

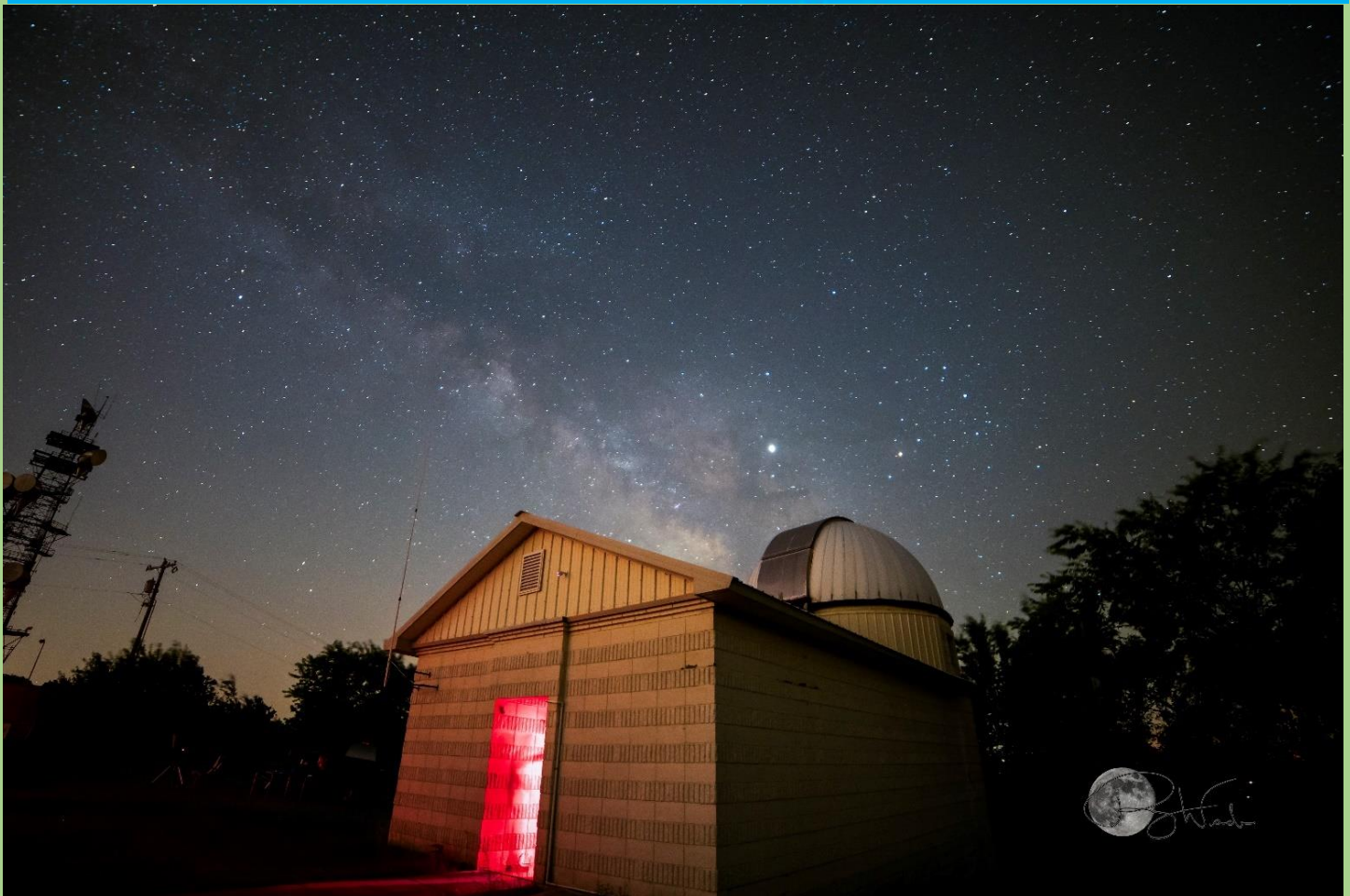


OBSERVER

JULY 2019

Bringing Stars to the eyes of Tulsa since 1937

Editor – John Land



**Photo by Ryan Wade June 1, 2019
of our club observatory during a member's night**

The photo was taken 6/1/19 at 1:02 AM. The camera used was a Sony alpha 7 iii full frame sensor, ISO 3200, 30 sec. exposure, lens is Rokinin 14mm F2.8 ultra-wide angle. It is a single image with some post processing done. Jupiter is bright object just to left of the dome. The star to the right of Jupiter is Antares in Scorpius. I got lucky and someone opened the door to the building for me just at the end of the exposure to create the red glow and ghost effect of a person.

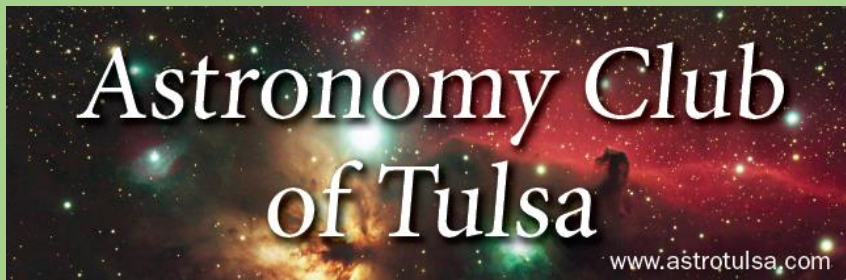
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We are trying something new this summer. If an Observing Night scheduled for FRIDAY night has to be Cancelled due to weather, we will try again on Saturday if the weather improves. CHECK the Astrotulsa.com Website on Saturday afternoon to see if the observing grounds will be open.

Astronomy Club Events Details at <http://astrotulsa.com/Events.aspx>

JULY				
SIDEWALK ASTRONOMY	1ST Q	SAT, JUL 6	7:45 PM	BASS PRO
Apollo 11 Planetarium Shows		July 15-20	See page 3	Jenks Planetarium
Apollo 11 50th Anniversary Event		Sat July 20	See page 3	Jenks Planetarium
PUBLIC NIGHT	3rd Q	FRI, JUL 26	8:00 PM	OBSERVATORY
AUGUST				
MEMBERS' NIGHT	New	FRI, AUG 2	8:30 PM	OBSERVATORY
CLUB PICNIC (MEMBERS ONLY)		SAT, AUG 3	5:00 PM	OBSERVATORY
SIDEWALK ASTRONOMY	1ST Q	SAT, AUG 10	7:30 PM	BASS PRO
PUBLIC NIGHT	3rd Q	FRI, AUG 23	7:30 PM	OBSERVATORY
MEMBERS' NIGHT	New	FRI, AUG 30	8:00 PM	OBSERVATORY
MEMBERS' BACKUP NIGHT	New	SAT, AUG 31	8:00 PM	OBSERVATORY
SEPTEMBER				
GENERAL MEETING		FRI, SEP 6	7:00 PM	JENKS PLANETARIUM
SIDEWALK ASTRONOMY		SAT, SEP 7	6:45 PM	BASS PRO
PUBLIC NIGHT		FRI, SEP 20	7:00 PM	OBSERVATORY
OKIE-TEX STAR PARTY		SEP 21-29	see page 3	BLACK MESA
AUTUMNAL EQUINOX		MON, SEP 23		
MEMBERS' NIGHT		FRI, SEP 27	7:15 PM	OBSERVATORY
MEMBERS' BACKUP NIGHT		SAT, SEP 28	7:15 PM	OBSERVATORY

MEMBER'S FACEBOOK FORUM - Come join us on our private Facebook group. Just search for the group "Astronomy Club of Tulsa Members Only" and click join. You will be granted access once you have been verified as a club member. This an informal group to announce things privately to only club members. Everyone please feel free to post request for astronomy help, meet ups at the observatory, post for sale astronomy gear, or general club chatter. It is a moderated group, please keep it civil. Hopefully this can become better method for everyone to keep each other in the loop.



Astronomy Club window sticker \$ 1 excellent for your car or telescope. Size ~ 6 x 2 inches
Member Michael Blaylock has created a beautiful club sticker from one of his own images of the Horsehead and Flame nebulas in Orion. Pick up one at club events or contact John Newton at Astrotulsa.tres@gmail.com

Jenks Planetarium Celebrates Apollo 11 Moon Landing



July 20, 2019 is the 50th Anniversary of the Apollo 11 Landing on the moon. The Jenks Planetarium is planning a weeklong celebration of Mankind's First Steps on the Moon. With multiple showings of its show recreating the landing using actual NASA footage from the day of the landing.

Details at jenkscommunityed.com

JENKS PLANETARIUM
205 East B Street, Jenks

Regular Shows Tickets
\$5 online or \$7 at the door

I recommend you call
918-298-0340 to expediate your reservation

APOLLO 11 50TH ANNIVERSARY EVENT--JULY 20 *New!*

Don't miss this special event designed for the entire family! View two new exciting shows in the dome including Apollo 11: Man's First Step on the Moon, created for this event by Jenks staff and students. Solar Superstorms will also be featured, a new production that takes viewers into the tangle of magnetic fields and superhot plasma that result in dramatic flares and violent solar tornadoes.

Plus, enjoy special activities in the Math and Science Building including making and launching parachutes, conducting mission control tests, enjoying story time, viewing space exhibits, looking through solar telescopes on the roof, and more. Food trucks will provide fun options for snacks and lunch. **Cost per person is \$10 by June 14; \$12 after June 14 (does not include food and drink). Space is limited! Choose from two July 20 sessions (includes shows and activities): 10:00am-12:00noon or 12:00noon-2:00pm. To enroll, visit jenkscommunityed.com.**

Or Purchase online at jenkscommunityed.com

For a complete listing of the shows Plus the special week of shows on the Apollo 11 Landing. [Go to Show Schedule](#) Click the Date Column to sort them by date



Okie-Tex Star Party Sept 21-29, 2019

Pre-registration must be postmarked by Saturday, August 31, or Online by Sunday Sept 1.

Every fall nearly astronomy enthusiasts from all over the country and beyond gather under some of the darkest sky on the planet for a week long fest of

starlight. Located at the tip of the Oklahoma Panhandle in the high dry Black Mesa near the tiny town of Kenton – **population 17 !**

The nearest town, Boise City, is 35 miles away. **population 1,030** Excellent Meals are catered by Jody's Catering, of Boise City, OK. and must be prepaid by Sept 1. There's also a midnight cash grill open until 2:00 AM. Read all the details at <http://www.okie-tex.com/index.php>



PRESIDENT'S MESSAGE

BY TAMARA GREEN



Now that Summer is here, we will be having more attendance at our public events, such as Public Nights and Sidewalk Astronomy. Volunteers will be needed!

I am very pleased with the way our Public Nights are being organized and handled now! The new PA system works great, plus having radios to communicate between the dome and the field, and between people acting as security have been a boon! Thank you to Dennis Berney for coming up with the radio idea and to Jerry Cassity and former members Tony and Jess Cagnolatti for the PA system idea! These eliminate the need for people to run back and forth to make announcements!

Public Night June 21 was a big success! We had 39 adults who registered for our guest list. Plus, there were several families with kids eager to learn about the sky. I want to thank the following who came out to Public Night on June 21 to help make it a success:

Owen Green and James Taggart, who did the dome shows.
John Newton, who was there to meet and register guests to handle the donations.
John Land, who did the laser-pointer-guided constellation show and had a scope on the field.
Dennis Berney, who acted as security. This surely makes our members and guests feel that they and their stuff are safe!
Bryan Kyle, Jerry Cassity, Adam Koloff, Steve and Deb Chapman, Don Bradford, and Jim Norwood, who had scopes on the field.

Plus, I would like to thank all who came out and volunteered at TASM on the 7th to provide viewing for the Oklahoma Science Teachers Association banquet and those who came out to Bass Pro on the 8th. Unfortunately, I do not remember who all came to those. Public Night is freshest in my memory!

We are also working on plans for our annual Club picnic for Saturday, August 3 at the Observatory. One idea that has been suggested is that we have a swap meet during the picnic where members can trade our sell surplus astronomy accessories and such. As soon as we get all the final details worked out, I will send an announcement soon.

The MidStates region of the Astronomical League has accepted our bid to host their 2020 convention. The dates will be Friday June 12 thru Saturday June 14, 2020. Astronomy Club of Tulsa and Broken Arrow Sidewalk Astronomers will be working on plans for the convention! **We will need lots of volunteers to help with that too!** We have already a Chairman and Vice Chairman, and a Food Coordinator, but we will need people to help procure vendors, speakers, etc. Please Contact Tamara Green or Jerry Cassity to volunteer.

I hope that many of our members will come out and participate in our fun Summer events. It will be a blast!

I hope all of you have a very safe and happy 4th of July Weekend!

Clear Skies, Tamara Green

PBS Channel OETA – Celebrates Apollo 11 & Space in July

M-W July 8-9-10 8:00 PM 2 Hrs “Chasing the Moon - American Experience” 3 parts
Repeated July 16-23-30 at 7:00 PM

Weds July 10 8:00 PM NOVA – “Back to the Moon” Future of Space Exploration

Thurs July 11 7:00 PM “Back in Time” Oklahoma’s Space Pioneers

Tues July 16 9:00 PM NOVA – Apollo’s Daring Mission

10:00 PM “Space Chase USA” Story of Cocoa Beach Florida

Weds July 17 8:00 PM “8 days To the Moon and Back”

Weds July 17 9:30 PM “When We were Apollo” conversations with Apollo 11 crew

Weds July 24 7:00 PM begins a 3-week series “Ancient Skies” Man’s quest for Space

Weds July 24 8:00 PM NOVA Part 1 of a Five Episodes on “The Planets”

Weds July 24 9:00 PM NOVA Part 2 of “The Planets”

Weds July 31 8:00 PM NOVA Part 3 of “The Planets”

For a complete listing of shows on OETA-HD Go to <http://www.oeta.tv/schedule/>
also check for repeat times on OETA World Channel

Member’s Memories and Reflections on the Apollo 11 Moon Landing



K.C. Lobrecht - I lived in Denver with my folks. A month earlier I had just moved from Toronto, Canada. My Dad loved the climate in Colorado and retired there. My Mom and I sat at the kitchen table watching the Landing. Two days before my 19th birthday. Remember it felt like a gift in so many ways. I had no idea then Astronomy would be part of my life. It was a thought I'd carried all these years of being with my Mom. Time, Space and Gravity. July 1969. KC

Merry Lobrecht (KC 's Sister)

I was up most of the night at OSU studying for a history exam. The only question he asked on the test the next morning was “*What was the name of the astronaut who stayed on the spaceship?*” It taught me a very valuable lesson. Whatever was in the curriculum current events are still important in any social studies class. I used that concept for the rest of my teaching career. Probably one of the reasons I specialized on Geography – IT IS - History, Place, Culture and Current Events ! “Actually, I don’t remember what I answered or if he asked for lunar landing shuttle or not. What was important was what was happening in the world had so much value”. (Merry was Texas Teacher of the year in 1995)



Byron Labadie - I was 12 years old at the time, and astronomy and space had grown into my heart three years earlier. I was at my great aunt's house in Muskogee, OK, and remember anxiously awaiting Neil Armstrong's climbing down the LEM's ladder on a old black and white console TV, late in the evening. Early that day, an old man next door told me that the moon walk was a joke; nobody was there, and he meant it ! I wish I was mature enough then to have replied, "I agree, airplanes are not real, even the moon is fake". I sat on the floor with my chin in my

hands, and never lost a moment of focus of what happened. It was one of the most memorable days of my life.

Byron sent this picture of him at age 15 with his Criterion RV-6” Dynascope. It was my 2nd scope. My first one was a 60mm refractor, purchased when I was 12, I remember using a 4mm 1.25” eyepiece and cheap 3X barlow trying to view Saturn. The image was large, dark, and showed zero detail. The steep learning curve had just begun.

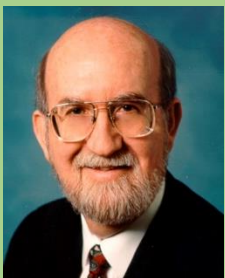


John Land (1969) – Growing up, my Mom and I shared a love of science and especially the Space Program. In the early days we would go out and look for the Echo I satellite to go over. It was a giant 10 story wide metallic balloon – as bright as Jupiter - that they could bounce TV signals across the Atlantic. The local weather news would tell us when it would go over Oklahoma. The Mercury, Gemini and Apollo launches were often live on TV or headliners on the evening news. We all wanted to be Astronauts when we grew up. I remember once a neighbor boy and I set his Mom’s yard on fire trying to build a giant matchstick rocket. (I’m still waiting for my Flying Car – that were in all the comic books)

In 1969 had just graduated college at OBU and gotten engaged to Marilyn in May. I spent that summer taking classes at OU and joined a program for teaching in OKC inner city schools called Teacher Corp. By late July the summer term had ended, and I was visiting my parents in McAlester, OK. We had all been eagerly awaiting the first manned moon landing. There had been a rapid succession of successful Apollo missions leading up to Apollo 11. Apollo 8 was first to orbit the moon at Christmas time of 1968. Apollo 9 – March 1969 – tested Docking and all systems of the LEM and Command modules. Apollo 10 – May 1969 – commanded by Oklahoman Tom Stafford – did a full dress rehearsal of the lunar landing descending to just 8 miles from its surface.

So, all of us awaited breathlessly when Apollo 11 was launched on July 16 to put the first men on the moon. You had to watch LIVE on TV – there were no devices to record the event. About Noon the LEM separated from the command module manned by Michael Collins and began its decent to the moon. We could hear the audio communications of the astronauts and command center. There were these odd beeps as they talked then waited for a response. I learned years later that it took the radio signals about 1.5 seconds to reach the moon and then another 1.5 to come back. So they had to delay enough time so messages didn’t overlap.

As the lander descended, we could hear Buzz Aldrin calling out the altitude and decent speeds. It seemed like forever! Finally, we saw it’s shadow on the ground and then Armstrong’s Words “The Eagle has Landed” We all breathed a sigh of relief and then cheered. It was mid-afternoon when they landed. But the astronauts had much to do before they exited the lander. Don’t remember what we did after that – probably went to evening church since my Dad was a pastor. I remember it was already dark when we turned the TV back on and waited for the astronauts to step out on the surface. The TV images from the Moon were blurry but we didn’t care. Finally, a bit before 10 PM Okla. time we saw Neil Armstrong climb out on the lander and slowly make his way down. He paused just a bit and then put one foot on the moon. Making his famous statement “That’s one small step for man, One Giant Leap for Mankind”



Don Bradford - WHY I AM HOOKED ON SKY-WATCHING

Everyone grows up seeing the night sky from time to time, including stars and the moon, and if lucky the Milky Way. But for me, that experience was little more than a blind acceptance of the strange world around me without significant concrete embrace of anything tangible or touchable. The Apollo 11 moon landing on June 20, 1969 forever changed the place in my mental framework in which I had stashed away the “universe”. I was 24 years old, but seeing the video of Neil Armstrong stepping onto the moon was like a very young child first

discovering that mud was not just an abstraction seen from the car window, but rather something one could feel, relish and play in.

I saw the video with my soon-to-be wife while we were dating in Dallas, Texas. And priorities being what they were, I didn't embrace the obsession of sky observing until later. But the seed was planted. It sprouted momentarily from time to time, most notably when our daughter was nine years old and working on a school project on the solar system. I bought us a 60mm refracting telescope and a pair of 50mm binoculars which were sufficient to provide inspiring views of bright star clusters, Saturn's rings, Jupiter and its four brightest moons, etc. Seeing objects in the night sky and relating them to photos developed over the years by NASA projects have instilled in me a sense of tangible reality that is truly awe-inspiring. Views of the Earth rising above the foreground of the moon and photos of the Earth and moon as side-by-side balls viewed from 6.2 million miles by the Galileo spacecraft in 1992 are among the early connections between my abstractions and tangible realities.

So, in my now-permanent phase of the obsession, I play with my 102mm refractor and 12-inch Dobsonian (and those same binoculars from 1989), expanding my observable connections to the boundless evidence of what the universe offers. Of course, most of the universe is still an abstraction to me (who can concretely understand the vast numbers and distances describing the known universe), but nevertheless I become more hooked each day by the boundless evidence available to anyone who looks up. I will always remember the Apollo 11 mission as triggering my appreciation of (maybe obsession with) that simple experience of looking up.



Ed Downs - Where Were You on July 20, 1969?

What is so important about that date? If you must ask, you are suffering from our modern educational system which overlooks some of our species greatest achievements. Instead, we concentrate on the latest news gossip and why a soap opera styled TV reality show "allowed Jessica to wear that bikini with both Jason and Kenny in the room OMG!!" Yeah, pretty thin stuff.

Now that I'm able to look back in time more years than I like to admit to, this writer has a few dates that stand out, those that contained an event that forever burns a time and place into one's brain. July 20, 1969 was the day that the human species became a true "space traveler," meaning we went someplace ... our own Moon. With the touchdown of the lunar lander, mankind's place in the universe forever changed, and the entire world stopped for just a few moments to inhale the reality of this achievement. I truly feel sorry for those who were not yet born, or too young to savor the event, as it was remarkable. Were you there? Do you remember where you were and what you were doing? Do you remember the names of Neil Armstrong, Edwin (Buzz) Aldrin and Michael Collins? Yes, Neil and Buzz did the moon walk, while Michael circled to the Moon in the command module, waiting to "rescue" his fellow travelers when they had completed their stroll. Quite a team.

This writer was on active duty with the Air Force, in the Command Center at Richards Gebaur Air Force base just outside of Kansas City. At that time, I was a Boeing 707 instructor with TWA, assigned to certification of the new Boeing 747. Most of my time was being spent in Seattle, but I had returned for my last "summer camp" as an Air Force Reservist, having joined in 1963. We were in the process of dispatching C-124 cargo planes ("old shaky") to the Philippines in support of the Viet Nam war. As I recall, it was in the evening and one of the other Airman had brought in a little B&W TV which got a poor picture. We all crowded around in absolute silence. The funny thing was, the main discussion was "Live TV, how the hell did they do that!" Live TV from the Moon! Yes, funny what details stick in your mind!



John Newton – Club Treasurer

In the coming months, you may discover many interesting stories surrounding man's first landing on the moon, but what about those rocket scientists behind the scenes who made it all possible while considering the basic design of the rocket, size, weight, and exactly how much fuel would be required to launch three men to the moon.

The Apollo 11 mission, as well as each of the subsequent Saturn V missions, required three rocket stages with the first stage starting at launch to leave Earth. Each stage takes the rocket to a higher velocity and altitude in a very efficient manner. When the first stage expends its fuel, it separates from the rocket, creating an advantage of reducing the overall rocket's weight. Then the second stage ignites, pushing the rocket to even greater height, and finally, the third stage completing the acceleration - but it still needed a little bit more.

When Saturn V blasted off from the Earth, the first stage (S-IC) burned for 2.5 minutes, lifting the rocket to an altitude of 68 km or 42 miles, to a speed of 2.76 km/s or 6,164 mph. This speed was much less than the needed escape velocity.

After the S-IC stage separated from the Saturn V rocket, the second stage (S-II) burned for 6 minutes. This propelled the rocket to an altitude of 176 km or 109 miles, to a speed of 6.995 km/s or 15,647 mph. This speed is close to the orbital velocity for that altitude.

After the S-II stage separated from the rocket, the third stage (S-IVB) burned for about 2.5 minutes. It then cut off placing Apollo 11 into a "parking orbit" at an altitude of 191.2 km or 118.8 miles above the Earth in low Earth orbit. Its velocity was 7.8 km/s or 17,432 mph.

After several orbits around the Earth, the rocket's engines re-ignited, and it blasted off for what rocket scientists call translunar injection. According to NASA data, Saturn V reached an altitude of 334.4 km or 207.8 miles and a speed of 10.4 km/s or 23,316 mph, at which time the engines were shut down again.

Even at this velocity, Apollo 11 was traveling less than the needed escape velocity for that altitude, however, the rocket received help by the gravitational attraction of the moon which the scientist cleverly anticipated. This created a slingshot effect making it possible to take Apollo 11 out of Earth's orbit and on course for the Moon. (Earth's escape velocity without the lunar assist is 11.2 km/sec or 25,056 mi/sec)

Explore a Detailed NASA archived Log of the Apollo 11 mission at
https://history.nasa.gov/ap11ann/apollo11_log/log.htm Times are given in EDT



The US Mint has created special coins to commemorate the Apollo 11 landing

The coin is curved to like the face of the Apollo astronaut's helmets. Several options are available. Go to [Apollo 11 Coins](#) or <https://www.usmint.gov/>



Caution: A number of imitation coins are being marketed even one from Fiji has an Ad in a noted astronomy magazine

Observe the Apollo 11 landing site on the moon with your telescope



The Apollo 11 astronauts first set foot on the moon on July 20, 1969 at 21:56 Oklahoma time. The moon's phase was a 6 day old waxing crescent moon. This year on July 7, 2019, the moon will again be a 5.9 day old waxing crest. Interestingly both dates are on a Sunday.

You can see the general region of the landing site in even a small telescope. The landing (marked by a yellow dot) was targeted for the southern region of the Mare Tranquillitatis (Sea of Tranquility), which lays on and slightly above the equator. **Refer to Map - page 11** Once you identify the correct region, increase magnification to about 75X or 100X

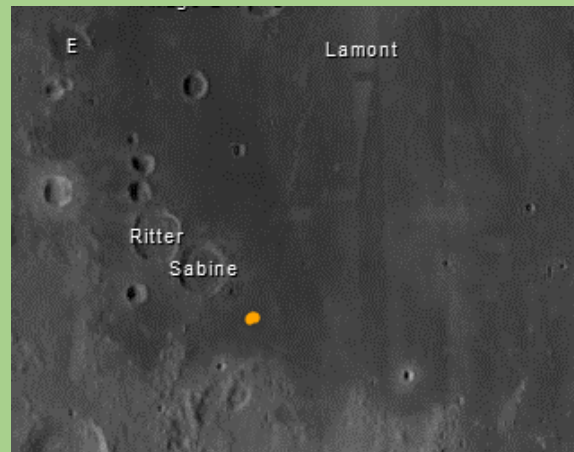
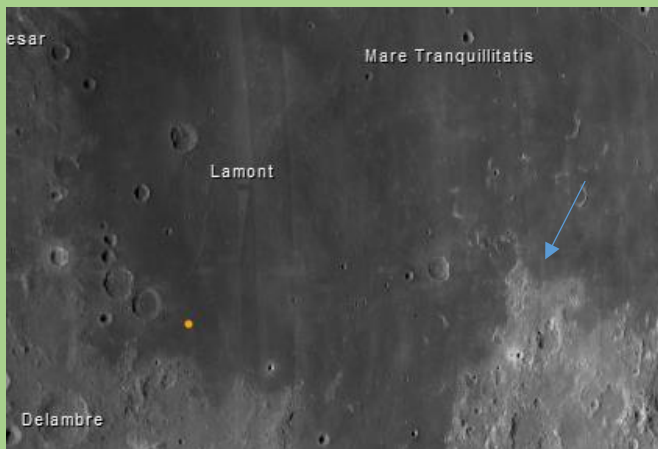
Note: images in your telescope are likely to appear inverted.

Look for the bright cup shaped region (arrowed) on the lower part of the Mare, then move over to the string of craters Ritter & Sabine. The landing site is just below and right of there. Of course, you'll not see the LEM or the flag. But you can see the smooth region of the Apollo 11 site.

In 2015 Sky & Telescope did an article featuring detailed images of all six Apollo Lunar Landing sites. Using high resolution telescope images as well as Lunar Reconnaissance Orbiter images that show the actual tracks of the lunar rovers. The accompanying telescope photos are inverted and flipper R to L much like they appear in most telescopes.

<https://www.skyandtelescope.com/observing/how-to-see-all-six-apollo-moon-landing-sites/>

The April 2015 article dates Will be the 2019 dates for July 7, July 8, July 9 and July 11



Credit: For this article I used images from the free [Virtual Moon Atlas](#)

ED DOWNS gives us a pilot's perspective on what the astronauts had to do for the landing. Flying in over the dry lava basins looking for identifying craters is "remarkably like identifying the multitude of dry lakes in the high deserts of our western U.S. Yes, there were plenty of checkpoints, all of which were memorized by Neil and Buzz; to be called out over the radio as they approached their destination. You see, the astronauts were using pilotage visual navigation, totally lacking anything like a modern navigational computer. The landing was not flown by an autopilot, but by the skilled hands of a test pilot." (as Apollo 11 came down it was headed for a crater with steep slopes and large boulders. Neil Armstrong had to hand fly the LEM to a safer location and landed with less than 30 seconds of fuel left!)

"Perhaps that one landing of 50 years ago has new lessons to teach. Today's aviators have become increasingly dependent upon automation and gadgetry, at the expense of knowledge and skill. The basic battle cry is "let technology do the job," resulting in aircraft we no longer fly, but instead, "manage." The way this writer sees it, technology is just fine, but when push comes to shove, I want to have the stick and rudder skills to make a Moon landing."



This article is distributed by NASA Night Sky Network

July 2019

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

Observe the Moon and Beyond: Apollo 11 at 50

By David Prosper

Saturn is at opposition this month, beckoning to future explorers with its beautiful rings and varied, mysterious moons. The **almost Full moon prominently passes Saturn the night of July 15th**, just in time for the 50th anniversary of Apollo 11!

Saturn is in opposition on July 9, rising in the east as the Sun sets in the west. It is visible all night, hovering right above the teapot of Sagittarius. Saturn is not nearly as **bright as Jupiter**, 30 degrees to the right and close to Scorpius, but both giant planets are easily the brightest objects in their constellations, making them easy to identify. A full Moon scrapes by the ringed planet late in the evening of the 15th through the early morning of the 16th. Some observers in South America will even see the Moon occult, or pass in front of, Saturn. Observe how fast the Moon moves in relation to Saturn throughout the night by recording their positions every half hour or so via sketches or photos.

While observing the Saturn-Moon celestial dance the early morning of the 16th, you can also contemplate the 50th anniversary of the launch of the Apollo 11 mission! **On June 16, 1969, Apollo 11 blasted off from Cape Canaveral in Florida** on a journey of almost a quarter million miles to our nearest celestial neighbor, a mission made possible by the tremendous power of the Saturn V rocket – still the most powerful rocket ever launched. Just a few days later, on **July 20, 1969 at 9:56 pm CDT, Neil Armstrong and Buzz Aldrin set foot on the lunar surface and became the first people in history to walk on another world.** The astronauts set up equipment including a solar wind sampler, laser ranging retroreflector, and seismometer, and gathered up almost 22 kilograms (48 pounds) of precious lunar rocks and soil samples. After spending less than a day on the Moon's surface, the duo blasted off and returned to the orbiting Columbia Command Module, piloted by Michael Collins. Just a few days later, on July 24, all three astronauts splashed down safely in the Pacific Ocean. You can follow the timeline of the Apollo 11 mission in greater detail at bit.ly/TimelineApollo11 and dig deep into mission history and science on NASA's Apollo History Site: bit.ly/ApolloNASA

Have you ever wanted to see the flag on the Moon left behind by the Apollo astronauts? While no telescope on Earth is powerful enough to see any items left behind the landing sites, you can discover how much you can observe with the Flag on the Moon handout: bit.ly/MoonFlag

You can catch up on all of NASA's current and future missions at <https://www.nasa.gov/>

The Moon

Copernicus

This crater (left) is easy to spot. It formed about 800 million years ago, and is 57 miles (92 km) wide. Note central peaks and terraced walls, caused by impact.

Aristarchus

Young crater. So bright that Sir William Herschel thought it was an active volcano.

Kepler

Small version of Copernicus

Grimaldi

Lava-filled crater is one of the darkest spots you can see on the Moon. It's 145 miles wide (233 km).

Mare Humorum

The Sea of Moisture is about 220 miles (350 km) across. You can spot it with the naked eye. With a telescope, you might notice two craters along its edge.

Tycho

Young crater best seen during a full Moon. Rays of bright material are ejecta blasted out of the crust when a large asteroid struck about 109 million years ago.

Mare Serenitatis

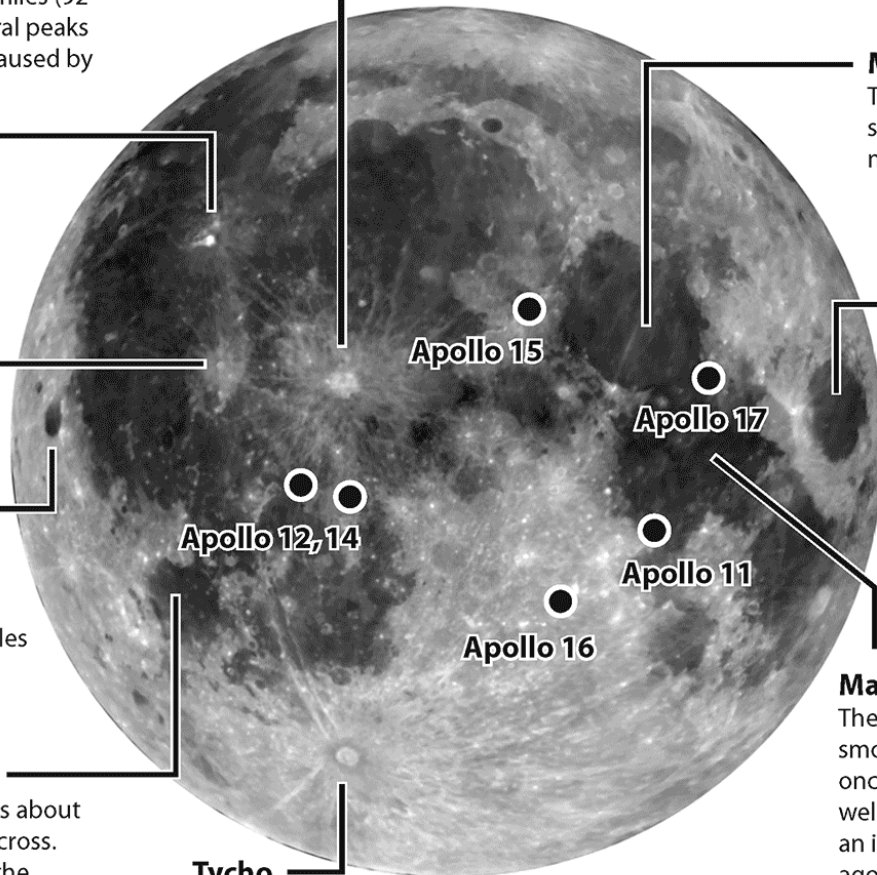
The Sea of Serenity is solid lava, some 380 miles (610 km) across.

Mare Crisium

The Sea of Crisis is about 340 miles wide (550 km) and visible to the naked eye.

Mare Tranquillitatis

The Sea of Tranquility is a smooth plain filled with once-molten lava that welled up from below after an impact billions of years ago. The first humans to walk on the Moon, Apollo 11 astronauts, landed near the edge.



SOURCES: NASA; ADVANCED SKYWATCHING; CAMBRIDGE ATLAS OF ASTRONOMY; DK VISUAL ENCYCLOPEDIA

Photos: James Scala. Layout and text for Moon map used with permission: Robert Roy Britt/SPACE.com.

Caption: Observe the larger details on the Moon with help from this map, which also pinpoints the Apollo landing site. Full handout available at bit.ly/MoonHandout

TREASURER'S and MEMBERSHIP Report

BY JOHN NEWTON



As of June 26, the Astronomy Club of Tulsa has **161 members**. We welcome our new members **Rendell Napier, Eric Johnson, Shelly Fulkerson, Stephen Kovacs, and Glenda Wilburn**. Hello and welcome to ACT! We look forward in seeing you at our meetings and other club gatherings **Thank You!** goes out to our long-term members for their continued support.

Accounts as of June 26, 2019 -

Checking: \$ 6,961.01

Savings: \$ 5,781.15

Investments: \$ 24,291.98 (Value tend to fluctuate with market changes).

The club now has **PayPal** available for you to start or renew memberships and subscriptions using your credit or debit cards. Fill out the registration form at <http://astrotulsa.com/page.aspx?pageid=16> **Click Submit** and you will be given the choice of either **mailing in your dues** with a check or using **PayPal** which accepts most major credit cards. A modest processing fee is added to PayPal transactions.

You may also renew your membership or join at one of our club events using your credit card by seeing one of our officers. We can take payments with the Square card reader. A small fee is also added on to these transactions.

ALSO NOTE: For our current members who are renewing their memberships, you can now go to a new link on the website to start your renewal process. On the home page, hover over the "Member" tab on the ribbon menu near the top of the page. Then select the "Membership Renewal" link and this will take to a page to fill out your information. Fill this out, submit it, then pay your dues by whatever method you choose.

NEWS NOTE: Both Sky & Telescope and Astronomy have free Digital subscriptions available with print subscriptions, or Digital subscriptions may be purchased separately. Details - Contact their websites

Membership rates for **2018** are as follows:

Adults: \$ 45 per year, includes Astronomical League Membership.

Sr. Adult: \$ 35 per year for those 65 or older, includes Astro League Membership.

Students: \$ 30 with League membership; Students: \$ 25 without League membership.

Additional Family membership: \$ 20 with voting rights and League membership.

\$ 15 with voting rights but without League Membership.

The regular membership allows all members in the family to participate in club events but only **ONE** Voting Membership and one Astronomical League membership.

Join Online – Add or renew magazine subscriptions.

<http://www.astrotulsa.com/page.aspx?pageid=16>

Magazine Subscriptions: If your magazines are coming up for renewal, try to save the mailing label or renewal form you get in the mail. Forms are available on the club website.

Astronomy is \$ 34 for 1 year, or \$ 60 for 2 years. www.astronomy.com

To get the club discount you must go through the club group rate.

Sky & Telescope is \$ 33 per year www.skyandtelescope.com

Sky & Telescope also offers a 10% discount on their products.

Note: You may renew your Sky & Telescope subscription directly by calling the number on the renewal form, **be sure to ask for the club rate.**

NEW SUBSCRIPTIONS must still be sent to the club

Dates and Times for Events are found at www.AstroTulsa.com under EVENTS tab
Be sure to check the Website for Weather Cancellations before coming.

You are invited to come join us to learn more about
Astronomy and view the wonderful sights in the night sky.

Check our Events Page of Dates [Link to Events Page](#)



During the school year our club holds a
Monthly General Club meetings at
Jenks Public Schools Planetarium
205 East B St, Jenks, OK
Located North of the intersection of
1st and B St

Meetings begin at 7:00 PM

When you enter the building lobby,
take the elevator to the 3rd floor.

[Click for Google Map Link](#)



Sidewalk Astronomy Night

East side of Bass Pro in Broken Arrow near the lake.
101 Bass Pro Drive, Broken Arrow, OK

[Click Map Link here](#)

On a Saturday evening near the 1st Quarter moon Astronomy Club volunteers set up telescopes to share views of the moon, planets and other bright objects. It's a come and go event where shoppers and restaurant goers get a chance to experience glimpses of the universe with their own eyes.



ASTRONOMY CLUB OBSERVATORY

Located on a hilltop about 25 miles SW of Tulsa
Features: classroom, restroom, dome with 14 inch telescope
and an acre to set up your telescopes.

Weather permitting, we host two types of observing nights.

PUBLIC OBSERVING NIGHT on a Saturday

This event is open to individuals and families.
Club members set up telescope for public viewing.

* Groups need to make separate arrangements.

MEMBERS OBSERVING NIGHT usually on a Friday near new moon
Reserved for club members and their families to allow them to pursue observing projects.

The Observatory is ONLY OPEN for SCHEDULED EVENTS. [Link to Events Page](#)

[Click for Observatory Map](#)

CAUTION: **DO NOT** use GPS it will likely send you on some nearly impassible back roads.

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NIGHT SKY NETWORK –
Open Position

WEBMASTER JENNIFER JONES

MEMBER ARTICLES WANTED

PLANNING A FUN ASTRONOMICAL ADVENTURE?

Got a new piece of equipment your dying to brag about?

Going on a vacation to an astronomical destination or done stargazing along the way.

Want to share your latest astrophotography success

Contact our Newsletter Editor about details at
Tulsaastrobiz@gmail.com

Submissions preferred in MS Word and submitted by the 20th of each month.

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