Volume 5, Number 2
February 2024

Club Website:
http://vlgastroclub.org/
Facebook:
https://www.facebook.com/groups/vlgastroclub/

Club Officers & Directors

President	Mark Graybill
Vice President	Ken Katta
Secretary	Randy Gilbert
Treasurer	Linda Meng

Newsletter Contact
saundby@gmail.com
(please include TVAstro in subject line)

UPCOMING EVENTS

Exec Directors' Meeting, February 2nd, 11am
All members are welcome, join us at Fishhawk Recreation Center, 2318 Buttonwood Run, from 11a to 12p as we plan 2024's events and meetings including February's SSN, The Villages Outdoor Expo and April's eclipse.

Starry Starry Night, Feb 3, 6:30-8:30pm

Join us for our first star party of 2024! We will be holding our Starry Starry Night program at Truman Recreation Center, 2507 Canal Street, at the Picnic Pavilion (behind the pool from the parking lot.)

Our astronomers will be showing Jupiter, The Great Orion Nebula, The Seven Sisters, double stars, star clusters, and many other objects in the winter sky. Come and go as you please, there is no set program. We will have many telescopes set up to view the sky, go from scope to scope to see the most objects you can!

The Moon by member John Keller, Seestar 50

Telescope Workshop, February 5th, 6pm
Our monthly Telescope Workshop will be held at the Picnic Pavilion at Truman Rec Center, 2507 Canal Street, at the Picnic Pavilion. Bring your new telescopes or other equipment to show off, find assistance in assembly or use, and learn about accessories that will make them easier to use!

Space Academy, February 5th, 6:30pm

Space Academy kicks off in 2024 with Astronomy 101 by Frank Ancona and Ken Katta. The Astronomy 101 program will be divided between the February and March meetings, you need not attend both meetings. Learn about the basics of astronomy, including the movement of objects in the sky, what different types of objects there are and how they are defined, and the relative distances and scales in astronomy.

Space Academy is held at Truman Recreation Center, 2507 Canal Street, in the Studebaker room.

General Meeting, February 20th, 2024:
EAA, Electronically Assisted Astronomy by Randy Gilbert

Learn about the new age of amateur astronomy being ushered in by highly integrated electronic aides to observation that can really make observing easier! Unlike earlier generations of aids, such as Go-To, these new devices do not require a degree in computer science to be useful!

From casual observing, to observing through clouds, to simplified astrophotography these devices are changing not just how we view the skies, but also what we can view, even under challenging conditions. They can align or guide our scopes without complex calibrations, and best of all, they're affordable!

Devices such as the ASIAir, Dwarf II, Vespera, SeeStar 50, Unistellar telescopes, and many others are using technologies like plate solving and automated astrophotography to make viewing the sky easy and accessible. Learn about software available, web based and movile tools to assist your astronomy, and how to get started in the vast ecosystem of software and equipment based EAA.

Randy will also provide us with information and insights into the Astronomical League and what it does for our members.

ASIAir Finder Package, ZWO Image

January 20th, 5pm:
Fruitland Park Astronomy Group

The Fruitland Park Astronomy Group meets for an evening of observing and talk on the third Saturday of the month every month, conditions allowing. The meeting is at the Cales Soccer Field in Fruitland Park at 300 Shiloh Road (at the corner of Shiloh Road and Dixie Avenue, north of the Fruitland Park water tower.) Village Astronomy Club members and the public are welcome. Gate opens at 5pm, solar observers can catch the sun while it's up, and astro observers can set up in daylight.

Scopes can be set up directly off of tailgates onto pavement, or taken further into the park along paved walks, away from the road to avoid nearby lights. Power is available.

Nova-C/EagleCAM Launch Mid-February

The launch window for the Intuitive Machines Nova-C lunar landing robotic vehicle is from the 20th through the 23rd for this month. In past month, range scheduling and payload preparedness issues have bumped the launch date later in the calendar. If the date holds, then Nova-C will launch in this time frame aboard a SpaceX Falcon 9 rocket.

Among the payloads aboard Nova-C is the EagleCAM, whose development team from Embry Riddle Aeronautical University visited us at one of our club meetings in 2022. EagleCAM will be ejected from the Nova-C above the surface of the Moon, then will fall to the surface ahead of Nova-C with the intent of filming Nova-C's landing from the surface of the Moon.

If successful, it will mark the first time that a lunar landing has been captured live as it happens from a camera on the Moon. It will also mark the first use of Wi-Fi on the Moon, as the EagleCAM uses Wi-Fi to transfer its data back to the Nova-C craft.

After the failure of last month's Peregrine lunar lander, IM-1 stands to be the first commercial lunar lander as well.

Aside from the technical accomplishments, the imagery will contribute to our knowledge of the dynamics of the lunar soil when a rocket is landing, assisting in our preparations to return humans to the Moon aboard Artemis III. Studies of prior lunar landings, including Apollo and Surveyor have revealed many gaps in our understanding of the dynamics of lunar soil when struck by rocket plumes. The information we gain, or fail to gain, may spell life or death for future astronauts, so the more we learn, the better, and video such as that captured by EagleCAM will be crucial in these efforts.

Embry Riddle Aeronautical University Open House, Feb 23rd

Embry Riddle Aeronautical University will be hosting an open house on the evening of January 26th, with Dr Sarah Ballard as the featured lecturer, speaking on exoplanets.

Her presentation begins at 7pm followed by telescope viewing at 8pm, conditions allowing. Contact our vice president, Ken Katta, at (917) 620-1081 to arrange for rides or carpooling to this event.

For more information, visit: [Embry-Riddle Daytona Beach Observatories - Astronomy Open House]

Calendar: https://vlgastroclub.org/calendar/

NEWS

Vulcan Launch Vehicle Debuts

The first launch of United Lauch Alliance's new Vulcan launch vehicle took place successfully on January 8th, 2024. This is the first launch vehicle entirely designed and built by the company, as its earlier Delta and Atlas rockets were inherited from its parent companies, Boeing and Lockheed (and Boeing's rockets were originally developed by McDonnell-Douglas.)

Vulcan is designed to replace both the Atlas V and Delta IV Heavy rockets at much lower cost. Each Vulcan launch costs roughly $110M, whereas Atlas V costs about $200-300M per launch, and Delta IVH costs $330-440M.

While still more than the SpaceX Falcon 9's cost of $40-75M per launch, the reduction is enough to maintain a degree of competitiveness, while being capable of launching heavier payloads that would otherwise require a similarly priced Falcon Heavy.

ULA Vulcan Inaugural Launch with Peregrine CLPS Lander Aboard--NASA Image

For this risky first launch, Vulcan carried a commercial lunar lander, Astrobotic's Peregrine, for NASA's Commercial Lunar Payload Services (CLPS) program. The program aims to develop at least two commercial cargo carrying spacecraft that can support the Artemis program by carrying supplies and instruments to the surface of the Moon.

Vulcan's performance was flawless

throughout the flight. For this flight, Vulcan was equipped with a pair of solid rocket booster motors. Vulcan can be scaled for the mass and delta V requirements of its payload by being equipped with zero, two, four, or six solid rockets.

The core stage's liquid rocket engines were started first, burning natural gas and liquid oxygen. Once started, the solid rocket motors were ignited and Vulcan lifted off the pad at +1.1 seconds on the clock.

First stage flight went smoothly, with the solid rockets departing at 1 minute 50 seconds into flight. The Vulcan core continued burning until 4 minutes 59 seconds into flight. Vulcan, like its Atlas predecessor, flies what is called a "lofted" trajectory, where the first stage carries the second stage up to a very high altitude compared to the trajectory of the Falcon 9, because Vulcan (and Atlas's) second stage is relatively low-powered, though high efficiency, and it needs more of a boost toward orbit than the Falcon 9's MVac second stage engine to avoid falling back into thicker regions of the atmosphere before reaching orbital velocity.

Six seconds after staging, the Vulcan's Centaur V second stage's two RL-10 engines started and began accelerating the Peregrine payload toward a lunar transfer velocity. This Centaur stage, and the RL-10 rocket engines, are direct descendants of the Centaur and RL-10s developed in the 1960s, and used to send space probes such as Pioneer and Voyager on their historic deep space missions.

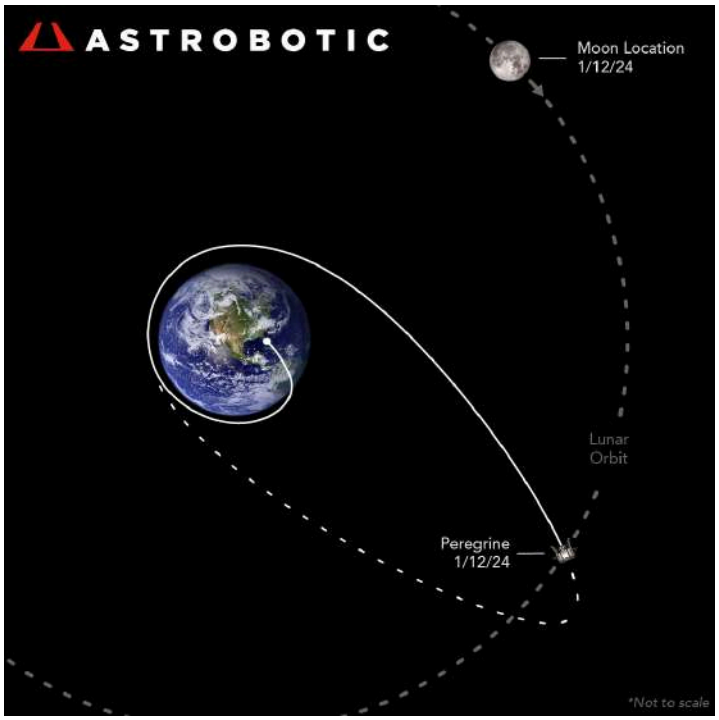
The Centaur's first burn lasted until 15 minutes, 45 seconds into the flight, after which it entered a coast phase. It ignited a second time at 47 minutes, 43 seconds, running for only about a second and a half to trim its trajectory to place the Peregrine on its lunar trajectory.

50 minutes, 26 seconds into flight, the Peregrine was separated and sent on its way toward the Moon (more on that flight in the Peregrine article, below.) Following payload separation, the Centaur performed a number of on-orbit technical tests to fulfill requirements toward its certification for higher priority NASA and national defense system launches. Following these tests, Centaur performed a deorbit burn to return the stage to a safe re-entry and breakup over the western Pacific Ocean, well clear of inhabited areas and shipping lanes.

The flight was considered a complete success, and marks the first of two successful launches required for certification of the Vulcan launch vehicle for critical NASA and DoD use.

Peregrine Lunar Lander "Successfully" Misses the Moon

The first launch of a NASA contracted commercial lunar lander was successful, however its flight was not. The lander encountered problems early in flight, ruining its chance to land on the Moon, but through diligence and skill the Astrobotic team were able to rescue many elements of the mission, and guide the spacecraft to a safe disposal trajectory on Earth after reaching lunar orbital distance.



Peregrine Lunar Lander Actual Trajectory--Astrobotic Image

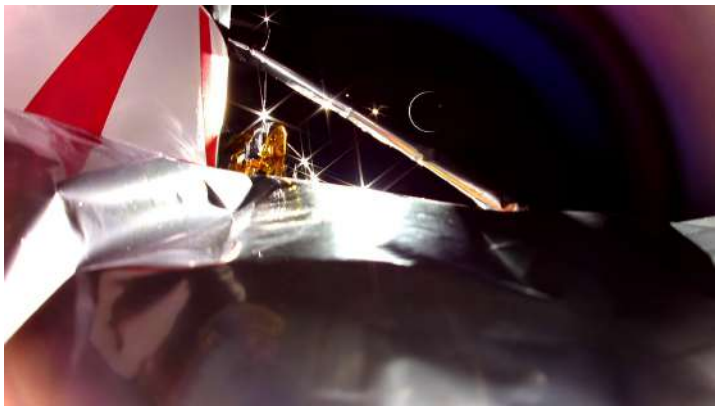
The problems with Peregrine started early in its commissioning after its separation from the

Vulcan Centaur V second stage. Communications and data transmissions were started flawlessly, but upon pressurizing the vehicle's propulsion system, there was an anomaly and the Peregrine's orientation became unstable. Pressure drops in the propellant system, along with the instability, suggested a leak in the propellant system, and with time it was obvious that enough propellant had leaked to prevent Peregrine from reaching the Moon. It was unknown how long the Peregrine would be able to function, as well, as it wouldn't be able to maintain an orientation to keep itself charged with solar power.

Astrobotic's flight team prepared for the worst, doing what they could to rescue the final hours of the mission by trying to both extend the life of Peregrine, while conducting as many on board tests of its equipment to prove it out in preparation for their second test flight in the future. Analysis of the leak's cause showed that a valve between the helium pressurization tank and the oxygen tank failed to close, which caused overpressurization of the oxygen tank (i.e. it popped the tank.)

After a while, though, the leak of propellant ceased, with some operation of the propellant system remaining. [Mark's observation: this is likely due to the leak being blocked by the formation of solid oxygen ice on the leak site, which would hold in some pressure once tank pressures dropped low enough, and so long as the leak site was not exposed to direct sunlight to soften the ice.]

Once they had some limited use of the propulsion system, Astrobotic first regained control of Peregrine's orientation and flight path, then began making plans for the rest of the mission. Their path was now far away from being able to reach the Moon, but it would be possible to enter a solar orbit. However, they were concerned about the possibility of a future uncontrolled encounter between Peregrine and Earth, so they decided instead to allow Peregrine to remain within Earth's sphere of gravitational influence, and to use the remaining propellant to perform a controlled re-entry to a safe location on Earth.



Peregrine Lunar Lander Approaches a Crescent Earth, 10 Days, 8 Hours into Flight

In the remaining days of flight, Astrobotic continued to perform tests of onboard systems, better understanding their readiness for a future lunar landing. The vehicle's trajectory carried it out to the distance of the Moon's orbit, though of course the Moon had already passed that point days before, and was far away.

Then began the long fall back toward Earth. During that fall, they used the propulsion system to make corrections toward a destructive re-entry over an empty area of the Pacific Ocean on Earth. They also carefully aligned the spacecraft for the above image of a crescent Earth during its approach, capturing the image by hiding the Sun from the camera behind one of the vehicle's struts (the gold and silver strut in the foreground) so that the dim Earth can be seen.

Peregrine successfully made one final swan dive into the Earth's atmosphere on its 11th day of flight though they failed to do the first successful commercial Moon landing

. The ball is now in Intuitive Machines' hands, with their own CLPS lander, IM-1, prepared to launch in mid-February for their attempt at a lunar landing. Astrobotic will also take their second swing this year, with the Griffin-1 lunar lander headed for the Moon's south pole.

Japan Becomes 5th Nation to Land on Moon

On January 19th, Japan's SLIM lander successfully landed on the Moon. Launched last September aboard an H2A rocket from Japan, the robotic vehicle successfully soft-landed on the Moon while deploying two independent robotic rovers, LEV-1 and LEV-2.

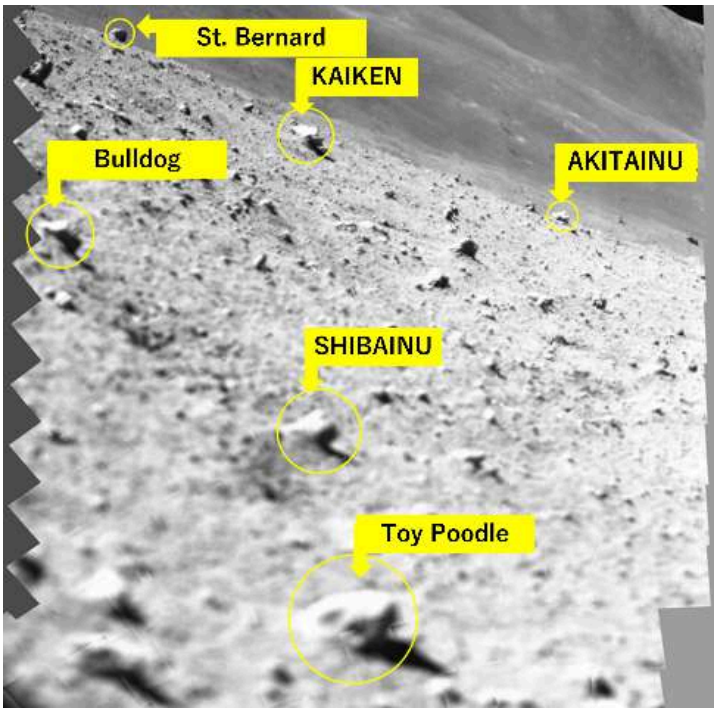


Image from SLIM Lander, Marking Names for Landmark Rocks Nearby--JAXA Image

Unfortunately, the lander didn't land in its planned position on the Moon. It was intended to land on its belly, with its solar arrays oriented to capture the rising Sun to the east to allow it two full weeks of operation before lunar night. Upon landing, it had only hours of battery life left, so members of the Japanese Aerospace eXploration Agency, JAXA, stayed up long hours extracting all the approach, landing, and post landing data possible before the batteries were shut off at 12% capacity to preserve them for future use if the solar cells begin to provide power.

At that time, the actual orientation of the spacecraft was unknown, due to the latency of the orientation measurement system and its communication with Earth during landing.

Once the batteries ran down on SLIM, the Smart Lander for Investigation of the Moon, focus moved to the two small rovers, Lunar Exploration Vehicles 1 and 2 (LEV-1 and LEV-2). LEV-1 is a small hopper rover, intended to operate independently for only a few hours, to demonstrate its unique method of moving across the Moon's surface. It was designed to use SLIM as a communications transponder to Earth, however. Fortunately, efforts to detect its faint radio signal from Earth directly were successful, and LEV-1 was run through its full mission, hopping across the surface of the Moon like a small frog after unpacking itself from a ball shape in which it was dropped to the surface by SLIM from 5 meters up.

LEV-2, by contrast, was designed for fully autonomous operation, with its own ability to communicate to Earth. It also bears a camera, and was used to take a picture of the sleeping SLIM, giving its Earthbound controllers the first look at its landing orientation.

SLIM Lander Imaged from LEV-2 Lunar Rover JAXA Image

The images from LEV-2 show SLIM in a nose-down orientation, with its solar panels on the west side of the lander. Currently, those panels are in shadow, but this raises hopes that in a week or so the panels will receive enough sunlight to revive SLIM and allow it to continue its mission. Meanwhile, LEV-2 will be continuing its

mission of rolling around on the Moon conducting its own studies. (Yes, I'm sure somebody has seriously considered seeing if LEV-2 could bump SLIM over, but they have probably rejected this idea as too risky for the time being, at least.)

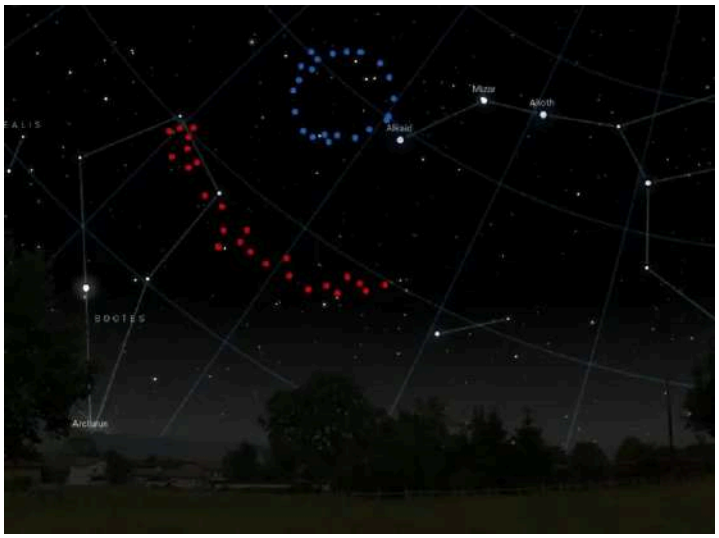
With this successful landing, Japan joins The United States, Russia (The Soviet Union), China, and India as the countries that have successfully soft-landed a robotic lander on the Moon. Japan's next target is Mars, with their MMX lander.

Half-Size Model of Japan's MMX Mars Lander
Sagimahara Museum, Japan--JAXA Image

Discovery of "Big Ring" Challenges Cosmological Ground Rules

At the AAS meeting in New Orleans last week, a team of astronomers have announced the discovery of a giant cosmic structure of galaxies that form a ring over 1.3 billion light years in diameter. The structure forms a ring as viewed from Earth, but in 3D it is actually more like a helix, with a number of galaxies all connected by a common stream of gas and dust between them.

This defies rules of universal homogeneity in the current cosmological model, which state that structures over about 1.1 billion light years should not exist. Given that a number of such super-large structures have been identified, including the Big Ring, the Giant Arc, the Great Attractor, and several other such structures, adjustments to current views on how structure formed and grew in the early universe will need to be made and compared against observations.



The Big Ring, in Blue, is a Giant Structure in the Universe, Joining the Giant Arc, in Red, as Unexplained Large Structures
UCLan Image with Stellarium Background

IN THE SKY THIS MONTH

The Moon:
Last Quarter, Febuary 2nd
New Moon, February 9th
1st Quarter, February 16th
Full Moon, February 24th
Last Quarter, March 3rd

Saturn leaves the evening sky this month, starting low on the western horizon at the start of the month, dropping toward the sun's glare a bit more each day until it is obscured completely.

If you want to see it, look early in the month, because it'll be behind the Sun for a while before reappearing in the morning sky.

Saturn finder chart:
https://in-the-sky.org//data/object.php?id=P6

Jupiter is high and bright in the sky at sunset this month, and will be a showpiece for our Starry Starry Night event on Feb 3rd. It shines at magnitude -2.2, and is 38 arcseconds across,

allowing easy observation of its bands. To find the times when the Great Red Spot crosses the center of Jupiter's disk, use the transit time calculator on Sky & Telescope's website here: Transit Times of Jupiter's Great Red Spot - Sky & Telescope

Here is a detailed guide to observing Jupiter's many features: https://arksky.org/aso-guides/aso-observational-guides/35-observing-jupiter

Uranus is a few degrees west of Jupiter, and is at magnitude 5.7 and 4 arcseconds across. It will show as an object with a green or blue color depending on sky conditions, and when seen even through binoculars or a telescope at low magnification will be obviously different from the stars around it. At mid-level powers of 75x-150x it will show a small disk, 3.7 arcsec in diameter.

Uranus finder chart: https://in-the-sky.org//data/object.php?id=P7

Neptune shines at magnitude 7.9 and is only 2.2 arcseconds across this month. It takes binoculars at minimum to see it. It isnear the western fish of Pisces. It takes about 100x magnification to display a disk.

Online finder chart for Neptune: https://in-the-sky.org//data/object.php?id=P8

Venus is a morning star right now, greeting early risers. It shines at magnitude -5.2, rising shortly before the Sun. It will have a conjunction with **Mars** on Feb 22nd, with the pair about half a degree apart, an easy view of two planets at low powers in most telescopes (40-75x). Mars is rising from behind the Sun this month, getting further from the Sun and easier to view as the month goes on.

Venus online finder chart: https://in-the-sky.org//data/object.php?id=P2

Online observing information for Mars: https://in-the-sky.org//data/object.php?id=P4

Mercury is lost in the Sun's glare most of the month, but is preparing for a good show in our sky in March. https://in-the-sky.org//data/object.php?id=P1

More information on sky events this month: https://in-the-sky.org/

Our skies are trending toward more clear days and nights as we move into February. The winter constellations **Orion, Taurus, Auriga, Gemini, Perseus, Pegasus, Canis Major, and Canis Minor** are well placed for observation, and high enough in the sky to clear much of the humid haze that plagues our skies.

The **Great Nebula of Orion (M42)** is a must-see object for this time of year, appearing to the eye as a star in the sword of **Orion** (south of Orion's belt, at the center of the triangle formed by the middle star in the belt, and Orion's two "foot" stars.) In binoculars it becomes a fuzzy patch, and in a telescope it becomes a nice nebula with embedded stars. See if you can see all four of the tight group of stars within it called The Trapezium.

Messier 41 (M41) is a star cluster in **Canis Major**, south and west of **Sirius**, the brightest star in the sky. It lies due south of Sirius, or, come about one-third of the way down the "spine" of the Dog from Sirius to **Delta Canis Majoris**, then sweep west. It looks good in both binoculars and a telescope at low powers. In less humid skies, it appears as a cloudy patch to the naked eye.

The "eye of the bull", **Aldebaran**, marks one tip of a V of stars that is the "face" of **Taurus** the Bull. To find it, follow the line from Sirius up to Orion's belt, on through about the same distance to the far side of Orion's belt. The bright star there is Aldebaran. Relax your eyes to see the V, with Aldebaran at the left tip of the V. The cluster of stars in and around the V are called **The Hyades**. This is the closest identified star cluster to Earth, at about 150 light years away. Aldebaran itself is closer, about 66 light years away.

Continue along the line from Orion's belt to find **The Pleiades (M45)**, also known as **The Seven Sisters**, which marks the "heart" of **Taurus the Bull**.

History of The Villages Astronomy Club

In 1995, The Villages Stargazers Club had 75 paid members. The following are the January and February announcements published in The Daily Sun on January 12, 1995 and February 16th, 1995:

[From January, 1995]
The January meeting of the Stargazers will feature a presentation on Orion, the birthplace of stars, by Rona Gold.

Orion is one of the winter constellations currently "up there". Dom Accettullo will cover this and other stars you can view this month.

And you don't have to own a telescope to see these things. Dom will tell you all you'd like to know about viewing the heavens with a good pair of binoculars. He will also tell you how to pick out those binoculars.

If time permits, the next section of TLC's "Guide to the Universe" on the outer planets will be shown.

SO BE THERE! January 16th, 7pm, Charlie Chaplin Room in the Paradise Recreation Office Building.

SEE YOU THERE
Ray Johnson

Starry Starry Night was originally held once a year, normally in October. Originally held as a Stargazers Club get-together, it became a Villages event in September 1996, gathering at the Tierra Del Sol fairway between the first and second hole. At that event, then-president Chuck Knaus was looking forward to having four telescopes to view at least six objects in the sky.

(continued-->)

[From February, 1995]
STARGAZERS FOR FEBRUARY

Our leader, Dom Accettullo, will inform us of the main constellations and stars which we can observe in the February skies.

Norm Olson will make his presentation on the constellation Orion. Then one of our new members, Chuck Knaus, will introduce us to Gamma Ray Astronomy.

Time permitting we will have the next video from The Learning Channel's Practical Guide to the Universe on The Sun, Our Nearest Star.

If this sounds like an interesting program, then join us on February 20th at 7:00pm in the Charlie Chaplin Room of the Paradise Recreation Office Building. See you there.

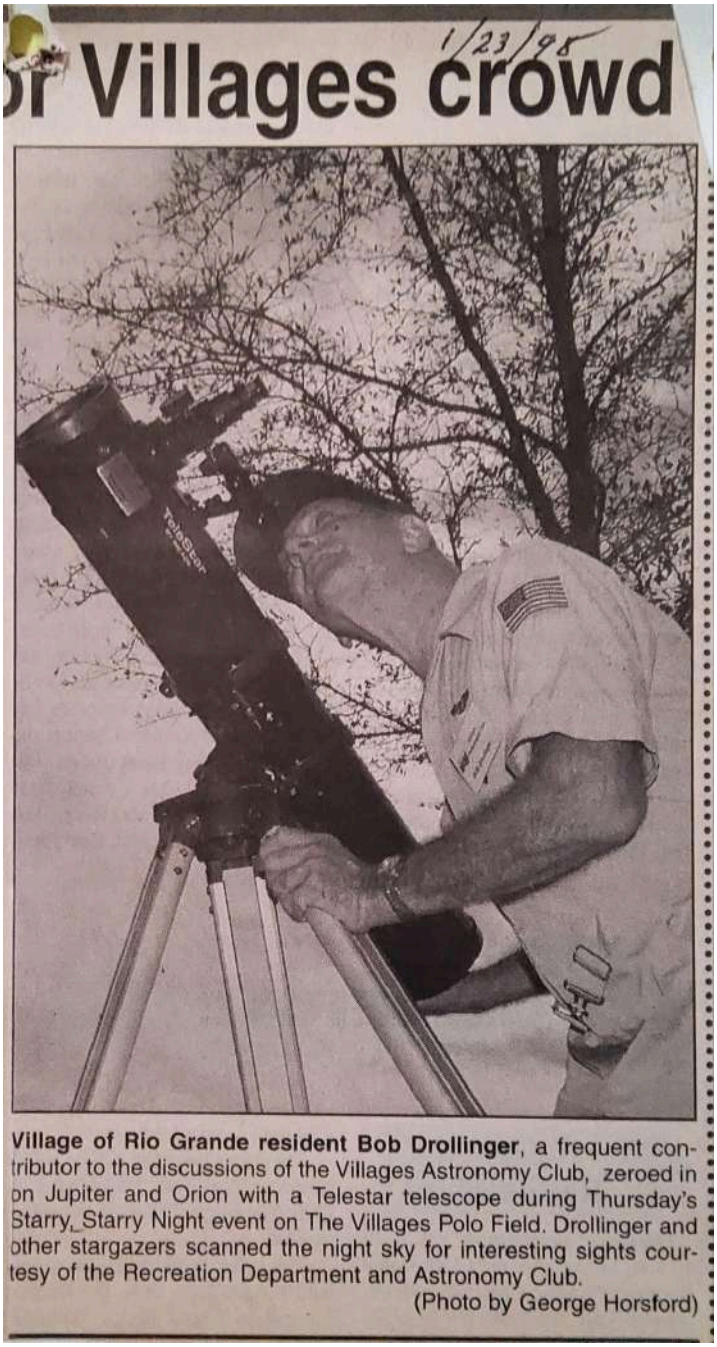
Ray Johnson

(continued) The Villages Recreation Director Martha Gjurich organized the event in conjunction with the Astronomy Club. Residents of The Village of Palo Alto volunteered to assist with guiding attendees to parking and to the event.

In 1997, John Rohan of The Villages Recreation took over responsibility for the event. The date was set for October 28th, with a rain date of November 4th. The site was changed to the Villages Polo Field. The event included wine and cheese for the attendees. Tickets were used to determine the number of attendees and to provide enough wine and cheese for everyone.

The Villages Recreation provided a band and a dance floor, with luminaries placed on walkways to lead attendees to the telescopes safely, without interfering with the telescopes.

Simple star charts were provided for attendees. Objects targeted by the telescopes were The Andromeda Galaxy (M31), Jupiter, Saturn, Venus, Mars, and Alcor and Mizar.



1/23/95

or Villages crowd

Village of Rio Grande resident Bob Drollinger, a frequent contributor to the discussions of the Villages Astronomy Club, zeroed in on Jupiter and Orion with a Telestar telescope during Thursday's Starry, Starry Night event on The Villages Polo Field. Drollinger and other stargazers scanned the night sky for interesting sights courtesy of the Recreation Department and Astronomy Club.

(Photo by George Horsford)

Club Calendar

Yellow marks special events hosted by The Villages Astronomy Club

Blue marks events that are not hosted by The Villages Astronomy Club, but which we recommend.

Green Marks Volunteer Events for other groups.

February 2024

2 Exec Meeting 11am Fishhawk Rec Ctr

3 Starry Starry Night, Truman Rec Center, 6:30-8:30p

5 Telescope Workshop 6:30pm/Space Academy 6:30pm Ken Katta Astronomy 101 Session 1

17 Fruitland Park Observing

20 General Meeting: Randy Gilbert (EAA, Electronic Astronomy), 6:30pm Laurel Manor Rec Ctr

23-24 The Villages Outdoor Expo, Everglades Rec Ctr

23 ERAU Open House

March 2024

1 Exec Meeting

4 Telescope Workshop 7pm/Space Academy 6:30pm Ken Katta Astronomy 101 Session 2

10 DST Begins

16 Fruitland Park Observing

19 General Meeting: Linda Meng, Cecelia Payne-Goposhkin

21 Venus/Saturn Conjunction, closest approach 9:59pm, 20 arcminutes.

25 Penumbral Lunar Eclipse, 12:53am to 5:32am, peak 3:12am (Not worth an event, just mentioning to club.)

29 ERAU Open House

Club Calendar on the web:
https://vlgastroclub.org/calendar/

STARRY STARRY NIGHT

Presented By The Villages® Astronomy Club

@ Truman Recreation Center (Picnic Pavilion)

Saturday, Feb 3rd, 6:30pm – 8:30pm