and appearance to the Ring. It is bright at 7th magnitude and has a lot of structure.



Over by Ced 211 is a peculiar 11th magnitude galaxy, NGC 7727. About 3 degrees north of Ced 211, N7727 has two nuclei, both of them black holes. Burnham gives its size as 2.7'x2.7', considerably smaller than the Internets 4.7'x3.5'. It would be interesting to see which matches up visually.

Star lore of all ages; a collection of myths, legends, and facts ...
By *William Tyler Olcott* 1911

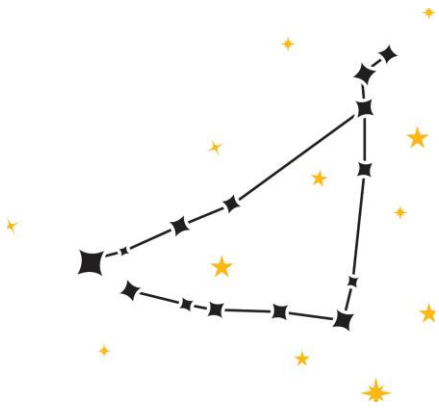
The story of Capricornus goes back over 3000 years to the Sumerians, the Babylonians, the Greeks, Romans and to Ptolemy in the 2nd century. The oldest records depict it as a "goat-fish". It was a very important constellation since it marked the winter solstice, the first day of winter. The Greeks kept the goat theme

alive connecting Pan, their pipes playing horned god with the goat legs with Capricornus. He got his fish tail escaping Typhon, a winged and snake footed monster by hiding in the Nile river.

Capricornus has a couple of deep sky objects to check out. M30 is a 7th magnitude Class V globular cluster with a dense, collapsed core

https://www.wikiwand.com/en/Messier_30

and NGC 6907 is an 11th magnitude spiral galaxy with two prominent arms giving is a pronounced "S" shape.



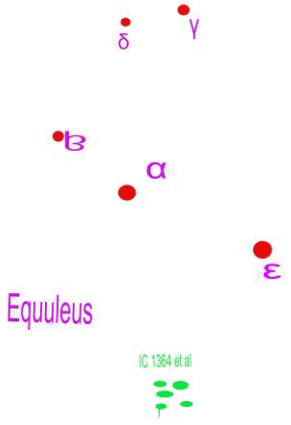
The brightest star in Capricornus is Delta Capricorni. Delta's δ name is Deneb Algedi, meaning Tail of the Goat. On the other side of Capricornus is Beta β, named Dabih, the Butcher. Then we have Alpha α, near Dabih named Algedi meaning the Goat. Nu ν is one of the last two named stars, Alshat meaning the sheep and Nashira Gamma γ , meaning "Bearer of Good News"

There are also a couple multiple star systems of interest. Alpha has two stars not physically related, and each star has a companion. Alpha 2 is variable from 3.5 to 11, something to look for. Beta is also a double with contrasting colors. Per Burnham, Beta 1 is a spectroscopic triple with a 13th magnitude pair (mag. 13 & 13.4) between the two bright stars.

Quoting Webb he reports: "Minute pair between them. Very fine large field. Barnard doubled Beta 2".

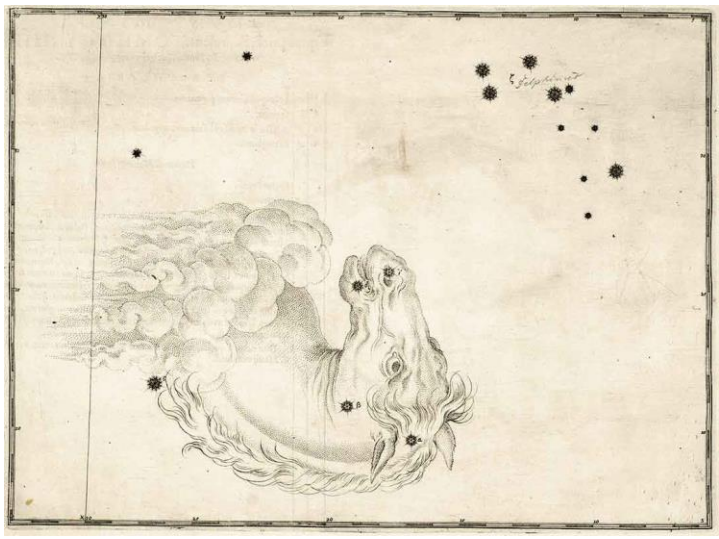
Palomar 12 is a tough globular. Its 12th mag and is pretty big, 17+ minutes of arc. The books say it's about 30% younger than most globular clusters in the Milky Way..

Palomar 12 Hubble.jpg



18-Bayer-Uranometria-1603.jpg (1078×800) (wallhapp.com)

https://webbdeepsky.com/galaxies/object/IC1365



Equuleus is the 2nd smallest constellation. It is one of Ptolemy's original 48 and its origin as a constellation is steeped in pre-history. Of course the Greeks had something to say about it, the usual seductions and searchs. It has no deep sky objects except for galaxies in the 12, 13 and fainter magnitudes. It has a few interesting multiple stars and a nice globular cluster, M15, right over it's border. Look for Epsilon ε Equulei, visual about 5th magnitude. It has 4 members ranging from 5.5 to 12.5

magnitudes. You can also try Beta β, a much more difficult triple system with magnitudes of 5-13, and 11. If you check the border between Equuleus and Aquarius you will find a small group of 12, 13 and 14 magnitude galaxies of all types and descriptions.

The Webb society has a great image of IC 1365 and NGC 7046. It's a nice little group. The Polish Wikipedia lists 10 close-in members. I wish you

Dark Skies

Dave Phelps

The Summer Triangle's Hidden Treasures
by David Prosper (NASA/JPL)

September skies bring the lovely **Summer Triangle** asterism into prime position after nightfall for observers in the Northern Hemisphere. Its position high in the sky may make it difficult for some to observe its member stars comfortably, since looking straight up while standing can be hard on one's neck! While that isn't much of a problem for those that just want to quickly spot its brightest stars and member constellations, this difficulty can prevent folks from seeing some of the lesser known and dimmer star patterns scattered around its informal borders. The solution? Lie down on the ground with a comfortable blanket or mat, or grab a lawn or gravity chair and sit luxuriously while facing up. You'll quickly spot the major constellations about the Summer Triangle's three corner stars: Lyra with bright star Vega, Cygnus with brilliant star Deneb, and Aquila with its blazing star, Altair. As you get comfortable and your eyes adjust, you'll soon find yourself able to spot a few constellations hidden in plain sight in the region around the Summer Triangle: **Vulpecula the Fox**, **Sagitta the Arrow**, and **Delphinus the Dolphin**! You could call these the Summer Triangle's "hidden treasures" – and they are hidden in plain sight for those that know where to look!

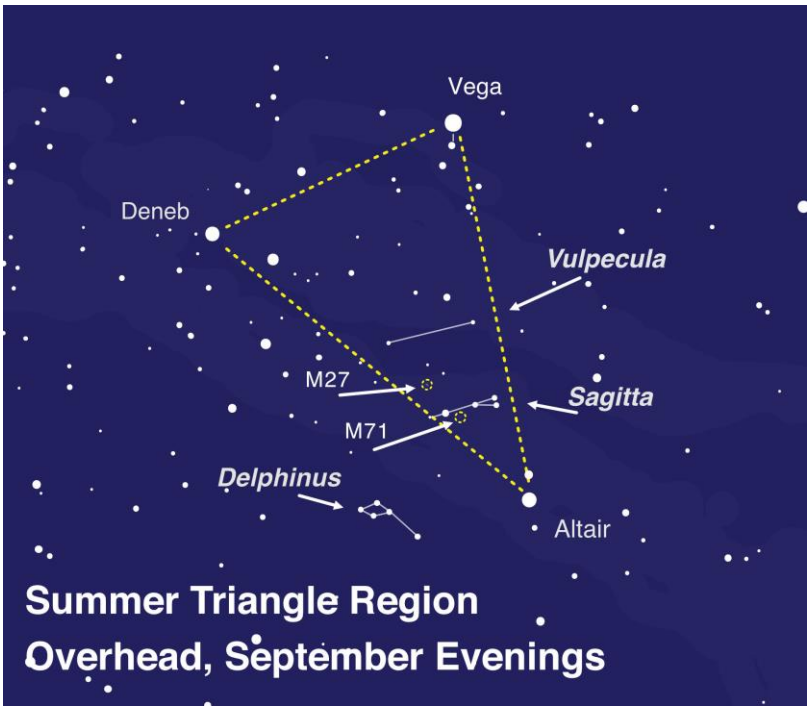
Vulpecula the Fox is located near the middle of the Summer Triangle, and is relatively small, like its namesake. Despite its size, it features the largest planetary nebula in our skies: M27, aka the Dumbbell Nebula! It's visible in binoculars as a fuzzy "star" and when seen through telescopes, its distinctive shape can be observed more readily - especially with larger telescopes. Planetary nebulae, named such because their round fuzzy appearances were initially thought to resemble the disc of a planet by early telescopic observers, form when stars similar to our Sun begin to die. The star will expand into a massive red giant, and its gasses drift off into space, forming a nebula. Eventually the star collapses into a white dwarf – as seen with M27 - and eventually the colorful shell of gasses will dissipate throughout the galaxy, leaving behind a solitary, tiny, dense, white dwarf star. You are getting a peek into our Sun's far-distant future when you observe this object!

Sagitta the Arrow is even smaller than Vulpecula – it's the third smallest constellation in the sky! Located between the stars of Vulpecula and Aquila the Eagle, Sagitta's stars resemble its namesake arrow. It too contains an interesting deep-sky object: M71, an unusually small and young globular cluster whose lack of a strong central core has long confused and intrigued astronomers. It's visible in binoculars, and a larger telescope will enable you to separate its stars a bit more easily than most globulars; you'll certainly see why it was thought to be an open cluster!

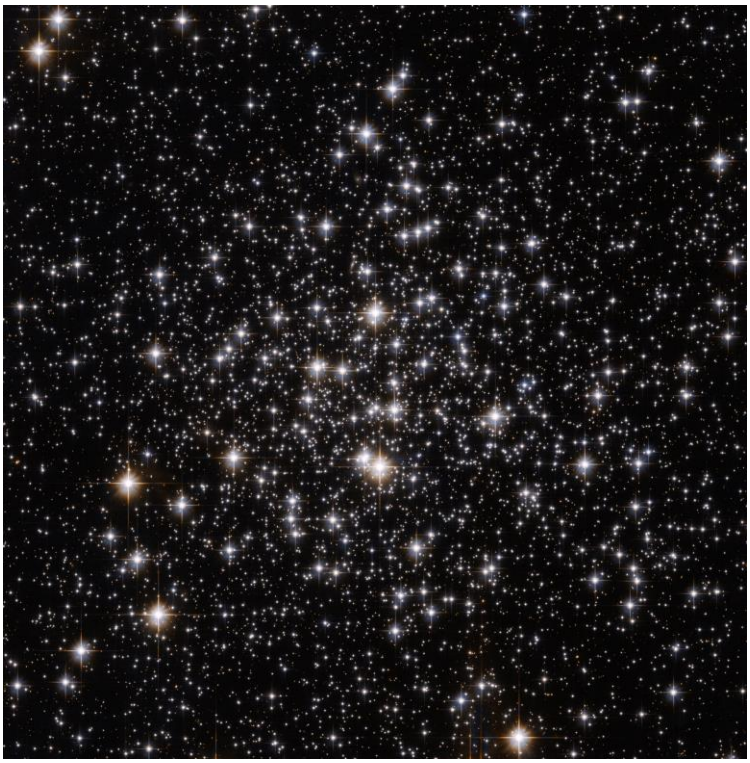
Delicate **Delphinus the Dolphin** appears to dive in and out of the Milky Way near Aquilla and Sagitta! Many stargazers identify Delphinus as a herald of the fainter water constellations, rising in the east after sunset as fall approaches. The starry dolphin appears to leap out of the great celestial ocean, announcing the arrival of more wonderful sights later in the evening.

Want to hunt for more treasures? You'll need a treasure map, and the Night Sky Network's "Trip Around the Triangle" handout is the perfect guide for your quest! Download one before your observing session at bit.ly/TriangleTrip. And of course, while you wait for the Sun to

set - or skies to clear - you can always find out more about the objects and science hidden inside these treasures by checking out NASA's latest at nasa.gov.



Search around the Summer Triangle to spot some of its hidden treasures! To improve readability, the lines for the constellations of Aquilla, Lyra, and Cygnus have been removed, but you can find a map which includes them in our previous article, Spot the Stars of the Summer Triangle, *from August 2019. These aren't the only wonderful celestial sights found around its borders; since the Milky Way passes through this region, it's littered with many incredible deep-sky objects for those using binoculars or a telescope to scan the heavens. Image created with assistance from Stellarium: stellarium.org*



M71 as seen by Hubble. Your own views very likely won't be as sharp or close as this. However, this photo does show the cluster's lack of a bright, concentrated core, which led astronomers until fairly recently to classify this unusual cluster as an "open cluster" rather than as a "globular cluster." Studies in the 1970s proved it to be a globular cluster after all – though an unusually young and small one! Credit ESA/Hubble and NASA. Source:
https://www.nasa.gov/feature/goddard/2017/messier-71

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