NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

JULY 2019

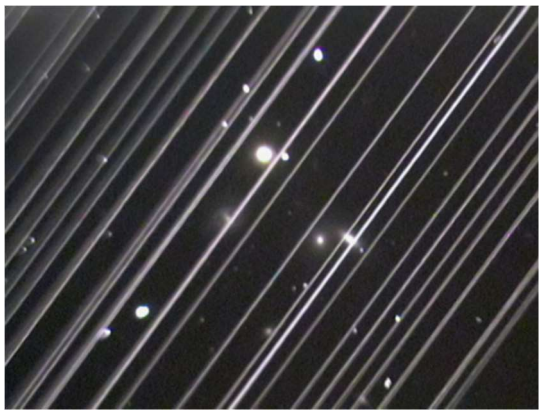
PRESIDENT'S NOTES

(Warning: this article may degrade to a rant)

It's July, time to see if your observatory is still waterproof. We amateur observers, imagers and readers have been living the good life in the golden age of modern astronomy. We have giant telescopes, extremely efficient cameras and the ability to collect data from around the world, and even above the world. We can do both art and science from our backyards. Some of us just stare in amazement. Much of our county is rural, with low light densities and dark sky. Even those of us living in one of our small towns are not more than a few minutes from a dark sky site. Recently, there has been a sort of reissuance space exploration from many different nations and private players. There are plans to go back to the Moon and to Mars (and go to stay), and maybe even go to an asteroid or two. Augmented reality could bring all these missions into our homes on the screens of our TVs, computers and, yes, phones. We could be, yep, golden.

The International Astronomical Union (IAU) is voicing concerns about the risks that SpaceX's Starlink and other planned massive satellite constellations in low Earth orbit pose to astronomy.

The diagonal lines stretching across this telescope image are reflected light from 25 of the first batch of Starlink satellites launched by SpaceX.



(Image: © 2019 Victoria Girgis/Lowell Observatory)

(This is where the rant part begins)

But ages don't last as long as they used to, and ours may be on the way out. On 23 May of this year Tony Stark's Elon Musk's SpaceX launched a clump of sixty small satellites into orbit around our planet. These are but a small subset of the planned 12,000 Starlink constellation surrounding Earth in low orbit to implement a new space-based internet communication system. During a prelaunch teleconference Musk stated, "There are already 4,900 satellites in orbit, which people notice ~0% of the time … Starlink won't be seen by anyone unless looking very carefully & will have ~0% impact on advancements in astronomy." The arrogance of the man is bottomless; he continued, "We need to move telescopes to orbit anyway. Atmospheric attenuation is terrible." The image (above) from Lowell Observatory shows the trails of just 25 of the satellites!

I single out Musk because, well, he's so full of himself (in my opinion), and he's first out of the gate, but there are other satellite mega-constellations in the works. Rings, swarms, clouds could soon be blanketing the U.S. in low Earth orbits (LEO), OneWeb, a London-based internet broadband, will initially be placing 650 satellites into orbit and possibly adding 1,972 over time. Boeing has applied to the U.S. Federal Communications Commission for a constellation numbering between 1,396 and 2,956 satellites in low Earth orbit for global internet access.

Just a quick count (12,000 SpaceX) plus (650 + 1,972 for OneWeb, to keep up with Musk) plus (and Boeing --Let's go small 1,396) comes to a debris field of some 16,018 LEO objects all to be used for wireless internet?! And this number doesn't consider the EU, China, India, and Russia keeping up with the U.S. and the UK. I started this article to describe the possible end of ground-based professional and backyard-based amateur astronomy, but I now think this may go well beyond that. We may be putting a cloud of "bullets" around Earth that could hinder space exploration as well. All for the sake of instantaneous cat and dog YouTubes and Twitter accounts.

I'm not the only one to see this as a direct and devastating threat. An article written by David Grossman, a staff writer for PopularMechanics.com., laid out the fears of professional astronomers:

> The IAU has issued a statement saying it is "concerned" about satellite constellations and what they mean for the future of astronomy. "We do not yet understand the impact of thousands of these visible satellites scattered across the night sky and despite their good intentions, these satellite constellations may threaten both" nocturnal wildlife and astronomical research, the IAU says.
>
> The risks are twofold—the satellite constellations could affect both visible and radio waves. The "surfaces of these satellites are often made of highly reflective metal, and reflections from the Sun in the hours after sunset and before sunrise make them appear as slow-moving dots in the night sky," reads the IAU press statement. "Although most of these reflections may be so faint that they are hard to pick out with the naked eye, they can be detrimental to the sensitive capabilities of large ground-based astronomical telescopes," like the Hobby–Eberly Telescope in Texas.
>
> It's more than a hypothetical. Victoria Girgis, of Lowell Observatory in Flagstaff, Arizona, told NPR about a moment when Starlink satellites moved in front of distant galaxies she was studying. "My first immediate reaction was, 'that's visually kind of cool,'" she says. "But my second reaction was, 'man you can't see a single galaxy.'"

If you are looking for a strategic thinker or voice of reason to put a check on these wild ideas, I have been as well. It was just a few years ago that the Defense Advanced Research Projects Agency (DARPA) publicized the Space Situational Awareness program and was actively recruiting amateur astronomers to help in the accusation of space junk positional and size data. Some of our membership may even have helped in the effort. DARPA's take on the subject at the time was, "space is increasingly congested and contested, with valuable satellites and various manmade and natural orbital debris all tracing paths above the Earth."

So I was surprised to read a 2018 article by Sandra Erwin: "DARPA to begin new effort to build military constellations in low Earth orbit … laying a path for the military to transition from huge satellites in geostationary earth orbit to constellations of smaller platforms in LEO has been a longtime pursuit at DARPA." The article continues to flesh out the concept of using multiple mini satellite platforms:

> DARPA last year launched the project known as Blackjack with the goal to develop a low Earth orbit constellation to provide global persistent coverage for military operations. The closing date for bids is June 6.
>
> Laying a path for the military to transition from huge satellites in geostationary Earth orbit to constellations of smaller and less expensive platforms in LEO has been a longtime pursuit at DARPA. That goal recently took on greater urgency as the military weighs replacing existing constellations that could be targeted by enemies with more resilient systems that would be easier to reconstitute if they came under electronic or kinetic attack.
>
> Global surveillance and communications would be the obvious missions for Blackjack-funded prototype constellations, but there have been talks about broadening the scope to more complex assignments such as space-based battle management. DARPA will take on the initial development and engineering work for the next three years and later could turn over prototype systems to the U.S. Air Force for further testing and possibly operational use.
>
> The basic formula will be to attach military-unique sensors and payloads to commercial satellite buses. DARPA plans to award $117.5 million in contracts over three phases to up to eight bus or payload suppliers. According to DARPA's solicitation, there will be additional contract awards down the road for autonomy hardware and software, launch services, ground systems and constellation flight operations.
>
> DARPA describes the Blackjack program as an "architecture demonstration intending to show the high military utility of global LEO constellations and mesh networks of lower size, weight, and cost spacecraft nodes." No single type or size of bus or mission payload type will be considered "optimal" for this demonstration.

Wow, so what was the reason DARPA wanted to spot space debris, to reduce it for the safety or to empty it for more commercial space? Or, maybe it was to find out what size debris was hardest to spot? And DARPA will be piggybacking military focused sensors and what else on commercial satellites? Again, wow.

I wish I had a constructive idea on what to do about this, but as of now, I don't. Will these satellites cause false readings in earth collected astronomical data? Yes, probably. Be positive, Dave. OK, maybe these satellites will eventually spread out and be small enough to not cause a problem. Maybe the designers will take reflectivity seriously and correct them. Expect to hear more about LEO mega-constellations.

Back to the normally scheduled article? Not really.

Anyway, if you get a clear night this month try to get out, look up and memorize the sky. Take a look at Jupiter and the four big moons that Galileo Galilei saw in 1610 AD and think of looking at them or anything else with 16,000 little satellites whizzing by in 2024.

Until then, get out there and stare.

At the July Meeting

The July meeting will be held on Friday, July 19 at 7p.m. in the community room of the Student Union Building, at Cochise College, Sierra Vista campus.

Our speaker will be HAC member Harold Satterler and his talk will be on the history of astronomy. Harold joined HAC in April coming to us from Dallas Texas. His presentation is a compressed version of one he delivered to audiences around Dallas.

He tells us this about himself:

"An avid Star Trek and Star Wars fan and many other Star based shows. That interest transferred over to another hobby, plastic modeling of cars planes and Sci-Fi. He watched with great interest when our astronauts went to the moon.

He bought his first telescope in 2000, an 8-inch reflector, in which he was disappointed in the quality of it because Mars appeared in it as an orange, no detail sphere. Then was relieved to read in Sky and Telescope about the global dust storm that summer that obscured the view.

Becoming a member of the Texas Astronomical Society he joined the Public Observing program doing public viewings and presentations for local schools and libraries, and planetariums at the Dallas County Community College District and University of Texas at Arlington."

HAC 2020 Schedule

HAC meetings for 2020 will be scheduled on the Friday closest to the full moon with just a few deviations to avoid holidays. Most of the meetings will be in the community room at Cochise College, but as usual, some will at other venues due to availability. Here are the HAC meeting dates for 2020:

- Jan 10 (Community Room
- Feb 7 (Patterson Observatory)
- Mar 6 (Library commons)
- Apr 10 (Library commons)
- May 8 (Community Room)
- Jun 5 (Community Room)
- Jul 10 (Community Room)
- Aug 7 (Community Room)
- Sep 4 (Location TBD)
- Oct 2 (Community Room)
- Nov 6 (Community Room)
- Dec 4 (Community Room : may be superseded by a holiday party)

Patterson Observatory Public Nights are scheduled on the Thursday closest to first quarter moon. Here are the dates for 2020:

- Jan 2 Sunset 5:35 (6 PM start) 44% moon
- Jan 30 Sunset 5:59 (6:30 start) 27% moon
- Feb 27 Sunset 6:23 (7 PM start) 14% moon
- Apr 2 Sunset 6:47 (7:30 start) 61% moon
- Apr 30 Sunset 7:06 (7:30 start) 46% moon
- May 28 Sunset 7:25 (8 PM start) 32% moon
- Jun 25 Sunset 7:36 (8 PM start) 19% moon
- Sep 24 Sunset 6:20 (7 PM start) 55% moon
- Oct 22 Sunset 5:46 (6:30 start) 39% moon
- Nov 19 Sunset 5:26 (6PM start) 24% moon
- Dec 17 Sunset 5:26 (6 PM Start) 11% moon

Herschel Object Project Update

By Ted Forte

Here is an update on my Herschel object visual observing project (which is itself a subset of an NGC observing project).

William Herschel published three catalogs of 1,000, 1,000, and 500 objects. Several of those objects were duplicates (objects WH "discovered" more than once), non-existent (objects that have not been found by modern observers either because they were stars misconstrued for nebulae or are unidentified due to positional or transcription errors) or objects that don't belong to Herschel having been discovered earlier by other observers.

After the list of 2,500 objects is reduced by the above list of discrepancies, it can then be partially re-populated by objects revealed though the extensive research of astronomical historians like Wolfgang Steinicke, Harold Corwin, Steve Gottlieb and several others. Many of the "non-existent" objects have been matched to existing nebulae or galaxies by careful and logical application of likely corrections to positional errors. These often are revealed by systemic errors made on a particular date or sweep. Occasionally, an object matches Herschel's description well enough that a clerical error, such as a reversal of direction, an error in arithmetic during reduction, or reference to the wrong star, can be assumed to be the culprit. In some cases, double or multiple stars at the position of missing objects are assumed to be what Herschel saw and classified as nebulous.

Finally, researcher's detailed study of Herschel's observing logs have revealed his likely primacy for several objects that were not included in Herschel's catalogs. These were later

attributed to other observers/surveys that published their positions but might rightly be considered as WH's discoveries. Many of these do not have NGC numbers.

There are several ambiguities, of course, and so any observer that decides to observe all of the objects Sir William discovered has to make some choices as to what to include or require. Evidence the fact that the Astronomical League's Herschel Society's list of the "Herschel 2500" contains just 2,381 discrete objects. My current list of Herschel objects contains 2,512 objects.

Having recently logged my 2500th Herschel object, I am down to a dozen objects left to attempt. A few of these are known to be just stars or asterisms but several are galaxies that I just haven't gotten around to observing yet. None of them are universally acknowledged as Herschel objects, but experts like Dr. Steinike have made compelling arguments for including them and so they are on my list. My list also contains a few objects that Herschel independently discovered (but wasn't first to discover).

Observing all of the Herschels is a relatively new goal for me. Like many of you, I completed the "Herschel 400" and the "Herschel II" programs and was content with those accomplishments. After moving to Arizona and with the purchase of my 30-inch Dobsonian, I decided on a project to observe all of the NGC/IC that I can reasonably expect to see from my home observatory. While my selection criteria are not hard and fast, I generally include any object brighter than 16.5 magnitude that rises about 15 degrees or so above my horizon. That puts my potential target list at little over 9,000 objects. But I have been concentrating on the NGC – observing IC objects only when they fall in or near my field of view.

When an email correspondent of mine shared his "corrected" list of the Herschel 2500 in 2017, I became curious as to how many of the Herschel discoveries I had observed. In trying to correlate his list to my logs I discovered several discrepancies in his list. My first inclination was just to try to correct that list, but that morphed into an effort to observe the objects as well. Nearly all of the recognized Herschel objects are in the NGC anyway so it was just a matter of prioritizing my NGC list to concentrate on observing the Herschel objects first. I corrected the list as best I could by checking every object with any sort of discrepancy against the data provided on the websites of Corwin, Gottlieb, and Steinicke.

Once I saw that the Astronomical League had a project for observing the Herschel 2500, I downloaded that list and started to cross check. I found a few duplicates and a few actually non-existent items on that list and over a few weeks and through a dozen or so emails, I helped Cliff Mygatt correct and improve the A.L's list.

I completed all of the objects included in the A.L. list in March of this year, and observed my 2,500th Herschel object on July 4. In as much as my first Herschel object was logged on February 3, 1992, I can say this has been a 27-year project.

Those Herschel objects constitute half of my NGC progress (I've logged 4,957 NGC objects so far – 80% of the 6,175 NGC targets I've selected).

I am happy to share my database (an Excel spreadsheet) of the Herschel 2500. It's an xlsx file so let me know if you need me to convert it to xls before sending it. It's large but not huge (685 kb as an xlsx) It is as correct as I can make it and I will send it to anyone that asks for it. It includes notes on the Herschel objects listed in the RNGC as "non-existent" and reproduces Steinicke's list of "additional" Herschels and a compilation of stars confused for nebulous objects from Steinicke's "Historic_WH" along with other notes and data. The A.L.'s Herschel 2500 list is also reproduced with extra data.

The spreadsheet is a work in progress and is refined when new data or errors are discovered. Please let me know of any discrepancies you encounter.

Two Events at Patterson Observatory

By Ted Forte

We hosted 49 kids (and about 7 adults) on Friday, June 28 and another 54 kids (and 7 adults) on Monday, July 1. Both groups were from the "Kid's World" summer program hosted by the City of Sierra Vista. The field trips were funded by the University South Foundation who paid the transportation costs and provided snacks and a pizza lunch. During their campus visit, the groups are split between the observatory and the Discovery Gardens so we have half of them at a time. After lunch, the UA Cooperative Extension takes them for another hour-long activity that features presentations from SNAP Ed and Water Wise. There is usually a mini petting zoo from 4-H as well.

Nancy Hannaford, David Roemer, Ken Duncan and I were at both events. Harold Satterler helped on Friday and on Monday we had Stacy and Fred Chitwood and Rick Burke join us. The kids got to view the sun (between the clouds) on both days and learned a lot about solar phenomena. Nancy uses both the Night Sky Network "Our Magnetic Sun" kit and her own materials gleaned from online sources to introduce the kids to solar science and prepare them for what they'll see in the telescope. In the classroom, the kids made "pocket Solar Systems" from an activity kit provided as part of the NISE Network "Explore Science" materials we received earlier this year. I got to share the meteorite kit provided by the Planetary Science Institute as well.

All of our members found ways to engage the students while they were at the observatory. We couldn't offer these programs without our volunteers – they are greatly

appreciated. An activity evaluation filled out by the Kid's World facilitator noted our members patience, enthusiasm, and knowledge in working with the kids.

We can always use more volunteers - all you have to do to participate is to show up. Outreach is both fun and fulfilling. It might also be one of the most important and valuable things we can do as amateur astronomers. You never know who you might inspire. It's also one of the fastest ways to learn about the science behind our hobby- learning from each other is a natural consequence of participation in these events.

We have a break now from outreach while the monsoon clouds take over the sky, but no doubt, we'll be back in full swing come September. Hope to see some new faces at some of these events come the fall. If you have any questions about upcoming events, don't hesitate to ask.

NASA Night Sky Notes July 2019

This article is distributed by NASA Night Sky Network

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 **Moon** prominently passes Saturn mid-month, just in time for the 50th anniversary of **Apollo 11**!

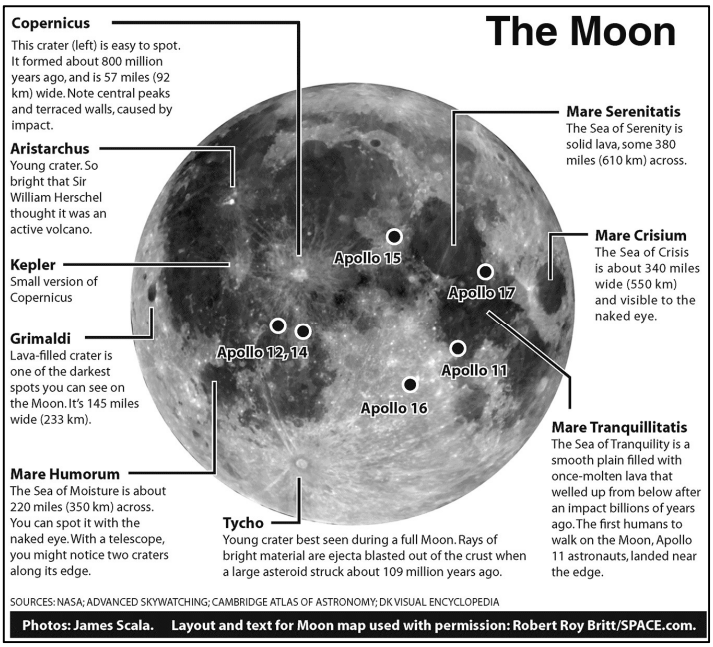
Saturn is in opposition on July 9, rising in the east as the Sun sets in the west. It is visible all night, hovering right above the teapot of Sagittarius. Saturn is not nearly as bright as Jupiter, next door in Scorpius, but both giant planets are easily the brightest objects in their constellations, 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 21, 1969, 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 rangefinder, and seismometer and gathered up 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 nasa.gov



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

Pictures from HAC Members

M8 Lagoon Nebula by David Roemer

NGC 1491 by Glenn Sanner

NGC 4005 Galaxy Group by Glen Sanner

NGC 4005 Galaxy Group Labeled by Glen Sanner

Want Ads

FOR SALE: A nearly unused ZWO 1600 with CFW and filters, and an ASA 12" Astrograph

Contact Max Mirot

FOR SALE: Nikon camera gear and lenses

Nikon D750 w/24-120 lens, five batteries, stock charger, Nikon mc-dc-2 remote cable release, box, manual, lens and body caps $1500
Nikon 80-400 zoom, lens caps, soft case $1275
Nikon 70-200 f/4, lens caps $900
Nikon 50mm f/1.8 G, 85mm f/1.8 G, lens caps $385 set
Tamron 15-30, lens caps, $775
Nikon D7200, Nikon 18-140 lens, Nikon 18-300 lens, Nikon mc-dc-2 cable release, two batteries, stock charger, manual, $1100 as a set

Contact Mike J. Shade at mshade@q.com

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President: David Roemer
Vice President: Bill Howard
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Howard Day | Ken Duncan | Gary Grue | Ken Kirchner

***Nightfall* Editor:** Cindy Lund cindy.jean.lund@gmail.com
Webmaster: Ken Kirchner
Facebook Editors: Bert Kelher

Website: http://www.hacastronomy.org
Facebook: http://www.facebook.com/HuachucaAstronomyClub
Email: info@hacastronomy.org

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HAC July/ August Calendar of Events

SU	MO	TU	WE	TH	FR	SA
30	1 Jul Kids world at Patterson	2 0:16 AM	3	4 	5	6
7	8	9 12:16 PM Saturn opposition	10	11	12	13 Jupiter 2° from moon
14 Pluto Opposition	15	16 2:38 PM Saturn/Moon	17	18	19 HAC Meeting Student Union	20  50th Anniversary
21	22	23	24 6:18 PM	25	26	27
28	29 Delta Aquariids	30 Delta Aquariid	31 8:12 PM Delta Aquariids	1 Aug	2	3
4	5	6	7 10:31 AM	8	9 Jupiter 2° from moon Mercury western elongation	10
11	12 Saturn/moon Perseid Meteors	13 Perseid Meteors	14 Perseid Meteors	15 5:29 AM	16 **HAC Meeting** **Library** **Commons**	17
18	19	20	21	22	23 7:56 AM	24
25	26	27	28	29	30 3:37 AM	

All event times MST. Join **HacAstro** to keep up to date with all of the Huachuca Astronomy Club events
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