http://www.raclub.org/

The StarGazer

Newsletter of the Rappahannock Astronomy Club No. 1 Vol. 9 May–July 2020

RAC on the Hunt for NEOWISE

Compiled and edited by Linda Billard

C/2020 F3 (NEOWISE) or Comet NEOWISE was discovered March 27, 2020, by astronomers associated with the NEOWISE mission of the Wide-field Infrared Survey Explorer (WISE) space telescope. At that time, the comet was magnitude 18, located 190 million miles from the Sun and 160 million miles from Earth. By July 24, it was bright enough (mag 4) to see with the naked eye in less light-polluted areas and easily seen with binoculars. Now, however, the comet is quickly moving away from Earth, and even in dark skies, a waxing crescent Moon is beginning to interfere.

Many RAC members attempted to view NEOWISE with varying degrees of success. This article describes some of their experiences and shows some of their photos.

Glenn Faini

It's been more than 23 years since I've seen a comet. After my feeble attempt at photographing Hale-Bopp in 1997, I didn't think I'd have to wait nearly a quarter century to try again. Hale-Bopp was before I had a digital camera, so by the time I got my pictures back, it was too late to try again. My one attempt at photographing Hale-Bopp on 35-mm film was mediocre at best.

Not being an early riser, I waited for Comet NEOWISE to move to the evening sky before taking a look.

Image DSC-3034-3100. Nikon D3300, 200 mm, 5s, f/5.6; 7 frames at ISO 800; 13 frames at ISO 1600[16 frames at ISO 3200. Copyright 2020 Glenn D. Faini, GDF Photography

First Attempt [July 15, 2020—9:15 EDT–10:20 EDT; Port Conway Road & Weems Drive, King George, VA; Magnitude +2.7; Distance 0.76 AU (70,960,000 mi); Altitude 13°–7°; Azimuth 321°–328°.]. My first opportunity was Wednesday, July 15. I found a site with an unobstructed view of the NW sky about 5 miles from my home just off Route 3 on the way to Fredericksburg. I arrived at 9:15 EDT and set up my camera and tripod. I searched the sky with and without binoculars for about 30 minutes without any luck, so I began photographing the NW sky in an attempt to locate NEOWISE at 9:53 EDT. I finally found it with my fifth photograph at 9:56 EDT. I centered NEOWISE in the frame and began taking pictures at 10:00 EDT. I took nearly a hundred 5- and 10-sec photos but discarded all the 10-sec shots because NEOWISE's nucleus was visibly elongated. I processed 36 5-sec frames with DeepSky Stacker 3.3.2, but the results were fairly disappointing. The image was dark, grainy, and muddy looking, ominously similar to my attempt at photographing Hale-Bopp more than 23 years ago.

(Continued on page 3)

How to Join RAClub

RAClub, located in the Fredericksburg, Virginia, area, is dedicated to the advancement of public interest in, and knowledge of, the science of astronomy. Members share a common interest in astronomy and related fields as well as a love of observing the night sky.

Membership is open to anyone interested in astronomy, regardless of his/her level of knowledge. Owning a telescope is not a requirement. All you need is a desire to expand your knowledge of astronomy. RAClub members are primarily from the Fredericksburg area, including, but not limited to, the City of Fredericksburg and the counties of Stafford, Spotsylvania, King George, and Orange. We also have several members who live outside Virginia and have joined to have the opportunity to use the Mark Slade Remote Observatory (MSRO)—one of the benefits of joining the club.

RAClub annual membership is $20 per family. Student membership is $7.50. Click here for a printable PDF application form.

The RAClub offers you a great opportunity to learn more about the stars, get advice on equipment purchases, and participate in community events. We meet once a month and hold regular **star parties** each month on the Saturday closest to the new Moon. Our website, www.raclub.org is the best source of information on our events.

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Website: www.raclub.org

Groups.io: Members-only group. When you join RAC, you will receive an invitation to join from the RAC President.

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Scott Busby Equipment Loan
Jerry Hubbell Astrophotography
Myron Wasiuta Mark Slade Remote Observatory (MSRO)

Upcoming Events*

Our public events are cancelled until September. However, to attend a virtual club meeting, email president@raclub.org for an invitation.

Star Party, Caledon State Park	August 22†
Star Party, Caledon State Park	September 12†
Star Party, Caledon State Park	October 10†

Recent Outreach Events Completed

Star Party, Caledon State Park	July 25

*Owing to varied and changing restrictions, please check the website raclub.org for updates.

†simultaneous star parties at Caledon State Park and Belmont Observatory—Caledon events are for the public, if public meetings are permitted (please check our website for updates before attending); Belmont events are for RAC members only

President's Corner

Dear Members,

RAC is still without a Vice President. Please consider serving your club as Vice President. The more we contribute our time and talent, the better RAC will be able to serve us and the community.

Owing to government restrictions, we have cancelled RAC's annual club picnic and are continuing to hold our business meetings via Zoom Video Conferencing. I send Zoom meeting invitations to all RAC members via BCC eMail. Non-members may also participate by sending me a request at president@raclub.org. RAC plans to continue to make its meetings available via Zoom so those who cannot attend in person may participate.

May God bless you with transparent skies and excellent seeing.

Glenn Faini
President

Did You Know? **by Scott Busby**

The nova Persei was first detected by T.D. Anderson on February 21, 1901. Dr. Anderson, a Scottish clergyman, was walking home late that night when, looking up at the constellation of Perseus, he noticed a strange star of the third magnitude in the region between the famous variable star, Algol, and the brightest star of the constellation, Alpha Persei. He did not need a star map to recognize that the star was an intruder since a person only slightly acquainted with constellations knows that there is no bright star between Algol and Alpha Persei. He communicated his discovery to the Greenwich Observatory, which immediately spread the news to the whole world.

At the Harvard Observatory, where the now famous collection of celestial photographs had already been started some years before under the direction of E.C. Pickering, it was found that the new star was actually not completely new. A number of early photographs revealed that in the position of the nova there had previously existed a faint star of about the thirteenth magnitude that showed small fluctuations in light. It so happened that the Perseus region had been photographed at Harvard only 2 days before Dr. Anderson's discovery, and the plate showed the star still at normal minimum brightness. Thus, in less than 2 days, it had brightened from the thirteenth to the third magnitude, an increase of 10,000 times in luminosity—a veritable explosion!

Between February 21 and 23, the star continued to increase in brightness, but at a somewhat slower rate, until it reached a maximum at magnitude zero, about the brilliance of Capella and Vega. The total change in brightness was accordingly about thirteen magnitudes and had been accomplished in less than 4 days. Directly after the nova had reached zero magnitude it began to decrease with a fair degree of rapidity, although slowly in comparison with its rise. The rate of diminution in brightness decreased steadily, and the nova finally returned to its former state, at magnitude thirteen, 11 years after its initial outburst.

Source: *The Story of Variable Stars,* Leon Campbell and Luigi Jacchia (orig. pub. 1941), part of Series 1 of *The Harvard Books on Astronomy*, edited by Harlow Shapley and Bart J. Bok, The Blakiston Company, Philadelphia.

On the Hunt for NEOWISE *(continued from page 1)*

According to SkyPortal (SkySafari 5) NEOWISE's magnitude was +2.7. I find that hard to believe because I could not see it without binoculars, and even with 7x35 binoculars, it was very difficult to see in the sky glow. Driving out to a darker site, such as Belmont Observatory or Shenandoah National Park, would have helped immensely. Attempt 1 was rather disappointing, but as its altitude increases, NEOWISE should be easier to see and photograph, even though it will be a bit dimmer.

Second Attempt [July 18, 2020—9:39 EDT–10:11 EDT; My Backyard, King George, VA; Magnitude +3.3; Distance 0.72 AU (66,490,000 mi); Altitude 17°–13°; Azimuth 319°–322°]. Three days after my first attempt at viewing and photographing Comet NEOWISE, it was finally visible from my backyard, forming an isosceles

triangle with stars Talitha Australis and Talitha. Although NEOWISE was six-tenths of a magnitude dimmer, its higher altitude made it appear brighter and easier to see and photograph. Rather than use my 200-mm telephoto lens again, I decided to go with my much faster 35-mm lens in an attempt to collect more photons. That turned out to be a wise choice. I was not only able to record more detail, I captured NEOWISE's faint blue ion tail. By 10 pm, I was also able to see it with the naked eye. I estimate the dust and ion tails spanned nearly 8° in my photographs. The prominent, curved ocher dust tail is like a stream of breadcrumbs marking the orbital path taken by Comet NEOWISE. The straight ion tail is a thin blue stream of particles pointing directly away from the Sun. In addition to capturing nice pictures of a comet, some frames also caught the dancing green glow of fireflies, and at 10:08 EDT, four sequential frames recorded the flyover of the International Space Station. One frame captured the ISS crossing in front of NEOWISE's ion tail.

Image DSC_3141-3158: Nikon D3300, 35 mm, 5s, f/2, 16 frames at ISO 800. Copyright 2020 Glenn D. Faini, GDF Photography

Image DSC_3159-3221. Nikon D3300, 35 mm, 5s, f/2; 31 frames at ISO 800; 29 frames at ISO 1600; 4 frames at ISO 3200. Copyright 2020 Glenn D. Faini, GDF Photography

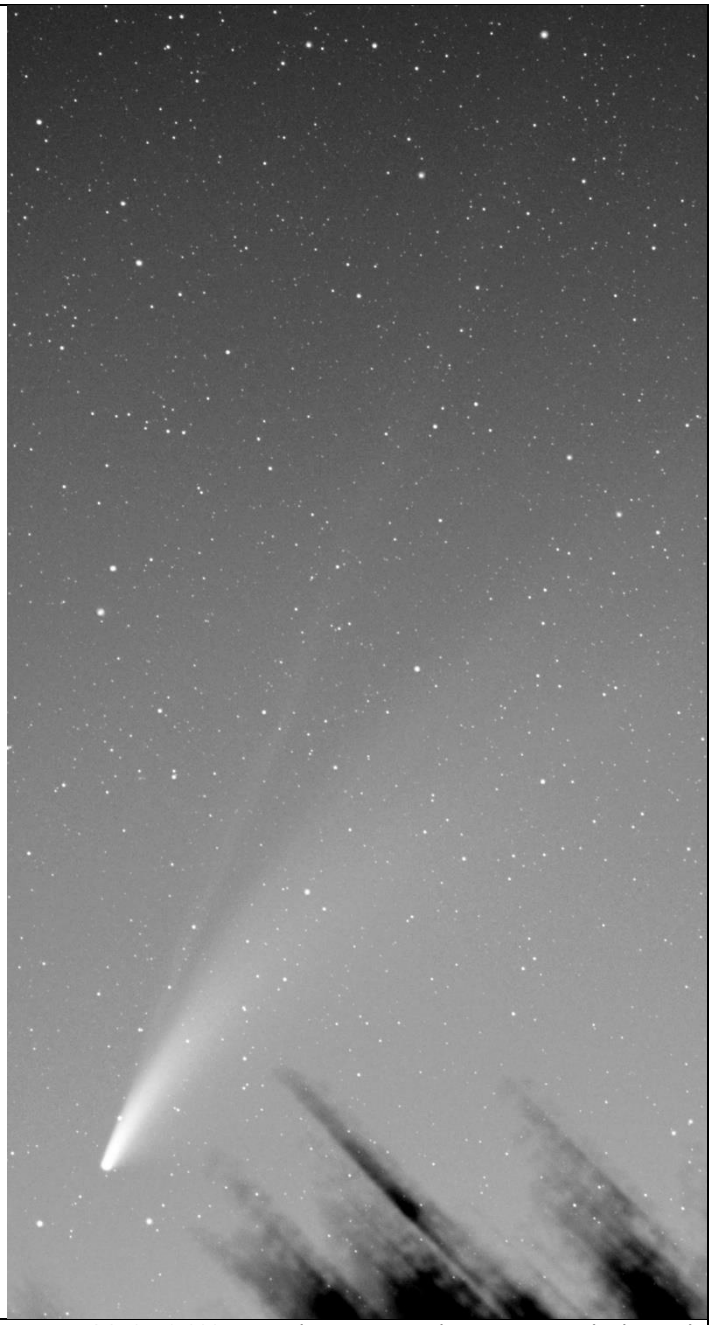


Image DSC_3159-3221 Mono is overexposed to accentuate the ion and dust tails. Copyright 2020 Glenn D. Faini, GDF Photography

Image DSC_3213a shows the ISS crossing Comet NEOWISE's ion tail. Processed with DeepSky Stacker 3.3.2 and Paint Shop Pro Photo X2. Copyright 2020 Glenn D. Faini, GDF Photography

Third Attempt [July 25, 2020—9:00 EDT–10:00 EDT; July Star Party, Caledon State Park, King George, VA. Magnitude +4.7; Distance 0.70 AU (65,490,000 mi); Altitude 36°–25°; Azimuth 295°–301°]. After a week of cloudy skies and storms, my final view of Comet NEOWISE came at our July Star Party. I was surprised at how much the comet had dimmed since the previous Saturday and how difficult it was to acquire in my binoculars. However, once I found it, I was able to help the others who attended the Star Party see it, using the stars Alula Australis and Alula Borealis as guides. NEOWISE was just a small, fuzzy, nebulous blob with a very short bit of vertical nebulosity. I did not have my camera with me, so I was not able to take any pictures, but one of our guests, pending member Amanda N., was thrilled to be able to take some pictures of the comet with my help. Please see the Recent Events article on page 10 of this newsletter for her picture and narrative.

Myron Wasiuta

NEOWISE. Credit: Myron Wasiuta

July 12, 2020. Although the comet is listed as mag 2.7, that is its total integrated brightness if it were to be all bunched up in a point. It is a rather large object by deep sky standards, so this light is spread over a large area, making its surface brightness rather low. Nonetheless, with a good sky, it is easily visible with the naked eye! I saw the comet looking like a faint 4- to 5-degree dagger of mist in the NW sky a couple nights ago. From Thornton Hollow [Shenandoah National Park] overlook on the morning of July 12, it was spectacular! I could see a bright fuzzy condensation with a curved tail flowing up for several degrees. [My photo] showing the closeup of the comet was actually taken with nothing more than my iPhone held up to the eyepiece of the 5-inch telescope! I snapped away and stacked 10 of the images to create the annotated version included here. As the comet is moving away from both the Sun and Earth, the sooner you observe it, the more impressive it will be, assuming sky conditions are good. If you can get to a dark sky site, it's worth the effort!

July 17, 2020. *[Note: Myron also took photos on July 17. His comments and the link to them follow.]* Here is the final 62-frame animation of a cloudy sky breaking briefly to allow the comet to be seen. Time lapse is 50 minutes. Recorded last night (July 17, 2020). Link to animation.

Christopher Law

I finally got a comet photo after trying literally all winter. On Sunday morning [July 12], I was at the location near the intersection of Harrison Rd and Chancellor Park Drive after 4:30 am. I had forgotten my binoculars in the rush to get there. I scanned the sky visually but could not find the comet. I was late getting up and the northeastern sky

was already pretty bright. Like Glenn, I shot the whole horizon in that area to see what I got. I reviewed my images on site but still didn't see it. On Monday, I reviewed the images and found that I had gotten four good shots.

Comet Neowise Evening Untracked. D7500, 18-140 at 95 mm, 5 sec @ f/5.6 ISO 1600, 14 July 2020 10:04 pm, Cropped, some processing in LR, Credit: Christopher Law

I decided to try an evening shot for my next attempt, and after looking at the weather forecast Monday evening, I realized there might not be another opportunity owing to incoming weather. I quickly grabbed everything, including the binoculars and headed up to a spot that is only a mile or less from my house. I got there after 9:30 pm and began looking with naked eye and did not see the comet. I did find it later with the binos, hiding under a small dark cloud. I began to take pictures with a 55-200 and a NISI Natural Night filter. The procedure was slow—align, live view to focus, shoot, review, move lens, zoom some, refocus, shoot again, repeat. Everything seemed really blue, so I switched to a UV-Haze filter, and it looked more neutral. Finally, I switched to an 18-140 also with UV-Haze. After looking at my photos, I think maybe I should go without any filter next time in hopes that I might see the ion tail, which does not seem present in any of my images so far. Also, I need to remember to set the exposure offset to zero before starting to photograph; I could have shot at ISO 800 if I had noticed the offset, which I use for flowers.

Troy Major

I shot the photo below July 16 about 9:45 pm. Canon EOS m50 camera with a 600 mm lens. 4-second exposure ISO 6400. Took the picture in Spotsylvania not far from my house.

NEOWISE. Credit: Troy Major

David Abbou

Comet NEOWISE was supposed to be a relatively bright and easy comet to find, but nothing in amateur astronomy is ever a sure bet. I ventured outdoors early before sunrise on two mornings during early to mid-July, armed with my camera and tripod so I could get a photographic souvenir of NEOWISE, which was being touted as the brightest comet in more than 20 years since Hale-Bopp graced our skies. Since my neighborhood is located in a low spot, I walked nearly a mile in the fresh morning air to find a clear, unobstructed NW horizon, but finding such a spot away from houses, lights, and trees was easier said than done. While I didn't see the comet those two mornings, I was rewarded with a few bright meteors along with Venus, the Moon, Jupiter, and Saturn all in the sky at the same time. And watching the incredible colors in the sky before sunrise is always something that makes me feel renewed and alive.

I tried to find elusive NEOWISE again during the evening of July 15. As I walked to the local elementary school, which is on higher ground than my neighborhood, I noticed a large, elongated cloud group forming in the northwest while the rest of the sky was perfectly clear. Just my luck, I thought! Unfortunately, this cloudbank obstructed the northwestern sky for the next hour and a half, which essentially eliminated any chance I had to see the comet. I still peered through a few breaks with my binoculars, but I was unsuccessful. On the way home, I was again rewarded with the universe's beauty as I watched Jupiter rising over the eastern horizon closely followed by Saturn, reminding me that the world continues to turn, and the universe waits for no one.

NEOWISE with airplane trail. Credit: David Abbou

I decided to give NEOWISE one last shot on the evening of July 18. The sky was absolutely clear, and the odds seemed to be in my favor as I walked to the elementary school with my camera and tripod in hand. I set up my equipment on the north side of the school, but too many lights interfered with my view to the NW as the sky slowly darkened. I decided to move and set up in the open field behind the school away from the brighter lights but closer to trees obstructing the NW horizon. I started scanning the sky with my small binoculars as the Big Dipper appeared with the growing darkness. The asterism was exactly what I needed as a guide to find the faint smudge of comet a few minutes later! I almost couldn't believe my eyes after trying over the last week with no success, but here it was, finally within my grasp. I immediately set up my camera on the tripod and began taking time exposures. I was happy the comet was visible well over the trees on the horizon—they framed the comet nicely along with two stars underneath it. I was even fortunate enough to capture an airplane flying by during one of the photos.

By 10:30 pm, after many photos and mosquito bites, I decided to call it a night and walk home. As I traveled south toward home, I kept glancing back toward the NW sky and was able to see the comet with my unaided eyes using the Big Dipper's bowl as a guide. What a wonderful night and experience to finally see and photograph NEOWISE before it departed for another 6,800 years!

NEOWISE. Credit: Scott Busby

Scott Busby

Here's my contribution. This image was taken on 18 July 2020 at Belmont Observatory. Weather was still warm and humid around 10 pm. Northwestern sky was clear but slowly degraded by haze as the night progressed. Nonetheless, I set up a CANON 20D DSLR on a tripod with a Canon 70–200-mm F2.8 telephoto lens set and focused at 70 mm. Shutter was set at bulb and an interferometer used to snap the timed shot at 10 sec. Full Frame image was further cropped to its current composition. This is a single frame. Image tweaks: PSCC 2020.

Bart Billard

Our neighborhood is on a south-facing slope down to a golf course and not suitable for seeing the comet either in the morning or the evening. From a map, I had located a flatter spot above our neighborhood where a street runs nearly the right way to be more than a block from the tree line. On July 13, Linda and I walked up the hill into that neighborhood to get a look at the northwest evening sky horizon and tried unsuccessfully to find the comet. We decided to drive up the next night for our second attempt.

We drove up on the 14th and found a spot on the shoulder to park just off the street I had found so we could look more northward across the yard at the corner (the street I found runs a little too much east-northeast). After 10 or 15 minutes, it was getting dark enough to recognize the stars in the bowl of the Big Dipper and Talitha Australis and Talitha. I was going to use them as guides to try to locate some stars in Lynx near the comet, but NEOWISE popped out first in the binoculars. We observed the comet for several minutes before heading home.

25 July 2020 at 10:01 pm EDT. Nikon D7100 DSLR with 18–140-mm lens at 100 mm. 10s at f/5.6, ISO 1600. Contrast and brightness enhanced in post processing. Credit: Bart Billard

For the next night, Linda suggested that we should try going down to the western end of our neighborhood where we could get away from all the lights by walking along the Dominion Energy transmission line right-of-way across the Lee's Hill Golf Course. I went to that location alone on the 15th with our DSLR in addition to the binoculars. This time, I could not find the comet or the Lynx stars I hoped could guide me, even after finding Talitha Australis and Talitha. I also should have applied mosquito repellant and did a lot of moving back and forth to avoid too many bites. As the comet was getting higher in the sky, I kept trying until just after 10 pm before giving up.

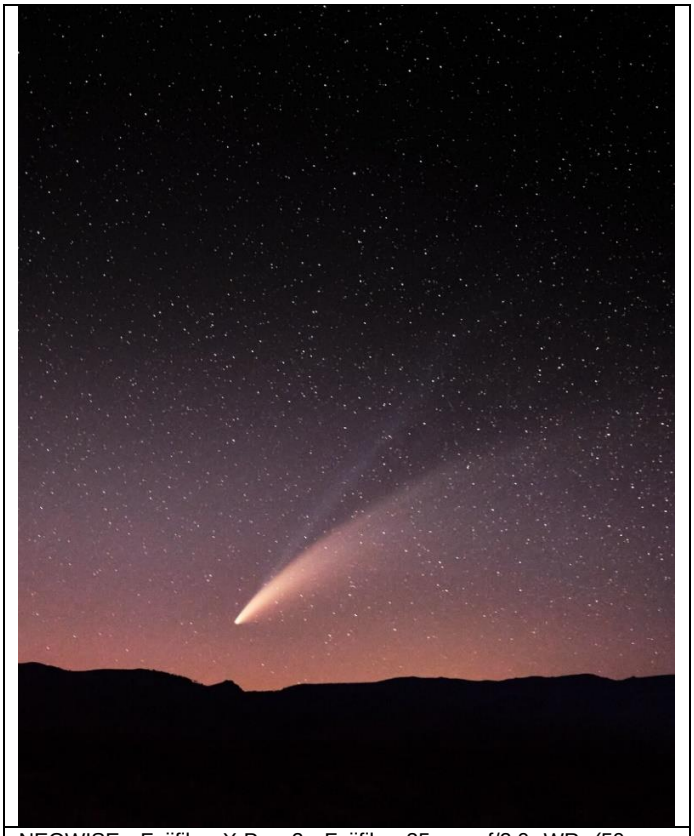
Glenn Faini's success that same evening encouraged us to try again (with insect repellant). On Saturday (July 18), the sky cooperated, with NEOWISE just above Talitha Australis and Talitha, but my focusing wasn't good. Finally, on July 25, I tried again with the camera. The accompanying photo shows the comet, but as Glenn indicated, it's getting very faint.

Matt Scott and Jean Benson

Jean and I were able to view the comet from our roof deck in downtown Fredericksburg. Friday (July 18) was the first night we saw it, about 9:30–10:00. It was the night that the comet was positioned between the two stars as shown in several other people's photos. Saturday night (July 19) we also were able to see the comet; it was around 10:00–10:30. We have looked on other days, but clouds or too much light pollution have not allowed viewing.

Brian Faini

[*Note: Brian is Glenn Faini's nephew who lives in California. This image demonstrates what a difference dry air makes! Glenn passed on the following from Brian about the included photo.]*



NEOWISE. Fujifilm X-Pro 2; Fujifilm 35-mm f/2.0 WR (50 mm equivalent); Camera controlled via smartphone app for liveview and no-touch shutter release. Standard editing of RAW images in CaptureOne Pro. Credit: Brian Faini

The week of July 12, I took a semi-regular trip to the Upper Owens River valley in Mono County, California, for fly fishing and to escape Los Angeles. I had been there many times and done VERY amateur astrophotography (nothing telescopic). I "boondock" in Bureau of Land Management areas to get away from the ruckus at campgrounds. This region is on the edge of the Inyo National Forest; it is high desert scrubland with dry alkali lakes and geothermal activity. The areas where I camp are at about 7,200 ft with minimal light pollution and low humidity. It's a great place to experience the cosmos.

For this trip, I didn't bring my best camera gear with me because I planned to do a lot of hiking in the Sierra Nevada and wanted to keep the load light. The night of July 14, I set up my camp about an hour before sunset and roughly framed up the sky to the northwest knowing

that NEOWISE would appear after sunset (approx. 8:10 pm that evening), and about 1 hour later it started to appear. For the next hour and a half or so, I worked on framing and exposure to balance the glow from the setting Sun and starlight while battling mosquitoes. (Despite the low humidity, the warm water from hot springs and the nearby Upper Owens River make it perfect for them.) At one point, I had to wait for a passing truck in the distance but other than that, it went quite well. The Moon phase and position was perfect as it wouldn't appear over the horizon for quite some time after NEOWISE descended the mountains in the distance.

In the end, I was happy with what I was able to capture. However, I do regret not planning a bit more to photograph this event and to bring a better camera/lens combo. Just gotta wait 6,800 years to do it again!

Follow-Up #2: Yerkes Future Foundation Moves Ahead!

By Linda Billard

As Scott Busby reported in late 2018, the University of Chicago, then owner of the Yerkes Observatory, closed the complex on October 1, 2018, with no prospects and no immediate plans to reopen. However, as I reported earlier this year, the university gave the observatory and 50 surrounding acres to the Yerkes Future Foundation, a local organization dedicated to restoring and reopening the facility for visitors and researchers. According to Dianna Coleman, chairwoman of the foundation, the funding goal is $20 million, of which about $3.5 million has been raised in just a few months. Money raised will go toward restoring the 60,000-square-foot building and its three main domes, each housing its own telescope. Reporting in the *Wisconsin State Journal*, Barry Adams writes that the foundation plans to restart tours and programs by spring 2021. Other plans include expanding research capabilities, improving technology, and providing a unique space for public and private events.

The 40-Inch Alvan Clark & Sons Refractor. Credit: Scott Busby

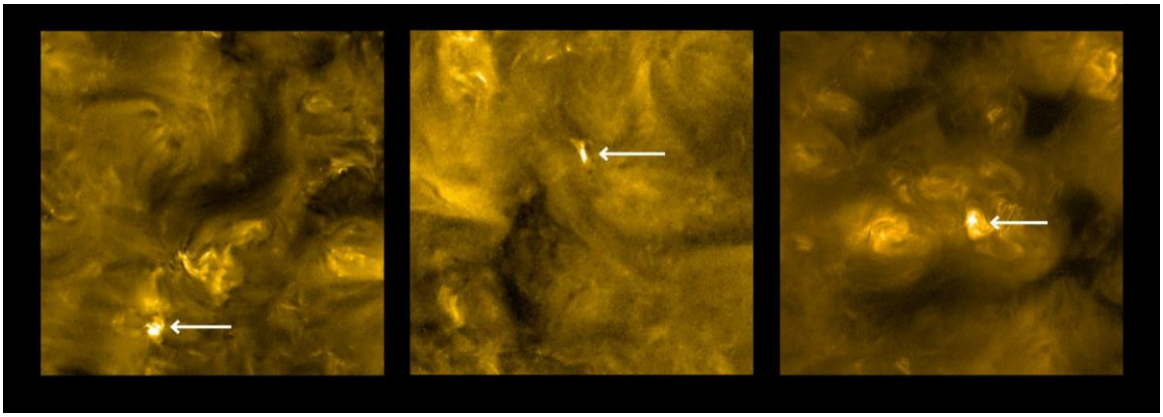
Campfires on the Sun?

By Linda Billard

Before you get out your marshmallows, take a look at the first publicly available images from the Solar Orbiter, including the closest photos ever taken of the Sun. The animation here is particularly amazing.

Solar Orbiter is an international collaboration of the European Space Agency (ESA) and NASA to study our Sun. Launched February 9, 2020, from Cape Canaveral, the spacecraft made its first close pass of the Sun in mid-June. Holly Gilbert, NASA project scientist for the mission at NASA's Goddard Space Flight Center, said, "These amazing images will help scientists piece together the Sun's atmospheric layers, which is important for understanding how it drives space weather near the Earth and throughout the solar system." Daniel Müller, ESA's Solar Orbiter project scientist, was surprised at the quality of these early images, saying, "These images show that Solar Orbiter is off to an excellent start."

In the still photos below, you can see the "campfires" described by principal investigator David Berghmans, an astrophysicist at the Royal Observatory of Belgium in Brussels. He says that these features, photographed by the Extreme Ultraviolet Imager (EUI), which is a part of the remote sensing instrument package, are "…the little nephews of solar flares, at least a million, perhaps a billion times smaller….[In] the new high-resolution EUI images, they are literally everywhere we look." The smallest are about the size of a European country, according to Berghmans.



Solar Orbiter spots “campfires” on the Sun. Locations of campfires are annotated with white arrows. Credits: Solar Orbiter/EUI Team (ESA & NASA); CSL, IAS, MPS, PMOD/WRC, ROB, UCL/MSSL.

The achievement is even more remarkable given the effects the pandemic have had on operations. Mission control at the European Space Operations Center (ESOC) in Darmstadt, Germany, shut down for more than a week. During commissioning—when each instrument is extensively tested—all but essential personnel worked from home. “The pandemic required us to perform critical operations remotely—the first time we have ever done that,” said Russell Howard, principal investigator for one of Solar Orbiter’s imagers.

However, the team adapted, even preparing for the previously unexpected encounter with comet ATLAS’s ion and dust tails on June 1 and 6, respectively. The spacecraft completed commissioning just in time for its first close solar pass on June 15. As it flew within 48 million miles of the Sun, Solar Orbiter snapped the closest pictures of the Sun to date. (Other spacecraft have come closer, but did not have Sun-facing imagers.)

Solar Orbiter carries six imaging instruments, each of which studies a different aspect of the Sun. Normally, the first images from a spacecraft simply confirm the instruments are working; scientists don’t expect new discoveries from them. However, the EUI data hint at solar features never observed in such detail.

Although it’s not yet clear what the “campfires” are or how they correspond to solar brightenings observed by other spacecraft, it’s possible they are mini-explosions known as nanoflares—tiny but ubiquitous sparks theorized to help heat the Sun’s corona to its temperature 300 times hotter than the solar surface. To know for sure, a more precise measurement of the campfires’ temperature is needed and will be provided by the Spectral Imaging of the Coronal Environment (SPICE) instrument onboard the Solar Orbiter. Output is expected in the next dataset.

So, reserve your marshmallows for another time…these campfires are likely a bit too hot! And if you want to track the current location of Solar Orbiter, visit this website.

Recent Club Events and Star Parties

By Glenn Faini and Linda Billard

Our May star party was cancelled owing to government restrictions at Caledon. The Caledon star party for June was set up as a members-only event to adhere to the Governor’s executive order and the closure of the park to public events, but even that was clouded out. The July 25 star party was again set up as a members-only event and the weather cooperated. The following is Glenn’s report:

I arrived at Caledon at 8 o'clock in case others showed up for our first Star Party since the government lockdown. Two families of pending members were there hoping to see the comet—3 adults, 8 children, and a new Newtonian telescope. The sky was surprisingly clear, and they were successful in seeing Comet NEOWISE using binoculars and capturing a few pictures. The comet had faded drastically, making it a challenge to find even with binoculars. We left at about a quarter past 10. At left is the picture taken by Amanda at the star party and what follows is her narrative about her experience:

"It's not every day that one has the opportunity to see a comet that only comes around every 7,000 years or so. When we heard about Comet NEOWISE, we definitely wanted to have the opportunity to attempt to see it. Because my husband and I missed the chance to see Halley's Comet several years ago, we didn't want to let this one pass us by.

We moved to Virginia 2 years ago, and it was one year ago that I discovered the Rappahannock Astronomy Club when one of the members set up a telescope at our American Heritage Girls Camporee at the Fredericksburg Agricultural Grounds. We purchased our first telescope and thought it would be a good time to look more closely at the club—but of course, that was in the middle of Covid. Thankfully, restrictions lifted enough for us to head out to Caledon where we met Mr. Faini, without whom we would have never found the comet.

Unfortunately, only my daughter and I were able to spy it with our binoculars, but with Mr. Faini's help, I was able to use our camera to locate the comet and got several pictures of it, which allowed the rest of my family to at least get a glimpse. Even though it may not have been the best viewing opportunity, it was exciting to be able to have that opportunity.

I'm so grateful for Mr. Faini's help, and for the existence of clubs like RAC. We're already looking forward to the next star party (at least most of us are—but you know how teenagers can be!), and I hope this will allow us to observe the glory of Creation outside of our own planet."

Focus On: The Lunar 100—Features 1 through 10

By Jerry Hubbell

(Note from the author: A version of this article was published in the May 2020 ALPO The Lunar Observer as the Focus On bi-monthly article. Part of my role as the Assistant Coordinator (Lunar Topographical Studies) is to write articles periodically on research done by ALPO contributors. To see full-size versions of the photos in this article, go to http://www.alpo-astronomy.org/gallery3/index.php/Lunar/The-Lunar-Observer/2020/tlo202005. To see the latest issue of The Lunar Observer, go to http://www.alpo-astronomy.org/gallery3/index.php/Lunar/The-Lunar-Observer/2020/tlo202007)

This is the first of 10 articles in a new series on Chuck Wood's Lunar 100 list. Chuck, the founder of the Lunar Photo of the Day (LPOD), first discussed this list of lunar features in a *Sky & Telescope* article published in 2004 and later published on the *Sky & Telescope* website. This series will run until at least January 2022. Along the way, I may also insert a few articles on other topics, so the last article may appear as late as the end of 2022. Chuck wanted this list of lunar features (L1 to L100) to be the lunar equivalent of the well-known list of Messier objects, giving lunar observers a way to progress in their study of the Moon and become lifelong observers. The list contains all the diverse features of the Moon, including mare, craters, rilles, mountains, and volcanic domes, It begins with the naked eye view of the full disk of the Moon and progresses to more difficult-to-observe features.

These articles are meant to be the basis for a lunar visual observing program but are not limited to that purpose. They can be the basis for starting your own image-based study of the Moon, which will allow you to use the Lunar Terminator Visualization Tool (LTVT), a sophisticated software program used to do topographical measurements of the lunar surface. These articles will introduce and show each of the Lunar 100 features as observed and submitted by our members through narrative descriptions, drawings, and images. Although you can use your naked eye and binoculars to start observing objects L1–L20, seeing objects L21–L80 will require use of a 3-inch (76-mm) telescope. Features at the end of the list (L81–L100) will require a 6- to 8-inch (152- to 203-mm) telescope. The best views of many of the different features may be at different phases of the Moon.

One of the best ways to help you learn the features of the Moon is by sketching the lunar surface. Springer Books publishes an excellent book, released in 2012, called *Sketching the Moon* (Handy, et al.). There are also other resources on the Internet to help you get started observing and sketching the Moon, including the ALPO's excellent *Handbook of the ALPO Training Program.*

In this article we start out easy with the first 10 features on Chuck's list. If you are a beginning lunar observer, this first article will be a great way to start learning about the features of the Moon using your naked eye and binoculars. Here is a list of the first 10 features:

Designation	Feature Name	Description/Significance
L1	The Moon	Satellite of the Earth—Full Moon
L2	Earthshine	Twice Reflected Sunlight
L3	Mare/Highland Dichotomy	Two Distinct Lunar Topography Types
L4	Appenines	Imbrium Basin Rim
L5	Copernicus	Large Complex Impact Crater
L6	Tycho	Large Rayed Crater
L7	Altai Scarp	Nectaris Basin Rim
L8	Theophilus, Cyrillus, Catharina	Three Craters Showing Different Stages of Degradation
L9	Clavius	Largest Impact Crater Lacking Basin Features
L10	Mare Crisium	Mare Contained within a Large Basin

Table 1. First 10 Lunar 100 Features

Lunar 100: Feature 1—The Moon

Figure 1. Full Moon, Michel Deconinck, Artignosc-sur-Verdon, Provence, France, 29 August 2015, 2000 UT, Colongitude 92.2°, Bresser 102/1000, double polarizing filter, magnification 25x, pastels Conté grey, black and white + blending stump on Canson paper 240gr black. Seeing 9/10, Transparency 6/6. North/Up, East/Right.

Lunar 100: Feature 2—Earthshine

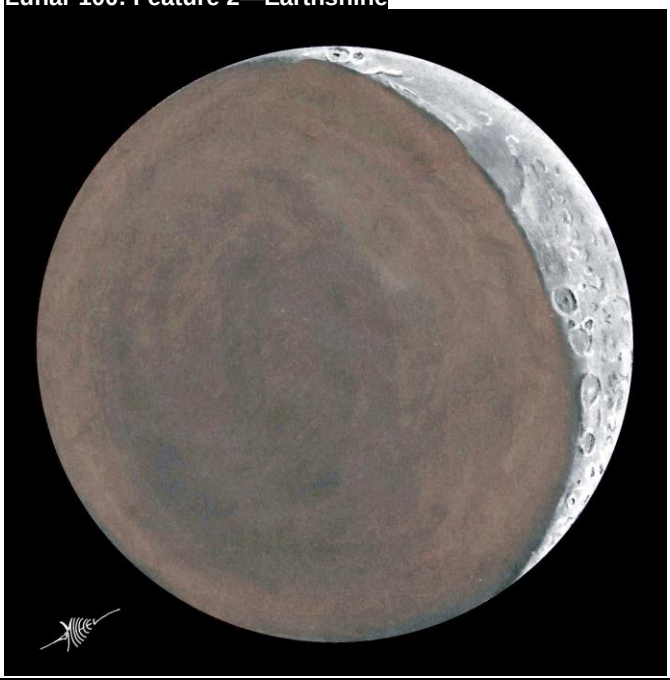


Figure 2. Earthshine, Michel Deconinck, Artignosc-sur-Verdon, Provence, France, 17 May 2018, 1930 UT, Colongitude 302.5°, Bresser 152/1200, magnification 30x, pastels Conté + blending stump on Canson paper 240gr black. Seeing 6/10, Transparency 5/6. North/Up, East/Right.

Lunar 100: Feature 3—Mare/Highland Dichotomy

Figure 3. Mare/Highland Dichotomy, Gabriel Scarponi, Montevideo, Uruguay, 12 April 2020, 0827 UT, Colongitude 141.2°, 70-mm refractor, Samsung A5 cellphone. West/Up, North/Right.

Lunar 100: Feature 4—Appenines

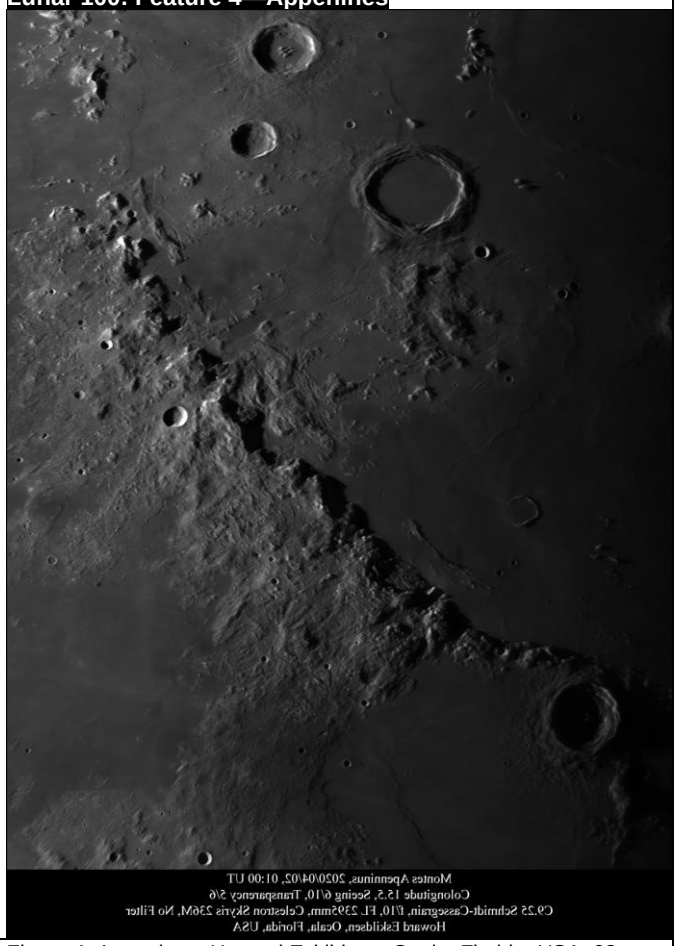


Figure 4. Appenines, Howard Eskildsen, Ocala, Florida, USA, 02 April 2020, 0100 UT, Colongitude 15.5°, C9.25 SCT f/10 FL 2395 mm, Celestron Skyris 236M. Seeing 6/10, Transparency 5/6. North/Up, East/Right.

Lunar 100: Feature 5—Copernicus

Figure 5. Copernicus, Sergio Babino, Montevideo, Uruguay, SLA-LIADA, 26 February 2018, 0037 UT, Colongitude 38.3°, 203-mm SCT, ZWO 174MM, North/Up, East/Right.

Lunar 100: Feature 6—Tycho

Figure 6. Tycho, Jerry Hubbell, Mark Slade Remote Observatory (MSRO) Wilderness, Virginia, USA. 02 February 2019, 0900 UT, Colongitude 122.2°. 165-mm APO refractor + 0.7x FRFF + Red Filter, QHY 163C camera, 100/150 frames, MaxIm DL, Registax 6, Photoshop. Seeing 6/10, Transparency 5/6. North/Up, East/Right.

Lunar 100: Feature 7—Altai Scarp Nectaris Basin

Figure 7. Altai Scarp, Francisco Alsina Cardinalli, Oro Verde, Argentina, SLA-LIADA. 29 November 2015, 0537 UT, Colongitude 122.2°. 250-mm Meade LX200 SCT, Canon EOS Digital Rebel XS camera, North/Up, East/Right.

Lunar 100: Feature 8—Theophilus, Cyrillus, Catharina

Figure 8. Theophilus, Cyrillus, Catharina, Jay Albert, Lake Worth, Florida, USA, 05 October 2019, 0103 UT. Colongitude 345.3°, 200-mm f/10 Celestron 8" NexStar Evolution SCT, 7-mm Orthoscopic eyepiece projection, iPhone 6s camera, Seeing 6/10, North/Up, East/Right.

Lunar 100: Feature 9—Clavius

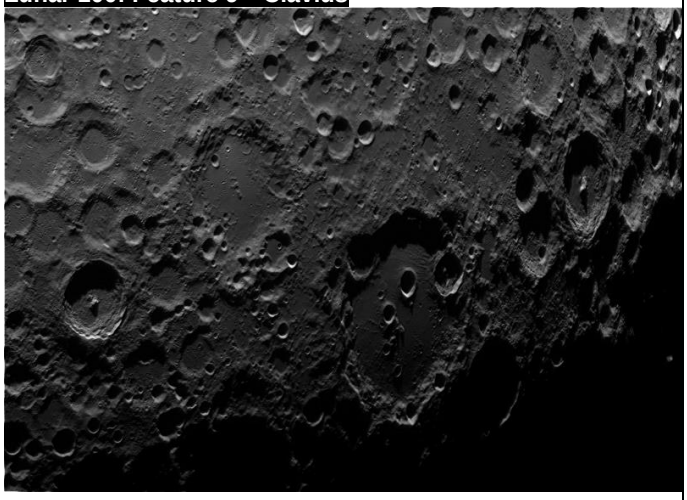


Figure 9. Clavius, Desireé Godoy, Oro Verde, Argentina, SLA-LIADA, 10 September 2016, 2315 UT. Colongitude 22.9°, 279-mm f/11 Celestron 11" Edge HD SCT, QHY5-II Camera, North/Up, East/Right.

The Lunar 100: Feature 10—Mare Crisium

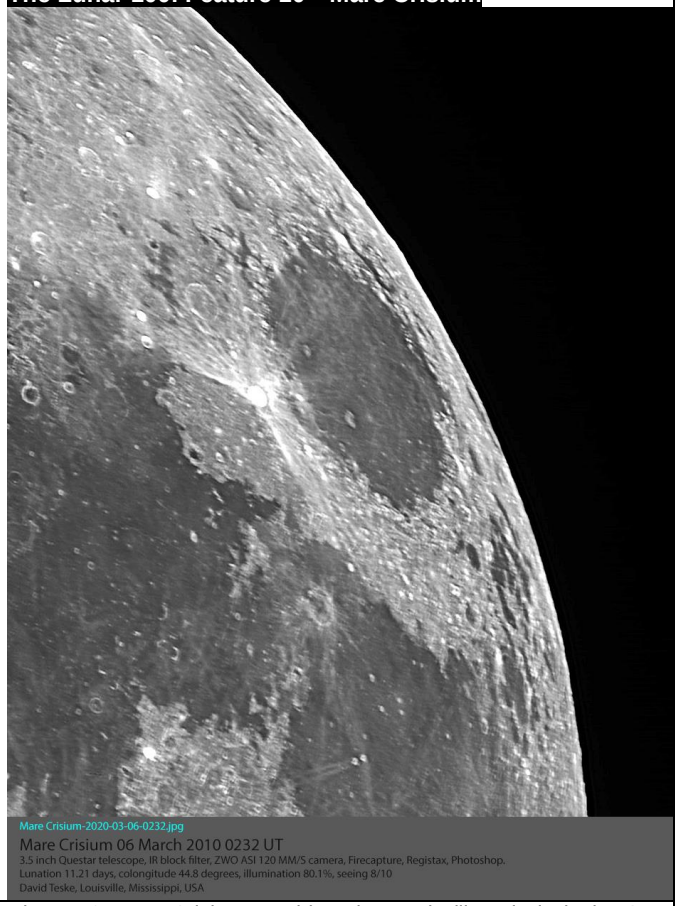


Figure 10. Mare Crisium, David Teske, Louisville, Mississippi, USA, 06 March 2010, 0232 UT. Colongitude 44.8°, 3.5-inch Questar with IR blocking filter, ZWO ASI120 MM/S camera, Firecapture, Registax, Photoshop, Seeing 8/10, North/Up, East/Right.

We had a very large response to our request for images and drawings for the first 10 features of the Lunar 100. We even had a few of the images taken with cellphone cameras—isn't technology great! I am grateful for all the submissions. We had a total of 82 images and drawings submitted from more than 20 astronomers. Well over half—51 of the 82 images—came from Alberto Anunziato's groups, SAO-SLA, and LIADA. He prefaced the 51 images he sent on behalf of his group this way:

LUNAR 100 PROGRAM Sociedad Astronómica Octante-Sociedad Lunar Argentina

> *When we found out that the next objectives of the Focus On Section would be the features listed in the Charles Wood's famous Lunar 100, the members from Sociedad Lunar Argentina (SLA) and Sociedad Astronómica Octante (SAO) of the República Oriental del Uruguay, we considered interesting to join the initiative of "The Lunar Observer" (TLO) and therefore we launched our Lunar 100 Program, under the auspices of the Lunar Section of the Liga Iberoamericana de Astronomía (LIADA). The objective is twofold. We will report the images submitted to the program to "The Lunar Observer". And we will also publish them in all the media of SLA, SAO, and LIADA. We think it is a great opportunity to stimulate amateur lunar observation and if the call is successful, we can dream of some final joint publication.*

We look forward to the images the SLA, SAO, and LIADA members share with us and hope to see everyone participate in these Focus On articles.

COMPUTER PROGRAMS

Virtual Moon Atlas, https://sourceforge.net/projects/virtualmoon/
Lunar Terminator Visualization Tool (LTVT), http://www.alpoastronomy.org/lunarupload/LTVT/ltvt_20180429-HTML.zip

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ADDITIONAL READING

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Highlights of Recent RAClub Presentations

Abstracted from Bart Billard's Meeting Minutes
NOTE: There was no presentation at the May or July meetings.

June 2020—The Future of Amateur Astronomy

Jerry Hubbell began by saying that his presentation would lay out what he thought the trends for the next 10 years were. Introducing his topic, he said that, more than ever, the amateur astronomy hobby involves people from all walks of life and from all over the world. He noted that the commercial sector's entry into the "space race" (companies such as SpaceX and Blue Origin) was driving interest in space science, spaceflight, and astronomy. It has brought a new generation of people into the space age and given a "déjà vu" moment to amateurs who remember their childhood in the 1960s and the Apollo program.

Jerry listed areas of change he anticipated over the next 10 years. The first was the definition of "Amateur Astronomer." He said the "state-of-the-art" technology affordable for today's amateurs allowed them to view objects and acquire images and data that rivalled those of professionals 20 years ago. Jerry said some amateurs were doing the cutting-edge astronomical research that was most suitable for small telescope systems (apertures up to 20 inches). They were best suited for follow-up work professionals could not afford to do. He mentioned that he preferred to drop the adjectives "amateur" and "professional" and just say "astronomer" because the difference was now less about equipment and capabilities and more about whether one got "paid to observe."

Another change in the definition of amateur astronomer has been from amateur telescope making to system integration. Jerry said that the growth of equipment and component manufacturers that cater to the commercial astronomy market meant that very few amateur astronomers had to build their own telescopes anymore.

Jerry's second area of change concerned a new wave of tech-savvy beginners. He said although there had been a tendency not to get serious about the pursuit of astronomy until later in life when disposable income was enough to afford getting started, we probably should not worry about the "graying" of the amateur astronomy hobby participants. Jerry said those new to the hobby now were often immersed in the Internet and mobile devices, and while disposable income would still be a driver, they probably would not take nearly as long to progress to high levels of skills and knowledge. Also, "Electronically Assisted Astronomy" equipment available now probably appealed to the interests of today's tech-savvy young people, whom we always want to include in our astronomy outreach efforts.

As Jerry talked about the changing equipment landscape, one of his points was the increasing sophistication of today's optical and electronic equipment which could be a hurdle for newcomers wanting to jump into astrophotography. He said, "Manufacturers have to step up their game in providing more and better documentation and training materials to use the new equipment." On the continuing impact of the Internet, and remote/virtual interaction, he anticipated remote access to equipment and small-telescope observatories would become commonplace, including commercial observatories for those who did not want to purchase their own equipment. Jerry also thought increased use of virtualization and augmentation technologies would lead to virtual star parties and observing sessions.

Jerry said he thought that pro/am collaboration would continue to increase, leading to two classes of equipment and astronomers: professionals using big-buck equipment for new celestial object discovery and amateurs using small-telescope systems for follow-up observations of newly discovered objects. He said the limits of size and sophistication of equipment accessible to amateurs would continue to drive innovation to overcome barriers confronting them. They would sometimes find ways to develop or adapt new technologies and improve capabilities of small-telescope systems. As an example, he mentioned the work he led at MSRO on adapting the use of an engineered diffuser for higher precision photometry on a small telescope.

Shannon Morgan asked whether discovery of minor planets and exoplanets was getting harder. Jerry talked about it as an opportunity for personal discovery. She indicated she was thinking of a Transiting Exoplanet Survey Satellite (TESS) Follow-up Program observation he made with Bart Billard. He said the observation was the first to identify the actual star that had the transit signal in the blend of stars detected by TESS, one that was different from the one initially thought to be the target.

Image of the Quarter

The Moon by David Abbou

Dave says: I took this photo of the Moon on Sunday evening, July 26, 2020, from my backyard in Stafford. I used my vintage (not old!) Celestron-8 telescope that I've owned since 1981, along with a Canon T7 DSLR. I used ISO 400 "film" speed and a 1/100 second exposure to capture this single shot at the telescope's prime focus. That evening, I took more than 30 photos of the Moon, but this one immediately stood out because it had the perfect balance of correct exposure time, sharpest focus, and no blurring from the camera shutter's vibration. In my opinion, it's probably the best photo of the Moon I've ever taken with my basic equipment. *[Editor's note: After I chose this picture as the Picture of the Quarter but before the newsletter was posted, we learned from member Glenn Holliday that TV station WJLA displayed this photo during its weather segment on Monday, July 27.]*