# VILLAGES STAR

Newsletter of The Villages Astronomy Club

**Volume 3, Number 12**
**December 2022**

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

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| Secretary/Historian | Burt Salk |
| Treasurer | Linda Meng |
| Education Coord. | Randy Gilbert |

**Newsletter Contact**
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## UPCOMING EVENTS

**Dec. 20th, 6:20pm: General Meeting**
Our December General Meeting will be held at Laurel Manor Recreation Center, 1985 Laurel Manor Drive. Ted Mitrou will speak to us on astrophotography. He is an accomplished astrophotographer, and will talk about the ins and outs of techniques, equipment, and the process of producing amazing images of the sky. This meeting will include an ice cream social after the presentation.

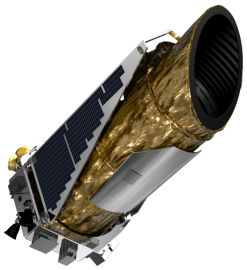
**Jan 3rd, 5pm: Telescope Workshop**
Held at Truman Recreation Center, 2705 Canal St., near the Pavilions (behind the pool from the parking lot.) Bring your telescopes that you want assistance with, or just want to get out of the garage or closet for some light observing! Bring your questions about telescopes to purchase or techniques for naked eye or binocular astronomy.

**Jan 6th, 11am: Directors' Meeting**
Held at Fishhawk Recreation Center, 2318 Buttonwood Run on the first Friday of the month.. All members are welcome.

**January 17th, 6:20pm: When Galaxies Collide**
Join us for our January general meeting at Laurel Manor Recreation Center,, where our presenter Jim Laurent will speak on "When Galaxies Collide: What happens when galaxies collide? How have collisions affected our own Milky Way in the past and future?" This promises to be a very interesting talk, so be sure to arrive on time!

**February 21st, 2023: Finding Other Worlds**
For our February general meeting, Drake Shepard will visit our club to give another presentation. Many of us will remember him for his talk on Albert Einstein *as* Albert Einstein.

In Finding Other Worlds, Drake will be bringing us an engaging talk on the discovery of planets outside our solar system, detailing the discoveries of the Kepler planet-hunting space telescope. The talk will include illustrations and essential info would highlight numerous distant, unique newly found planets, and solar systems. Over 6,000 new planets have now been discovered in the Milky Way. Also discussed are the conditions these planets need for habitability, and compared to planets in our own solar system.



**Kepler Space Telescope**

**Feb 24th, 2023: Starry Starry Day and Night**
Our next Starry Starry Day and Night will be held Saturday, Feb 25th at the Wildwood Community Center, 6500 Powell Road in Wildwood, FL.

During the day we will have talks on astronomy and astrophysics inside the center while giving tours of the solar system on our Solar Walk outside. During the evening, we will share views of the sky with the public through our astronomers' telescopes. Stay tuned for further news!

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

## NEWS

### Telescope Workshops

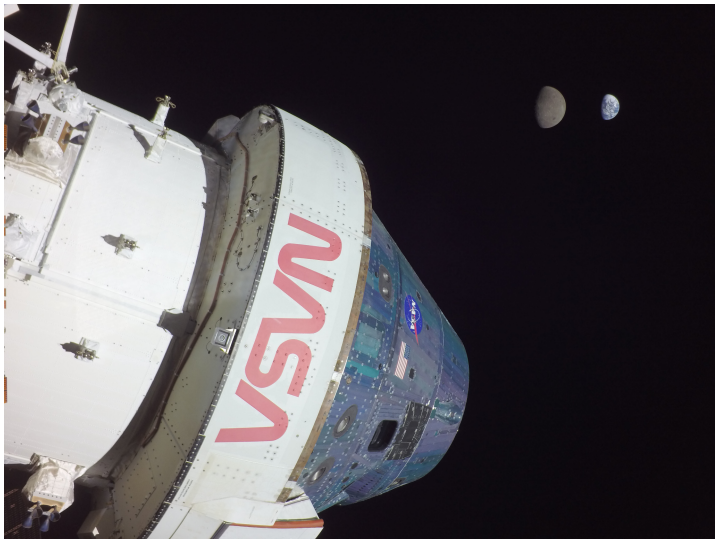
The mild weather has made for productive telescope workshops the past two months, with Jupiter, Saturn, and now Mars putting on a show for our participants. Decemeber's workshop had a mostly cloudy sky, but with enough breaks to allow viewing of the nearly-full Moon as well as the 3 planets easily visible. It was an exercise in rapidly finding an object, as moving slow would lose the target behind a cloud while another is revealed elsewhere in the sky. The bright Moon washed out all but the brightest objects for observation, but what we had was very nice.

### Artemis I Launch

Artemis I successfully launched on November 16th for its trip into lunar Distant Retrograde Orbit. While later missions are expected to use a different type of orbit, a Near Rectilinear Halo Orbit, the DRO allows for better options if there is a problem with the spacecraft or communications during this test flight.

Artemis II will use the even more conservative Free Return Trajectory, where the spacecraft will use the Moon's gravity to return the Orion to Earth with no maneuvering required.

The Artemis I Orion spacecraft will return to Earth on December 11th, with a splashdown inthe Pacific Oceanoff the coast of California. It has been an exciting flight. Once is is complete we then begin the long wait for Artemis II, which will carry a crew to the Moon without landing.




**Artemis I's Orion Catches Moon and Earth from DRO. NASA Image**

### SpaceX Starship

SpaceX continues to prepare to perform the orbital launch test of its Starship launch vehicle as of this writing. A number of static fire tests using Starship Booster #7 have completed successfully, with continuous upgrades to the launch mount as a result of this testing.

Booster 7 is slated to carry Starship 24 into orbit some time in the next month or two. Starship 24 will carry Starlink 2 satellites on its maiden flight, carried in a dispenser that will eject them from the craft in orbit. The dispenser has been compared to a Pez candy dispenser.

Though the Starship system is designed to be reusable, Booster 7 and Ship 24 are not expected to be recovered on this inaugural spaceflight. Booster 7 is planned to make a controlled landing in the Gulf of Mexico after it boosts Ship 24 toward orbit, and Ship 24 is expected to make a non-recoverable landing in the Pacific Ocean near Hawaii, where Space Force instruments can monitor its re-entry.

If all goes well on the initial flight, work toward both recovering the Booster and Starship on later flights will commence, as well as work toward preparing Starship to act as the NASA Lunar Lander on Artemis III.
https://www.spacex.com/vehicles/starship/

## IN THE SKY THIS MONTH

**The Moon:**
Full Moon, December 8th
Last Quarter, December 16th
New Moon, December 23rd
1st Quarter, December 30th
Full Moon, January 6th

On Dec 24th, the slender crescent of the Moon will appear near the planets Mercury and Venus in the evening sky. Counting the Sun, an observer will be able to see all 7 of the classical planets in the sky: The Sun, Moon, Mercury, Venus, Mars, Jupiter, and Saturn. These seven bodies were the planets until recent history, when the term “planet” was changed to mean an object that orbits the Sun directly, excluding the Sun and the Moon.

**Winter Solstice, Dec. 21st**
Winter begins at 4:48pm, when the Sun reaches its southernmost point in our sky. Then we enter into the longest night of the year at sunset at 5:34pm. The sun returns after 13 hours and 18 minutes, at 7:16am on the 22nd.

**Geminid Meteor Shower, Peak Dec 13-14th**
The Geminid Meteor Shower peak often reaches about 100 meteors per hour, but this year it is up against a bright Moon that will hide many of the dimmer meteors. If you are out on the nights from December 13th through the 15th, expect to see less than 1 meteor per minute through the glare of the Moon.

**The Planets:**.

**Mars** is at opposition on December 8th, directly opposite the Sun from the Earth. Mars will be at a midpoint between its aphelion and perihelion distances, so it will not be as large as its appearance 26 months ago in 2020, but it is much higher in the sky this time, giving better views for more of the night.

At an apparent diameter of 17.2” (arcseconds), and a brightness of magnitude -1.8 it will show surface detail even to small telescopes and high power binoculars (25x or greater, on a stable mount.) Syrtis Major, Solis Lacus, and Arabia Planitia are all features that stand out on the surface of Mars.

The southern pole of Mars is oriented toward us, but unfortunately it is summer in the southern hemisphere of Mars at present, so there will be little or no polar cap to view. A light blue color filter will bring out what little polar ice or atmospheric haze there is.

The dark features of Mars will stand out more strongly through a red or orange color filter, and a green filter will bring out the lighter features.

More detailed information on observing Mars, including what magnification will reveal different features, and the identification of features and use of filters can be found in my presentation from 2012, available online: http://saundby.com/astronomy/mars2012/Mars%20Presentation%20JPG/

Also helpful is the Sky and Telscope Mars Profiler tool, available online here: https://skyandtelescope.org/observing/mars-which-side-is-visible/

**Jupiter** is still a bright showpiece in our evening sky, in the south in Pisces at sunset. At 44 arcseconds diameter it is still very large though months past opposition. At magnutude -2.5 is is the brightest planet until Venus moves into the evening sky from behind the Sun.

**Saturn** is not as bright as Jupiter, at magnitude 0.8, but it is bright enough to make out even when the other stars in Capricorn are washed out in the sky. The rings are at a good able to view, see if you can see their shadow on the surface of Saturn, as well as the break in the rings. With a good telescope, you may be able to see the smaller division in the rings as well as the faint inner ring, known as the Crepe Ring, inside the brighter main rings of Saturn.

**Mercury and Venus** make their appearance in the evening sky from behind the Sun this month. Venus will be a glaring magnitude

-3.9, and Mercury about the same brightness as Saturn. Start looking for them at mid-month.

**Neptune** stands near the boundary between Pisces and Aquarius, still bright (for telescopes or binoculars) at magnitude 7.9. It can be picked up by sweeping from Jupiter toward Phi Aquarius. Under magnification, it will show as a blue object that is obviously not a star. Even low magnifications will show it as a disk, but only the best amateur telescopes will reveal any surface details, and even then only during the rare occasions of large weather patterns on it.

**Uranus** is magnitude 5.7 and will require binoculars to observe in our dense and moist sky. Like Neptune, its color will distinguish it from the nearby stars, appearing green or blue. It is in a relatively bare area of sky in Aries.

It is about 1 degree west of Sigma Arietis. From Sigma Arietis, sweep west and slightly north with an eyepiece that provides at least half a degree of real field of view to easily pick it up as a blue-green non-stellar object.

## Light Gathering and Magnification


**The business end of a Meade 2080 Schmidt-Cassegrain Telescope**

Light gathering is what makes our binoculars and telescopes allow us to see so much at night. Our eyes only let a little bit of light in through our pupils, which open up to as much as 8 or 9 millimeters when we are fully adapted to the darkness. Even small 35mm binoculars collect much more light, almost 20 times as much light!

They collect that light into an *exit pupil* that is 5mm in diameter that fits through our pupil. You can find the exit pupil diameter by dividing the objective lens size by the magnification. 7x35 binoculars have 7x magnification, dividing 35mm by 7 gives 5mm.

You can see that this means there is a lowest practical magnification for a telescope, too. If we had an 8” (200mm) telescope that had 7 power magnification, the exit pupil would be 29mm! Way too large for our pupil, anything over 8mm or so would be wasted. The minumum useful magnification for an 8 inch telescope is therefore about 25 powers.

(Divide your aperture in mm by 8 to get the minumum useful magnification. Note that for telescopes with a central obstruction, like Newtonians, Maksutovs, and Schmidt-Cassegrains, the shadow of your secondary mirror may make such a low magnification useless.)

Dividing the scope’s focal length by the eyepiece’s focal length gives magnification. A 2000mm focal length telescope with a 25mm eyepiece gives 80 powers. A 12mm eyepiece gives about 160 powers in that scope.

The scope’s focal length is its aperture times its focal ration. For example, our 8” f/10 scope has a 202mm aperture. Times 10 gives a focal length of about 2000mm.

Numbers don’t have to be exact, and some calculations are easier in inches than in mm. For example, an 8” f/10 scope clearly has a focal length of 80 inches, and a 25mm (one inch) eyepiece will give 80 powers, a 12mm (half inch) eyepiece will give 160.

A 6” f/8 telescope has a focal length of 48 inches (6x8), close enough to 50. A one inch eyepiece gives about 50 powers, a half inch gives about 100 powers.