New Braunfels Astronomy Club

No Meeting in December

Celebrate and be Good

- Open meeting and introduce new members (get names, email)
- Interesting observations, experiences
- Show and tell
- What's in our sky this month? Newsletter + member input
- What's going on – news, events, outreach.
- Main feature(s)
  -
- Open for discussion
- Feedback and close the meeting

Coming up: OUR 268th ASTRONOMY CLUB MEETING

January 20th, 2022, from 6 - 8 pm **TJ's on Loop 337**

astronomynbtx.org Email: info@astronomynbtx.org

Astronomy Friends New Braunfels………… facebook.com/groups/354953995432792/

Comal County Friends of the Night Sky…… facebook.com/groups/166098014710276/

comaldarksky.org/ Email: info@comaldarksky.org

New Braunfels Astronomy Club

Larry's Celestial Calendar & Newsletter

by Eric Erickson

293rd Edition

December 16th , 2021 to January 20th, 2022

NBAC Observing Calendar

Winter Solstice – The Long Night

Four Planet Lineup Dec 28

The Moon Dances with Planets and Stars

Astrophotography

Start by

Shooting the MOON!

Solar System

Quadrantids-Peak or Fizzle?

Mars-Photo Opps in the Milky Way

Satellite Transits of Jupiter Jan 12

Comet 19P/Borrelly-Dim Start to 2022

Lagniappe

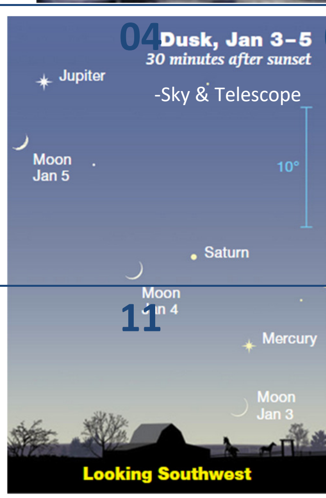
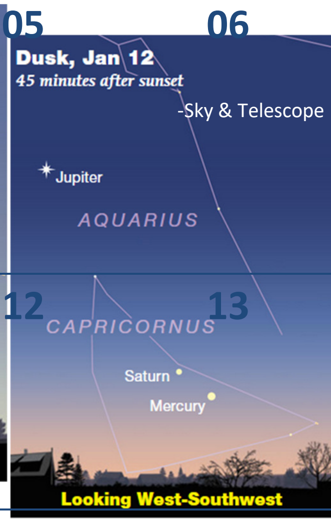
What's Inside Mars?

Watch the ISS Transit your Sky

Eric W Erickson

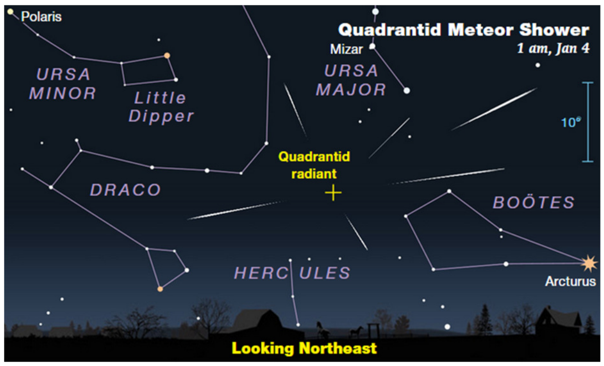
DEC/JAN 2021/22

NBAC *OBSERVING CALENDAR*

SUN	MON	TUE	WED	THU	FRI	SAT
				16 **No Meeting**	**17** Moon is at apogee 8:15 pm CST	**18** Full (micro) Moon 10:35 pm CST
19	**20**	**21** ***Winter Solstice*** 09:59 am CST Have a hot beverage on this long cold night	**22**	**23** 11pm- East A waning gibbous Moon is near Regulus Regulus	**24**	**25** **Merry Christmas!**
26 Last Quarter Moon 8:24pm CST	**27**	**28** 	**29**	**30**	**31** Pre-dawn SE Moon, Mars, Antares Mars	**01** Jan 2022 **Happy New Year!** Antares
02 New Moon 1233pm CST	**03**	**04** 	**05** 	**06**	**07**	**08**
09 First Quarter Moon 12:11 CST	**10**	**11**	**12**	**13**	**14**	**15**
16	**17** Full Moon 5:48pm CST	**18**	**19**	**20** NBAC Meeting 6:00pm TJ's on Loop 337		

Solar System Observing

- Mercury becomes an evening planet later in December, rising higher and reaching greatest eastern elongation on January 7th.
- Venus dominates the western evening sky after sunset but setting earlier, heading for inferior conjunction with the Sun on January 8th.
- Earth still spins, and we are still here to marvel at it all. The Quadrantids peak Jan 3-4

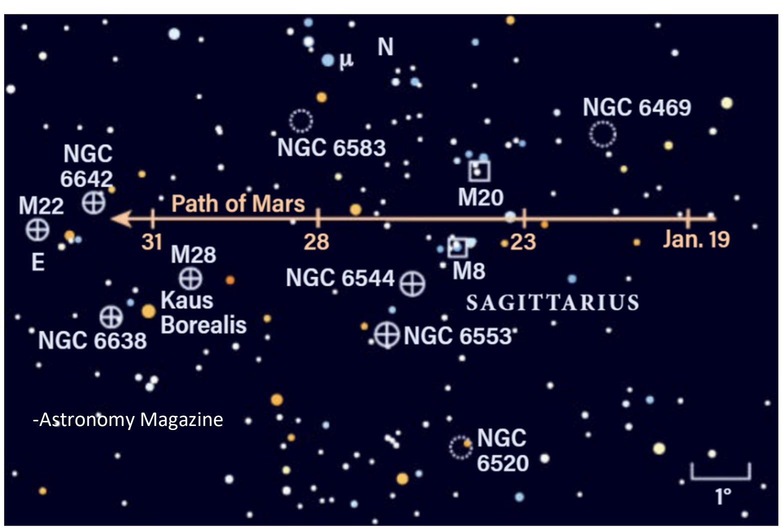


-From Sky & Telescope Magazine

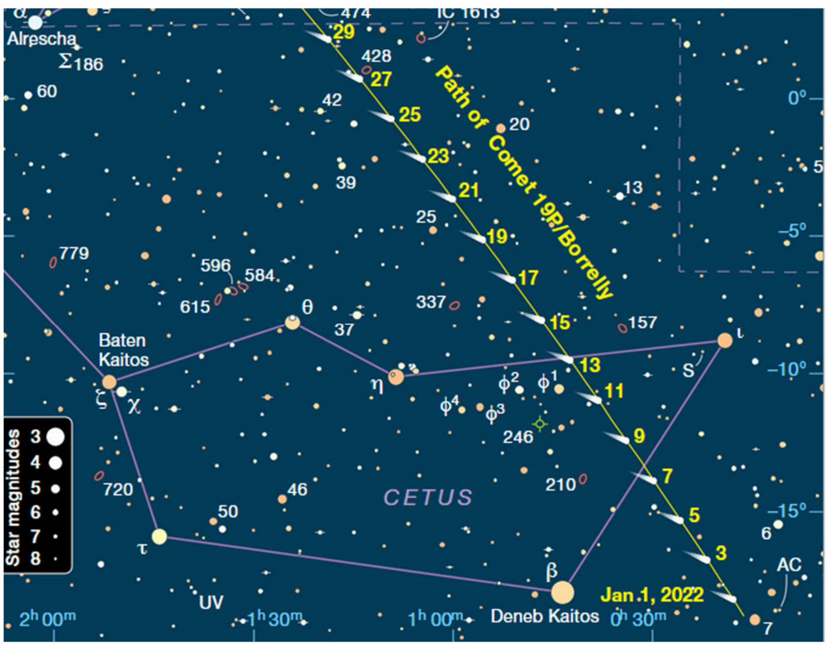
Best ISS viewing for New Braunfels (works for Canyon Lake too) -From Heavens Above

Date	Start Time	Start Loc	Max Alt °	End Loc	Note
12/17	06:49	SW	77	NE	
12/18	06:08	SSW	36	NE	
12/19	06:51	WSW	27	NNE	
01/07	06:27	NNW	32	ESE	
01/09	06:30	WNW	60	SE	
01/15	18:22	S	19	ENE	Clips Orion's foot star Saiph
01/16	19:11	SW	47	NNE	Gets close to Jupiter
01/17	18:23	SW	82	NE	Gets close to Capella in Auriga
01/19	18:25	WSW	26	NNE	Rises just west of Saturn. Gets close to Deneb in Cygnus

- The Moon dances with planets and stars
- Mars is in the early pre-dawn sky and travels through a crowded portion of the Milky Way starting on January 19th. Some nice photo opportunities.



- Jupiter is still looking good in the south and southwestern sky. If you like to see transits by Jupiter's moons, January 12th has a two-fer. Castillo starts it off at 4:22pm CST, still light outside but wait, Ganymede comes in at 5:50pm CST. Watch Ganymede catch up with Castillo as the sky darkens.
- Saturn is rising about an hour earlier than Jupiter and noticeably dimmer. Catch it soon, before it gets lost in the Sun's glare.
- Uranus is visible most of the night in southern Aries. At magnitude 5.8 it is catchable in binoculars. Look for a fairly bright greenish gray "star".
- Neptune is magnitude 7.8 and visible in binoculars, a bright blue "star". It's up most of the night in eastern Aquarius
- Comet(s)
    - Periodic comet 19P/Borrelly returns. It was discovered by French astronomer Alphonse Borrelly on December 28, 1904. 19P is expected to peak at magnitude 9, dim in a 4-inch scope.



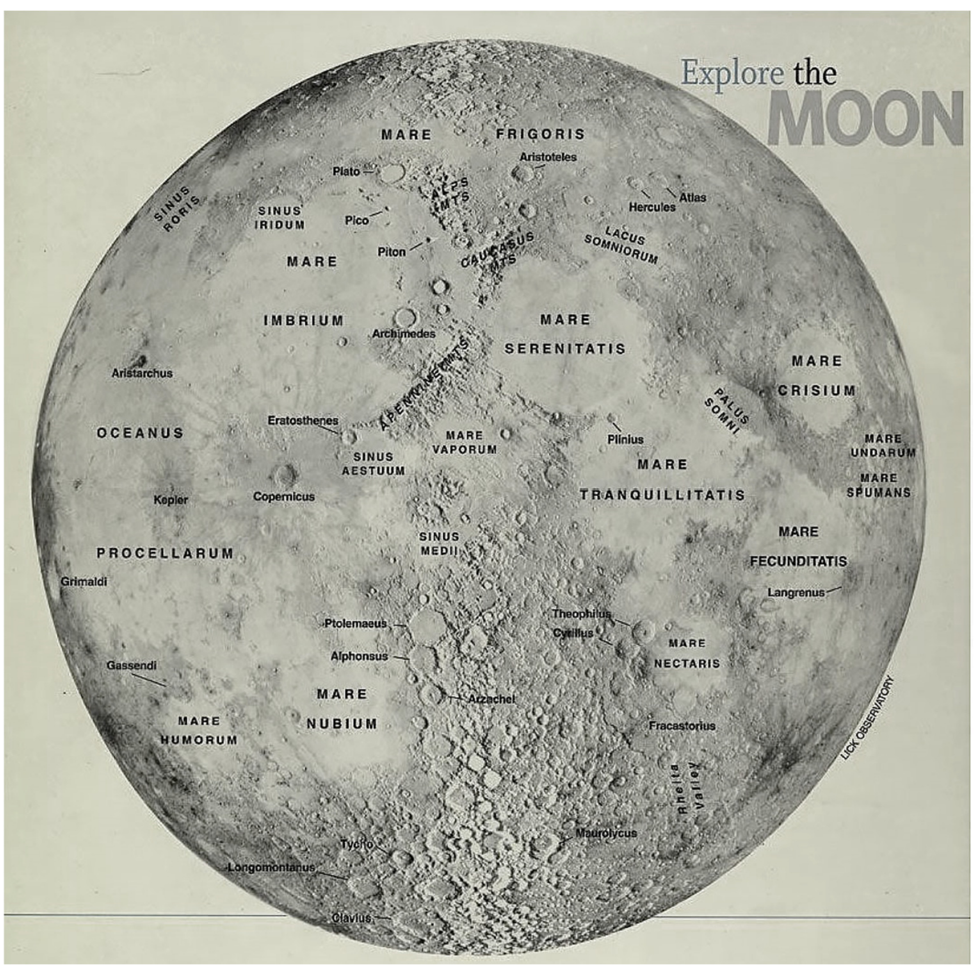
From Sky & Telescope magazine

My Observing Pick: The Moon

It's close enough to see surface features clearly with binoculars. It's close enouth to see larger surface details with a telescope. It's the Moon! Our Moon has bunches of stuff to examine, just look. I have attached a basic map with major features identified.

Current theory indicates our Moon came to be as a result of a glancing collision by a Mars sized body. Why this theory? When astronomers wind back the clock they see the Moon getting closer and closer to Earth and finally it appears the Moon is just too close to stay together. A principle called the Roche limit, named after Édouard Roche, the French astronomer who determined this theoretical limit, comes into play. This limit describes how mass and angular momentum conspire to tear apart one body orbiting a larger body. The larger body's mass (gravity) acts more intensly on the smaller body as the smaller body orbits more closely. Also, the smaller body orbits faster as it gets closer. At some point (the Roche limit) the smaller body loses integrety and disintegrates, forming a ring around the larger body. By looking at the Moon's orbit over its lifetime, it appears the Moon was a ring around the Earth prior to forming its current shape. The current explanation for this is a collision, tearing a bunch of material from Earth, forming a ring temporarrily, then coalescing into the Moon.

Our Moon is tidaly locked in synchronous orbit, meaning it rotates one time per orbital revolution, showing the same side to us all the time. It is slowly drifting away from Earth, about 1.5 inches per year but don't worry, it'll be causing total solar eclipses for some time.



Imagining Imaging: Platform for club imagers…images and imagers needed!

Start by Shooting the Moon!

The Moon is a good starting place for beginning astrophotography. It's big, bright, and easy focus on. You don't even need a telescope to capture our natural satellite. In some cases, you don't even need a tripod but I still recommend using one. If you use a wide-angle perspective, you can capture the Moon in context with landscapes or cityscapes without a tripod…but use one anyway. With a telephoto perspective you can still have the Moon in context with buildings or landscapes, but it will look much larger. With a long telephoto perspective, you can even capture lunar craters.

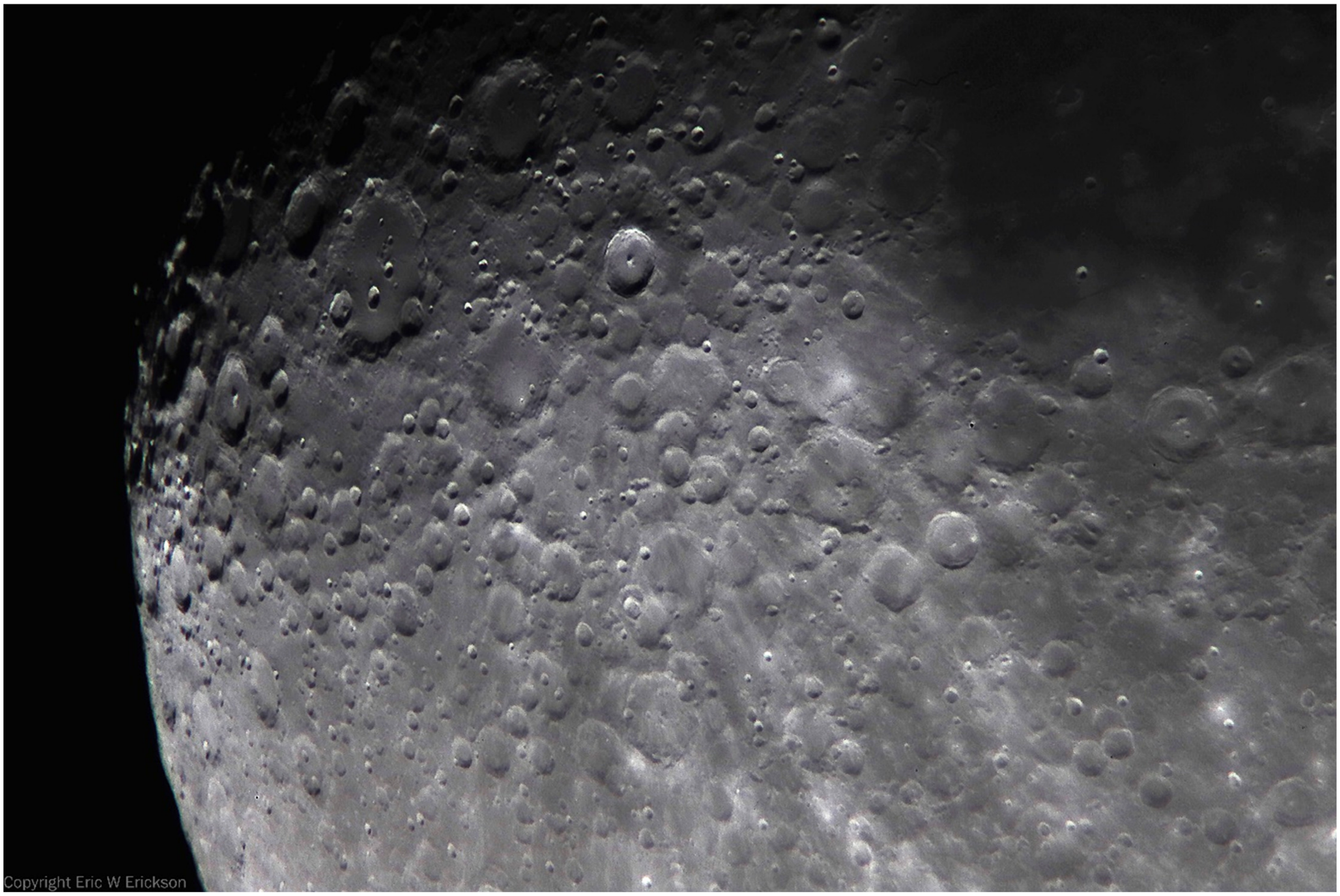
A few things to note:

- Most cameras are not built for astrophotography. They are made for daytime shooting and might have a "Night" mode but that is not usually appropriate for shooting celestial objects. Keep reading.
- If your camera allows, use its Manual mode. It gives you control over how the photos are shot. Unless your camera has a very narrow "Spot" metering capability, it will tend to overexpose the Moon in automatic modes. Experiment with settings a little but you will get sharper images (less camera shake effect) with faster shutter speeds (1/100 of a second or faster). Set the lens aperture to ½ or 1 stop from its widest setting, its f-stop. For example, if its widest setting is f4, set it to f4.5 or f5.6. This will ensure your lens produces a sharper image. Most lenses perform better when adjusted ½ to 1 f-stop from their widest possible aperture.
- There is a setting called ISO that adjusts the camera sensor. In the film days, ISO (formerly ASA) indicated the films sensitivity, that is, how large the silver halide grains were in the film's emulsion. That is why "faster" films tended to be grainy compared with "slower" films, faster films had larger silver halide grains. So, a film ISO of 800 was more sensitive, or faster than a film with an ISO of 400. Higher ISO means you can set a higher shutter speed and reduce the effects of camera shake. Digital camera sensors don't work exactly that way, you don't make the pixels larger or smaller by changing ISO, but the effect is similar. Use a high enough ISO to be able to use a higher shutter speed. Be aware that ISOs higher than around 1600 can produce digital "noise" that resembles the graininess of fast films. That is not necessarily bad, and you can reduce noise in post processing.
- With the Moon you are usually trying to expose for the brightly lit part to capture details. If you want to get earthshine, then the brightly lit portion will be overexposed. An option is to shoot several times, capturing the bright part details and the earthshine, then using a post processing app to combine them into what's called a HDR (high dynamic range) image.

This image of the full Moon was shot with a long telephoto lens and shows the same perspective east-west, north-south as we normally see. I could have achieved this with a tripod vs telescope mounting by using a higher ISO (400 or 800) and faster shutter speed. Since I was set up to shoot the eclipse, I just did some full Moon shots to check focus, and this is one of them. Tycho and its impact ejecta rays are obvious in the lower right, with Mare Nubium (Sea of Clouds) to the left from our perspective.

Technical:

Captured	01/20/2019
Camera	Canon 5D, 1/400 sec, ISO 200
Optics	Canon 300mm f4L, 2xII, = 600mm, @f11
Mount	Losmandy G11, Lunar rate
Processed	Adobe Lightroom: Crop, exposure, contrast, curves, sharpen, luminance noise reduction



This shot of the waxing gibbous Moon shows its perspective as captured, with N-S and E-W reversed. It’s the same image used in this newsletter cover except there I cropped it to fit the full vertical page layout. See the prominent crater Tycho in the upper center, named after Tycho Brahe, with its central peak and rays of bright impact ejecta emanating below it. This shows even better in the full Moon photo. Tycho is a young crater at around 100 million years and that’s why its ejecta is so bright. It will darken with longer exposure to solar radiation. To Tycho’s left (our right) is Mare Nubium, the Sea of Clouds. Also notice the bright spots scattered lower right of Tycho. These spots tend to line up with Tycho’s bright rays and might be large chunks of subsurface material, or ejecta from smaller impacts, maybe concurrent with the Tycho impactor. Or newer?

Technical:

Captured	04/15/2019
Camera	Canon 6DII, 1/50 sec, ISO 800
Optics	Meade ed102/f9 refractor (918mm focal length)
	Orion 10mm flat field eyepiece using eyepiece projection (91.8x), f82.6
Mount	Losmandy G-11, lunar rate
Processed	Adobe Lightroom: Exposure, contrast, sharpen, luminance noise reduction, CA reduction

Lagniappe

We humans have made it to Mars, well, vicariously with machines. One day humans will set foot on Mars and witness Martian existence, feel its wind, the regolith beneath their boots.

But until then we depend on the machines in place on, roving around, and in orbit around Mars to send us data about its atmosphere, rocks, and soil. One machine in particular, NASA's lander InSight, is delving deeper, looking into Mars below its surface. InSight was made to study Mars' interior, as its full mission name implies; **IN**terior exploration using **S**eismic **I**nvestigations, **G**eodesy and **H**eat **T**ransport. InSight is a lot simpler to say! So, while other machines are sniffing and scraping, drilling, and digging, InSight is measuring Mars' body temperature, reflexes, and pulse.

Mars' pulse comes from marsquakes, detected by a seismometer appropriately named SEIS. The InSight lander placed it on Mars' surface just alongside itself after a soft-landing using rockets. It's the marsquakes that help InSight look deeply into Mars interior, not unlike how geologists use seismic information to picture Earth's crust, mantle, and core. Like earthquakes marsquakes produce seismic energy waves that travel through the planet via solid rock.

While that all sounds straight forward, and the technology is, Mars needs to cooperate. Due to Mars' low level of tectonic activity, most marsquakes are too mild to give a good picture of interior formations, so it took many months before any of sufficient power occurred. When some finally happened, investigators started getting a good image of Mars' interior. So, what's the interior like?

First, the crust seems thinner than expected, based on early analyses, and needs to be verified via additional data. Deeper down, it's a clearer picture. Mars' mantle extends between 400 and 600 km below the crust and is a single layer, vs Earth's two layers. The result of a simple, single layer mantle is quicker heat loss due to more efficient heat transfer outward from the core.

At approximately 3700 km across, Mars' core is larger with respect to the planet's diameter than Earth's. It blocks seismic waves coming from marsquakes near Tharsis Rise on the other side of Mars, indicating it's a completely liquid core. Not having a solid inner core explains why Mars has a weak magnetic field. In contrast, Earth's core has a solid inner core and liquid outer core that forms a spinning dynamo, producing our strong magnetic field. Our magnetic field is crucial for protecting us from the intense stream of charged particles coming from our Sun. With its weak magnetic field, Mars is continuously bombarded by solar radiation, and this is one of the many things planners need to consider when sending humans to Mars.

-Eric Erickson