



Newsletter of the Pomona Valley Amateur Astronomers

Science is always wrong. It never solves a problem
without creating 10 more.

George Bernard Shaw



Volume 42 Number 10

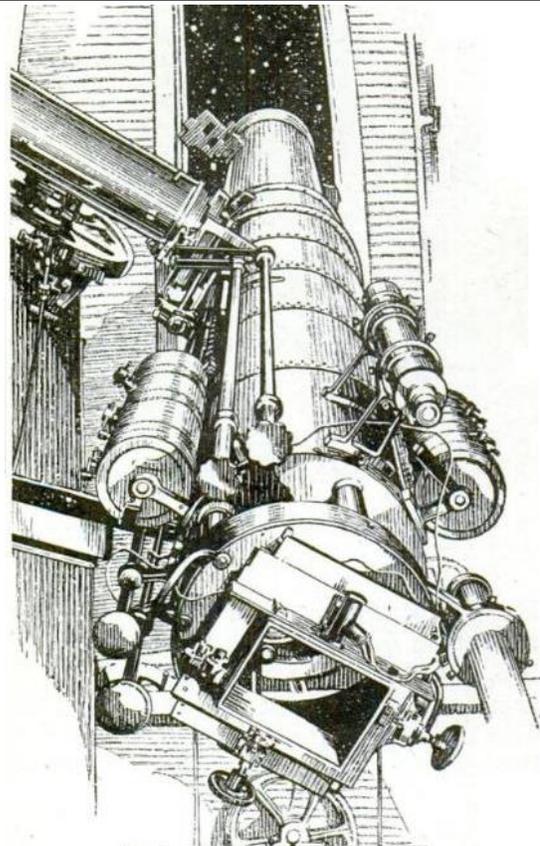
nightwatch

October 2022

We will enjoy four speakers at the General Meeting this Friday, October 7th at 7:30PM on Zoom. Gary Thompson will speak about SpaceX plans to boost the HST into a higher orbit, Ken Elchert will talk about the DART spacecraft's collision with asteroid Dimorphos, then Sharol Carter and Ron Ugolick will each speak about some of their astro-images.

Club Events Calendar

- Oct 7** General Meeting-7:30 PM
Gary Thompson on plans to boost HST to a higher orbit,
Ken Elchert on DART spacecraft's collision with Dimorphos,
Sharol Carter and Ron Ugolick about their astro-images
- Oct 22** Star Party – Cow Canyon Saddle
Oct 26 Board Meeting 6:15 PM
- Nov 4** General Meeting (presentation:TBD) 7:30 PM
Nov 19 Star Party – Joshua Tree
Nov 26 Star Party in the Park – Cahuilla Park
- Nov 30** Board Meeting 6:15 PM
- Dec 10** Christmas Party – Casa Jimenez, Claremont 6PM



PVAA General Meeting 09/09/22

Before the speaker we talked about new star party dates. Please check the PVAA calendar on our website at PVAA.us to see what is scheduled.

Our speaker for the night was Dr. Ken Farley, Professor of Geochemistry at the California Institute of Technology and a Project Scientist for the Mars 2020 rover. Much of his current work is centered on Martian geochronology and surface exposure dating using in-situ noble-gas based techniques. His topic for the night was the current main instrument in his research – the Perseverance Rover on Mars. It got its name in a nation-wide K-12 student “Name the Rover” contest. The Rover is also called “Percy” for short.

Ken has been working on this project since its inception in 2013. He was one of the few early scientists whose role it was to get the engineers to truly understand the scientists’ needs. Now there are about 550 scientists on the project. At the time of the presentation, Perseverance had been on Mars for 553 Sols – or Martian days. A Martian day is 24 hours, 37 minutes, and 22 seconds long.

Percy landed in Jezero Crater. It was chosen as the landing site because it was ancient lake that no longer exists. It has a delta in it formed by a river that flowed into the lake billions of years ago.

The spacecraft came in on a ballistic trajectory, aero-braking followed by a robust supersonic parachute, and finally rocket-powered flight to bring the rover to hover over the surface, and then was lowered by winch to the ground. The lines were then cut, and the rocket flew away and landed about 1.5 km away.

The main objectives of Mars 2020 are to:

- 1.) Seek evidence of ancient Martian life
- 2.) Prepare samples for return to Earth
- 3.) Enable the future

Why ancient life? Mars is currently very inhospitable to life as we know it. We know that about 3.5 billion years ago there was liquid water on Mars, there was an atmosphere, and it was shielded from cosmic rays. We believe that there was a magnetic field and Jezero crater was a lake 40 km wide and at least 200 meters deep unlike today where there is no standing water, a tiny atmosphere that is only 6 tenths of one percent of Earth’s, and a surface now bathed in cosmic rays, with no magnetic field.



Landing Site



Artist concept of Jezero Crater 3.6 billion years ago.

Ken Farley PhD 9 9 22 Mars 2020 Perserverance Rover Mission

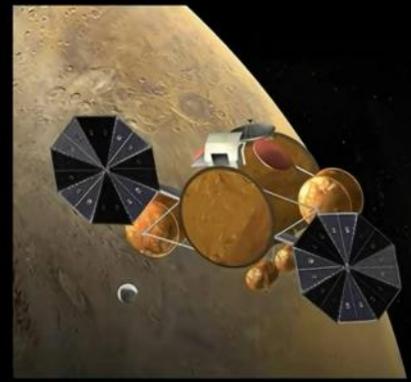
A Notional Three-Mission Mars Sample Return Campaign



Sample Collection
(Mars 2020)



Mars Ascent Vehicle (MAV)
launches Orbiting Sample (OS)



Mars Orbiter captures OS and
brings it back to Earth

Mars Sample Return example

The Rover also brought along with it a little helicopter named “Ingenuity” as a technology demonstrator. It had an original mission profile of 5 to 6 flights to see if it could even take off and fly. Ingenuity has made 32 flights as of September 18,2022. It can fly for up to 167 seconds going as far as 704 meters (2,310 ft) and to a height of 12 meters (39 ft). So far it has flown for 57 minutes, 46 seconds and traveled 7.36 km (4.57 miles). Because these flights were so successful NASA is considering using helicopters to retrieve the samples for the return mission.

Ken then pointed out many Mars features and compared them to similar things on Earth. Perseverance is taking samples of the Martian rocks and surface, first documenting the area, and then sealing the samples in each individual container, weighing it, and measuring its volume. The first time that they wanted to get a sample it didn’t work. The rock core turned to dust. They were truly afraid that they wouldn’t be able to get any samples. They persevered and got their sample. They were able to do an x-ray florescent spectrograph of the ‘dust’ sample and they got Iron Oxide, Aluminum Oxide, Calcium Oxide, along with white

salt minerals.

NASA and ESA are working on a way to bring the samples back. The samples will be put in sphere about the size of a basketball that is part of a Mars Ascent Vehicle (a rocket that lands on Mars and later sends it payload into Mars orbit.) There it docks with a Mars Orbiter which brings it back to Earth.

The rover is powered by a MMRTG (Multi-Mission Radioisotope Thermoelectric Generator) weighing in at 45kg (99 lbs.). It contains 4.8kg (11 lbs.) of plutonium dioxide that converts heat into electricity. At launch it was generating 110 watts of electrical power. It has two lithium-ion batteries to meet peak power demands when the rover activities exceed the MMRTG’s output.

Gary Thompson

PVAA Video:

<https://www.youtube.com/watch?v=mOP2EwCnhH4>

Wikipedia:

[https://en.wikipedia.org/wiki/Perseverance_\(rover\)](https://en.wikipedia.org/wiki/Perseverance_(rover))

NASA:

<https://www.nasa.gov/perseverance>

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Another Look - October 2022

Full moon October 9, called the Hunter's Moon; New Moons Sunday Sept 25 and Tuesday Oct. 25 Native Americans named this Full Moon after Autumn, including Drying Rice Moon, Falling Leaves Moon, and Freezing Moon. The Celts used Seed Fall Moon to describe this moon. Also, the Pagan Blood Moon or Sanguine Moon

On Oct 25 is a partial solar eclipse. At max the Moon covers 82.11% of Sun's surface somewhere east of the Urals and north of Novosibersk. The partial phase is visible into Spain, Africa; the southern tip of India will see a tiny notch taken out.

When you take into account that Aries is one of the puny constellations surrounded by Triangulum and Pisces it is a wonder why it is so famous. That being said, Aries could be one of the oldest constellations identified. If we accept that the constellations as we know them, excluding India and China, were first named several thousands of years ago in and around the region of the Euphrates River, it is probable, 3500 years ago, that the stars were not named because they looked like anything but because they identified with a certain significance in their daily lives. It is also probable that star configurations were pin-pointed by civilizations preceding the Euphratean era. One thing is likely, however, that many of the names given any particular star grouping meandered all over the ancient world and influenced civilizations from Greece and Mesopotamia down to Egypt and the Nile valley; and as we know, the Romans incorporated Grecian culture into their own, Latinizing their names.

(Aries and [Musca Borealis](#) as depicted in [Urania's Mirror](#), a set of constellation cards published in London c.1825)

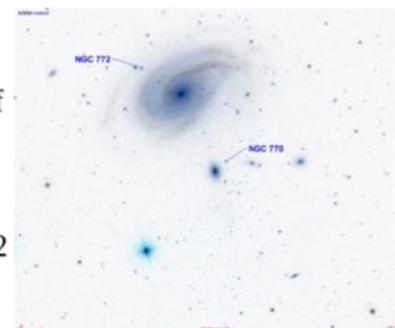
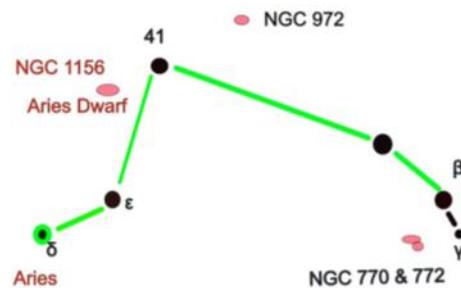


Thus, 3500 years ago the Chaldeans, who named the sun after their flocks, put a name to the stars where the sun shone as the seasons changed. Through the centuries the name stuck. Now, as the seasons change the vernal equinox is in Pisces while 3500 years ago, it was in Aries. Now, the First Point in Aries is slightly below the circlet of Pisces.

I think one of the more fun myths associated with Aries was that of Helles and Phrixus, who were given a ram to escape their evil stepmother. Racing across the Adriatic up into Asia Minor, Helles fell off, thus naming that narrow strait, near the Dardanelles, between Greece and Turkey the Hellespont. The ram raced across the Black Sea bringing the brave young man to safety in Colchis, now modern Georgia. The Ram magically changed its fleece to gold, was sacrificed in thanks to the gods, (I wonder if the ram thought it was such a great honor) and the fleece placed in a grove guarded by a dragon, ready to be stolen by Jason and the Argonauts.

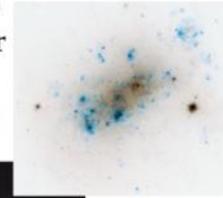
Near Beta and Gamma Arietis is NGC 772 and its satellite galaxy 770. NGC 772 is big and bright at 11th magnitude and you can find NGC 770 at 14th. It is interesting that NGC 772 is also number 78 in Arp's **Atlas of Peculiar Galaxies**.

Image courtesy of *Image créée à l'aide du logiciel Aladin Sky Atlas du Centre de Données astronomiques de Strasbourg et des données de SDSS (Sloan Digital Sky Survey).*



Aries also has its own dwarf galaxy NGC 1156. NGC 1156 is interesting. It has no structure because of interaction with other galaxies. Those bright spots are star forming regions. NGC 1156 is 12th magnitude so you will find it in your 8" backyard telescope.

NGC 1156 →



Up at the top of Aries is NGC 972, another interesting galaxy. Images of it from Hubble show what looks like at first glance an irregular galaxy, but closer study finds its spiral structure hidden by the knots of star nurseries gas and dust. It is 12th magnitude but only 10 arcmin in size. Still if you compare it to the moon at 31 arcmin, you can get a good idea of the relative size of NGC 972. Both images

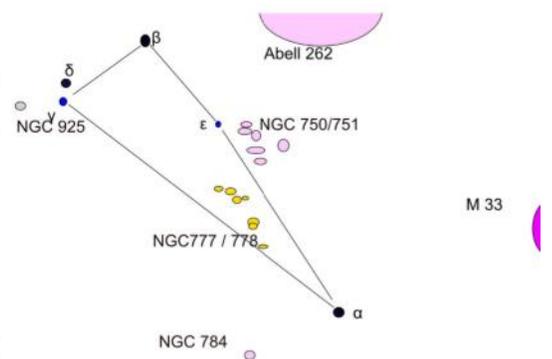


Credit: Hubble Image of the Week

While up at the top of Aries find 41 Arietis. It is a triple star system with components of 4th, 11th and 11th magnitudes. 41 Ari has an official name from the Hindu, Bharani, it means 2nd lunar mansion. 41 Ari is also a part of the obsolete constellation of Musca Borealis, first introduced on a globe of 1612 by the Dutchman Petrus Plancius and shown above the Ram in our clipping from Urania's Mirror.

It being that time of year, Triangulum is galaxies, galaxies and more galaxies.

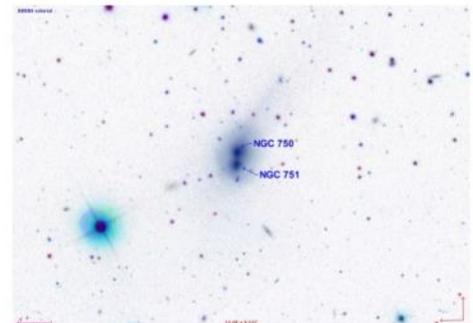
Near each other just off the line from delta to alpha are NGC's 777 and 778. NGC 777 is a bright 12th magnitude nearly textbook elliptical. Its beautifully formed, an oval gradually getting denser and brighter from the edges of the galaxy to its star-like nucleus. NGC 778 is not too far off and can be seen in wide angle images much smaller than its companion. NGC 778 visual magnitude is 14 in the blue range so it will be a properly difficult object to locate. If you can spread out its 8x4 arcsec image you will see a tilted spiral with some unusual knots and clumps.



1902

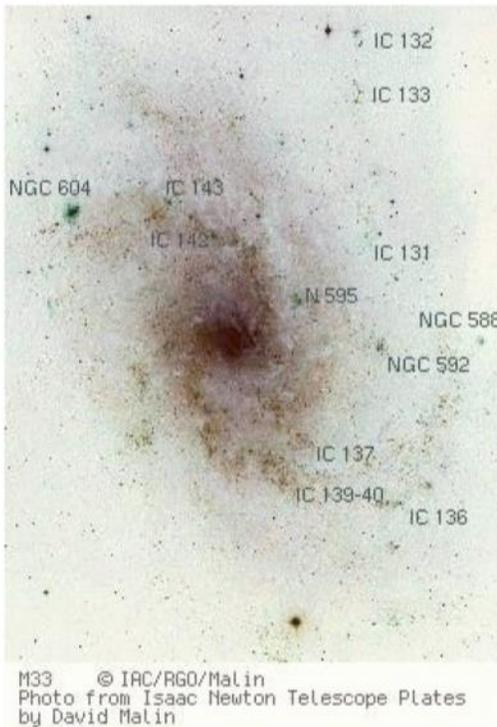


2014



<https://www.drewexmachina.com/2021/06/27/a-century-of-progress-telescopic-views-of-the-triangulum-galaxy/> and https://www.messier.seds.org/more/m033_map.html

Moving over to the other side of Triangulum, there is another knot of interacting galaxies comprised of NGC 750 and NGC 751, number 166 on Arp's "Atlas of Peculiar Galaxies". Near delta δ and gamma γ Trianguli is **N925** a nice loose spiral. It is named the Almatha Galaxy: Quite pretty and at 10' by 5', should be fairly easy to see, though a little low in surface brightness.



NGC 598 or better known as M33 is one of the largest deep sky objects and one of the brightest we have. So, why is it so hard to see sometimes? It's huge, 70x41moa, but that size compared with its low surface brightness has given it the reputation of being a difficult object. Its 5th magnitude so we should be able to see it visually under dark enough skies, and we can. I have a homemade collimation eyepiece, a 1.25" round piece of aluminum with a 1/8" hole bored through it. It works as a great eye focuser, eliminating extraneous light around the edge of your eye. With it on a mountain in Utah I saw M33 and even resolved a few knots.

The Malin image shows four NGC's and 8 IC's. The trick is to try to identify them visually using a map like this as your guide. The four H II star forming regions identified in the image are NGC 595, NGC 588, NGC 592 and NGC 604.

In antiquity Triangulum was seen as a triangle and the Greeks even called it Deltaton because it resembled the capital letter delta in their alphabet. It resembled the Nile delta and the Island of Sicily because of three peaks on the island. Sicily is the legendary home of Ceres, the goddess of agriculture and our minor planet. Ceres apparently loved the island so much she asked Zeus to place it in the heavens.

Pisces Urania's Mirror, Second Edition

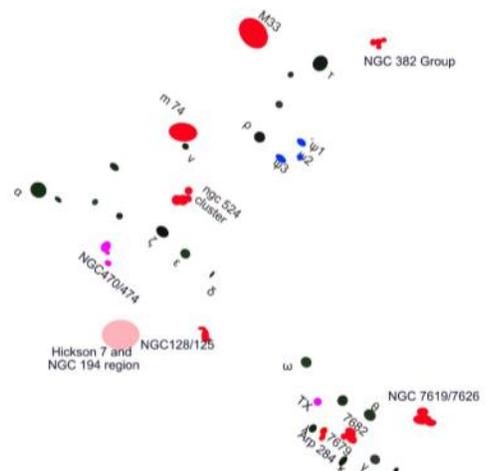
Pisces

"The Fishes shine one higher than the other, from each of them extends as 'twere a band that fastens tail to tail, as wide it floats, and one star large and brilliant clasps its ends"

The Heavenly Knot ' tis called" Erothingham's Aratos



The asterisms that make up Pisces, the Northern Fish and the Western Fish are a part of Ptolemy's original 48, but are thousands of years more ancient. The Babylonians and other civilizations up to and including the Romans regarded the star group as two fishes tied together by a cord or ribbon. The star at the base of the ribbons is Alpha α Piscium. It is a named star, Al Rescha, meaning the knot. In one of my references, it is posited that the dual nature of the constellation contributed to or was in turn contributed to by the addition of an extra month every six years of the Babylonian calendar. That's how ancient this constellation is. Due to the precession of the equinoxes, the vernal equinox is close to the circlet.



The Greeks had the most fun with this constellation. They wove into it the Titan's war with the gods, the birth of the most dangerous Titan of all, an escape and a stellar honor. Typhon was supposedly the fiercest monster ever created. He had serpentine feet, many heads and could breath fire. His story easily goes back to the Egyptians and we can trace its origin back millennia, as far as the civilizations that grew along the Euphrates. In the Greek saga, Typhon, our monster, attacked the gods, seeking to give the Titans rule over the world. The gods escaped by turning themselves into animals. Aphrodite and her son Eros escaped into the river (either the Euphrates or the Nile depending on the narrator,) by changing themselves into fish. Minerva honored this pretense by placing the fish in the heavens. So, what happened to Typhon? Zeus defeated him thus cementing his authority over the heavens. He then buried him under Mt. Etna, making it the largest volcano in Europe.

The single Messier in Pisces is M74, a big beautiful face on spiral. M74, also known as NGC 628 is a large, 10'x10', 9th magnitude galaxy that is usually the bane of the Messier Marathoner. It all has to do with its surface brightness. M74 doesn't have much in the way of bright star forming regions. Its face is uniform from the nucleus out to the spiral arms. M74 courtesy of: **ESO PESSTO**



My observing plan was to choose a particular constellation and learn it. I figured that I would never be able to find out everything that a constellation had to offer and doing a constellation a month would ensure that I would have a lifetime's work ahead of me. Pisces is a great example of that. I was first interested because it is faint and had an interesting circlet of stars. I decided to search for and identify every galaxy within reach of my 17.5 inch mirror. I never came close. In the circlet neighborhood alone there are three clusters of galaxies within reach of your 12 inch and detectable in your 8 inch. The rough chart I made shows eight reachable clusters.



Near the circlet are 12th magnitude NGC's 7714 and 7715 also known as Apr 284. A pair of interacting galaxies discovered by John Herschel in 1830.

<https://esahubble.org/images/heic1503a/>

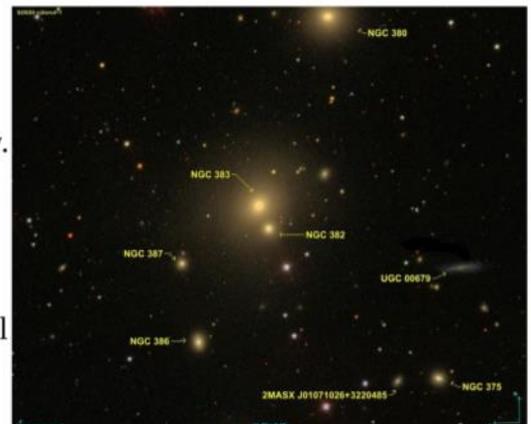


Next to the circlet is 19 Piscium, better known as TX Piscium. 19 Piscium is one of the reddest stars known. The star has an apparent magnitude that varies between 4.9 and 5.5 magnitudes. It is a variable carbon star, which is to say a late type star that contains clouds of carbon circulating in the atmosphere. That's kinda wowsy to imagine, isn't it.

This wide field image of N524 was taken by Gregg L. Ruppel on <http://greggsastronomy.com/ngc524.html>

In the center of Pisces near the cusp is another group dominated by the 10th magnitude NGC 524. Its going to look like an elliptical, in fact early observers described it as a dense E1 galaxy. Actually N524 is a tightly wound face on galaxy. It will be tough to see it however.

The NGC 383 group is up north against Andromeda, not too far from τ Piscium. It is another "string of pearls" and quite beautiful



as I remember. Arp put it into his *Atlas of Peculiar Galaxies* as number 331. The credit for this image belongs to: *Ngc 382 Image créée à l'aide du logiciel Aladin Sky Atlas du Centre de Données astronomiques de Strasbourg et des données de SDSS (Sloan Digital Sky Survey)*

The "Webb Deep-Sky Society" also cataloged this cluster. A finders and identifier chart is on-line at <https://www.webbdeepsky.com/images/galaxies/ngc383.pdf>

NGC 474/470 are found off the southern fish between α and ζ , another tough cluster to find. I reckoned its magnitude at 11-12. I never saw the faint swirls around N474. I guess its being disrupted by N470. This group is also Arp 227 and can be found on-line at the Webb Society.

Galaxy NGC 474: Cosmic Blender Credit & Copyright:
Mischa Schirmer APOD 2007 Oct 8

So, Aries, Triangulum and Pisces, bundled together beneath Andromeda and Pegasus and maybe passed over a little bit by their more famous neighbors. Still they are a significant part of the realm of galaxies. I hope you enjoy finding and observing them.

Dark Skys
Dave Phelps





Wanted – Telescope Builders and Mentors

Mt. SAC is launching a new Adopt-A-Telescope program this semester. We've had several telescopes generously donated to Mt. SAC for this program, but these telescopes are in need of some repair. Mt. SAC students who participate in giving these telescopes some much needed TLC will be eligible to adopt these scopes at the end of the semester to take home and keep. However, these students are not experienced astronomers! They don't know everything you know! They need your guidance to learn how to fix and use these scopes. Please help us mentor the next generation of astronomers by meeting with us once a month for a Telescope Repair Party. Meet with the students, enjoy some pizza and help mentor a future astronomer in repairing and using their telescopes.

Tools will be available to use. There may be some restrictions on some tool use. You will need to sign up as a Mountie MakerSpace member (registration is free) and have a safety tour before repairing telescopes. Closed-toe shoes are required at all times. Eye protection will be required for some activities.

Skills especially needed this semester are:

- Collimating
- Aligning finder scopes
- Cleaning mirrors/lenses
- Motor repair of a "The Optical Craftsman" 1968 telescope
- Replacing a homemade eyepiece holder with a more modern one

Telescope Repair Parties

Mt. SAC Mountie MakerSpace
Building F7 (near the farm) – Free Parking Available
6:00 – 9:00 PM

October 11, 2022

November 8, 2022

December 6, 2022

Please let us know you're coming by emailing
Heather Rookhuyzen at planetarium@mtsac.edu in advance. Thank you!





This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Fomalhaut: Not So Lonely After All

David Prosper

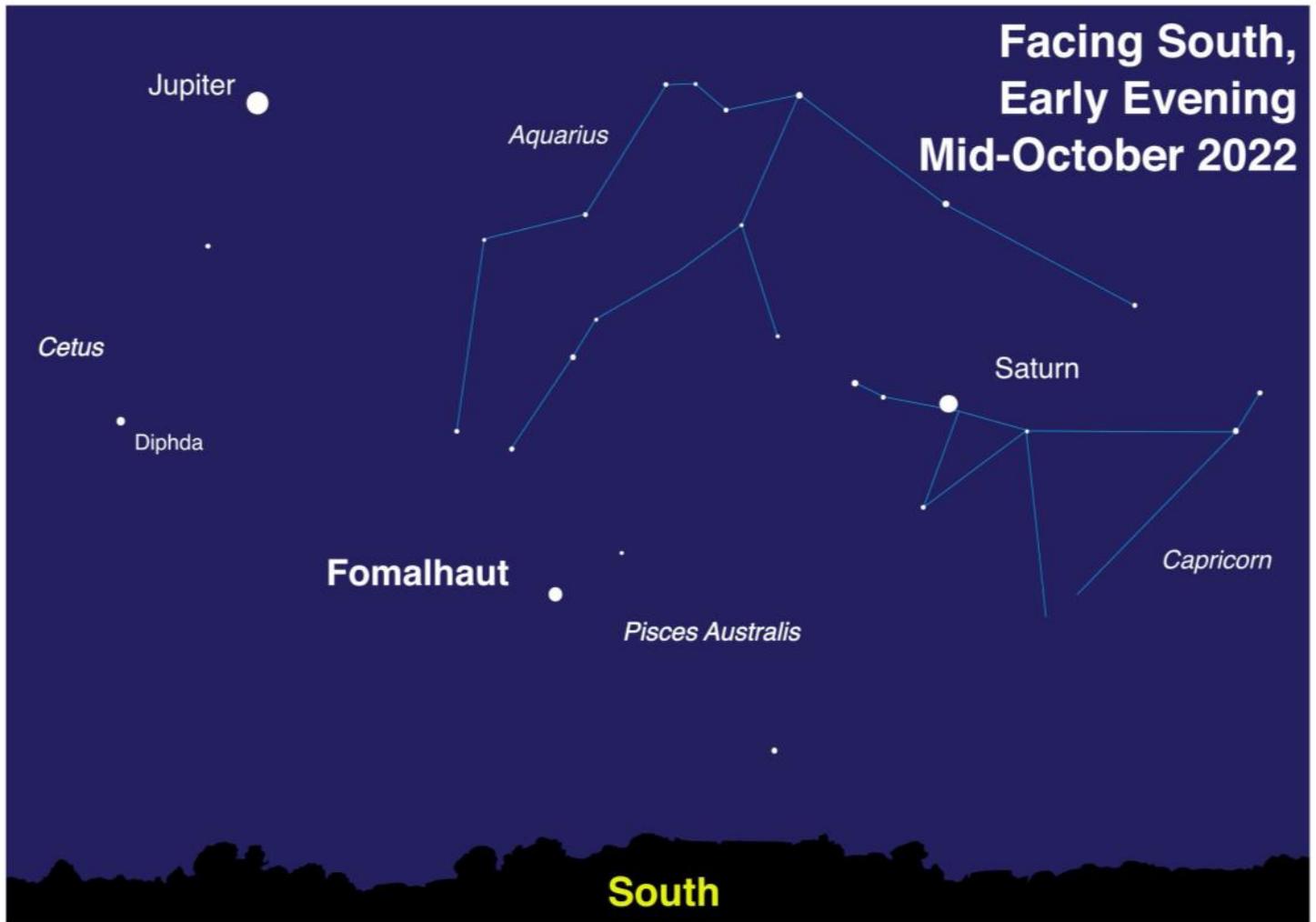
Fall evenings bring a prominent visitor to southern skies for Northern Hemisphere observers: the bright star **Fomalhaut**! Sometimes called "The Autumn Star," Fomalhaut appears unusually distant from other bright stars in its section of sky, leading to its other nickname: "The Loneliest Star." Since this star appears so low and lonely over the horizon for many observers, is so bright, and often wildly twinkles from atmospheric turbulence, Fomalhaut's brief but bright seasonal appearance often inspires a few startled UFO reports. While definitely out of this world – Fomalhaut is about 25 light years distant from us – it has been extensively studied and is a fascinating, and very identified, stellar object.

Fomalhaut appears solitary, but it does in fact have company. Fomalhaut's entourage includes two stellar companions, both of which keep their distance but are still gravitationally bound. Fomalhaut B (aka TW Piscis Austrini, not to be confused with former planetary candidate Fomalhaut b*), is an orange dwarf star almost a light year distant from its parent star (Fomalhaut A), and Fomalhaut C (aka LP 876-10), a red dwarf star located a little over 3 light years from Fomalhaut A! Surprisingly far from its parent star – even from our view on Earth, Fomalhaut C lies in the constellation Aquarius, while Fomalhaut A and B lie in Piscis Australis, another constellation! – studies of Fomalhaut C confirm it as the third stellar member of the Fomalhaut system, its immense distance still within Fomalhaut A's gravitational influence. So, while not truly "lonely," Fomalhaut A's companions do keep their distance.

Fomalhaut's most famous feature is a massive and complex disc of debris spanning many billions of miles in diameter. This disc was first detected by NASA's IRAS space telescope in the 1980s, and first imaged in visible light by Hubble in 2004. Studies by additional advanced telescopes, based both on Earth's surface and in space, show the debris around Fomalhaut to be differentiated into several "rings" or "belts" of different sizes and types of materials. Complicating matters further, the disc is not centered on the star itself, but on a point approximately 1.4 billion miles away, or half a billion miles further from Fomalhaut than Saturn is from our own Sun! In the mid-2000s a candidate planetary body was imaged by Hubble and named Fomalhaut b. However, Fomalhaut b was observed to slowly fade over multiple years of observations, and its trajectory appeared to take it out of the system, which is curious behavior for a planet. Scientists now suspect that Hubble observed the shattered debris of a recent violent collision between two 125-mile wide bodies, their impact driving the remains of the now decidedly non-planetary Fomalhaut b out of the system! Interestingly enough, Fomalhaut A isn't the only star in its system to host a dusty disc; Fomalhaut C also hosts a disc, detected by the Herschel Space Observatory in 2013. Despite their distance, the two stars may be exchanging material between their discs - including comets! Their co-mingling may help to explain the elliptical nature of both of the stars' debris discs. The odd one out, Fomalhaut B does not possess a debris disc of its own, but may host at least one suspected planet.

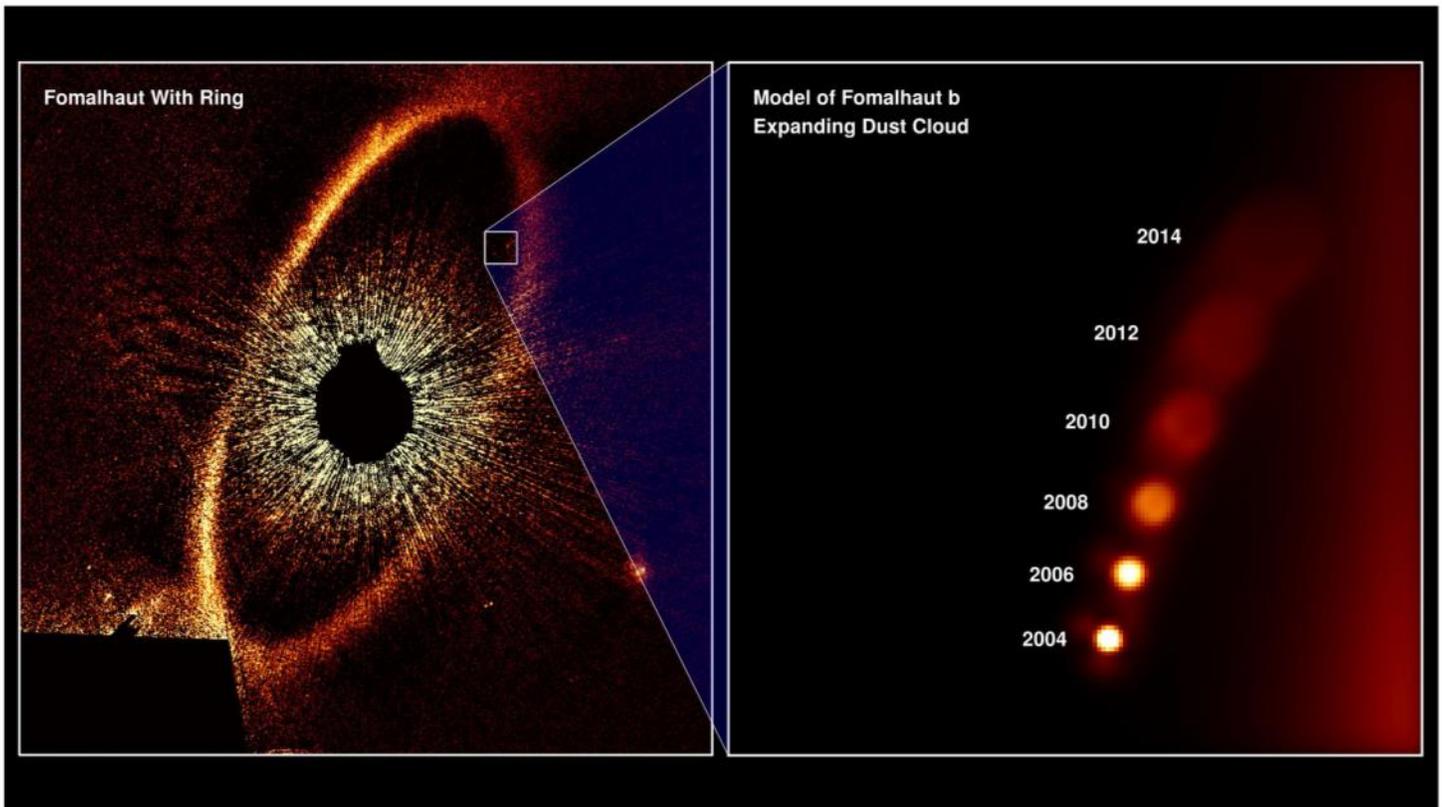
While Hubble imaged the infamous "imposter planet" of Fomalhaut b, very few planets have been directly imaged by powerful telescopes, but NASA's James Webb Space Telescope will soon change that. In fact, Webb will be imaging Fomalhaut and its famous disc in the near future, and its tremendous power is sure to tease out more amazing discoveries from its dusty grains. You can learn about the latest discoveries from Webb and NASA's other amazing missions at nasa.gov.

**Astronomers use capital letters to label companion stars, while lowercase letters are used to label planets.*



Sky map of the southern facing sky for mid-latitude Northern Hemisphere observers. With Fomalhaut lying so low for many observers, its fellow member stars in the constellation Piscis Australis won't be easily visible for many without aid due to a combination of light pollution and atmospheric extinction (thick air dimming the light from the stars). Fomalhaut is by far the brightest star in its constellation, and is one of the brightest stars in the night sky. While the dim constellations of Aquarius and Capricorn may also not be visible to many without aid, they are outlined here. While known as the "Loneliest Star," you can see that Fomalhaut has two relatively close and bright visitors this year: Jupiter and Saturn!

Illustration created with assistance from Stellarium



The magnificent and complex dust disc of the Fomalhaut system (left) with the path and dissolution of former planetary candidate Fomalhaut b displayed in detail (right).

Image credits: NASA, ESA, and A. Gáspár and G. Rieke (University of Arizona) Source:

<https://www.nasa.gov/feature/goddard/2020/exoplanet-apparently-disappears-in-latest-hubble-observations>