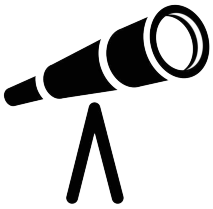
Rochester Skies

A publication of the Rochester Astronomy Club

Rochester, MN | 43.9°N 92.49°W Elev: 1316' | Issue #27 July 2018

RAC Public Sky Outreach



Under the diligent work from member **Josef Chlachula**, and others lending their support, the ***RAC* Public Sky Outreach** gathers once a month on a Friday around the first quarter Moon. With the sky not entirely dominated by the reflected sunlight off the Moon, the public can witness, through a telescope, the details of craters or incredible views of brighter planets, even under light polluted skies. In a few cases, for the very first time.

If you wish to help the Outreach Committee, please contact **Josef Chlachula.** Support hands-on astronomy education in our community; bring your telescope and enthusiasm. The next two meetings will be at the Watson Soccer field on **July 20th** (9:30 pm to 11:30 pm) and **August 17th** (9:00 pm to 11:00 pm).

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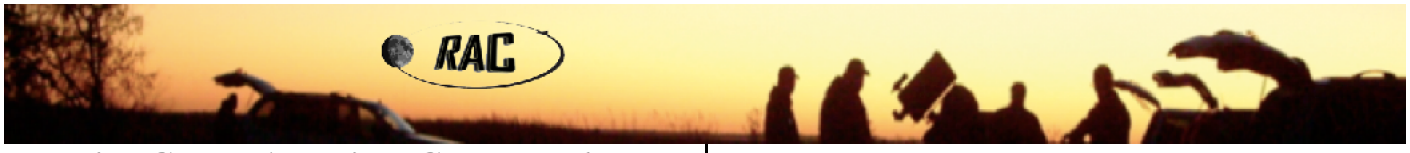
doorastronomy

okie-tex

Heart of America

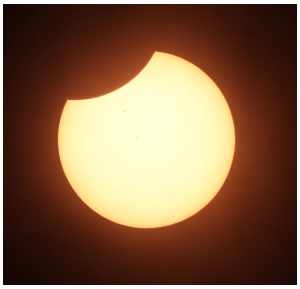
For more events, goto page 11.

Highlights RAC



The Great America Get Together: 21 August 2017

One year ago millions witnessed the spectacular event, dubbed the 'Great American Eclipse,' that spanned the entire contiguous United States. Not since 8 June 1918 has a similar event had taken place, though the last total eclipse in the United State was 26 February 1979. Yaquina Head Lighthouse in Newport, Oregon, was the first location on the continental US soil to see totality. The partial phase of the eclipse started there at 9:04 a.m. PDT and totality occurred at 10:15 a.m. As the lunar shadow traversed the landscape, southeast of Carbondale, Illinois, the greatest time of totality observed was 2 minutes and 41 seconds. The total eclipse ended near Charleston, South Carolina, at 2:48 p.m. EDT. From there the lunar shadow left the United States at 4:09 EDT. This much anticipated astronomical event was the most watched, most photographed and most televised in a generation. The path of totality crossed 14 states in 90 minutes in a narrow 70 mile width corridor.



One of many scientific discoveries (our ***RAC*** member, Dr. Jack Wiltsie, will be presenting a future talk about experiments performed during the August 17th eclipse) came from MIT's Haystack Observatory and the University of Tromsø in Norway confirming the existence of ionospheric bow waves (watch here). These new gravity waves had been predicted for more than 40 years to exist in the wake of an eclipse passage. Past attempts had very limited spatial coverage of the observations produced inconclusive results. The Great American Eclipse of 2017 provided unprecedented spatial coverage to view unambiguously the complete wave structures.

> "The eclipse shadow has a supersonic motion which [generates] atmospheric bow waves, similar to a fast-moving river boat, with waves starting in the lower atmosphere and propagating into the ionosphere," the description by MIT's researcher Shun-Rong Zhang and his colleagues states.
>
> "Eclipse passage generated clear ionospheric bow waves in electron content disturbances emanating from totality primarily over central/eastern United States. Study of wave characteristics reveals complex interconnections between the sun, moon, and Earth's neutral atmosphere and ionosphere."

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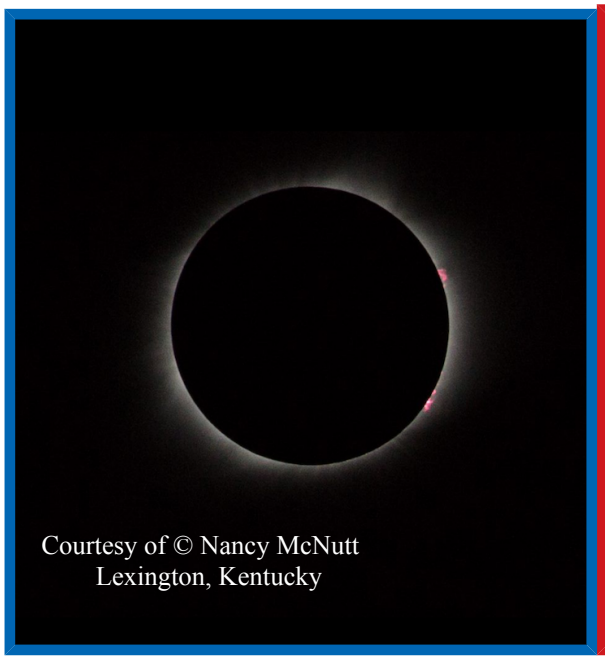
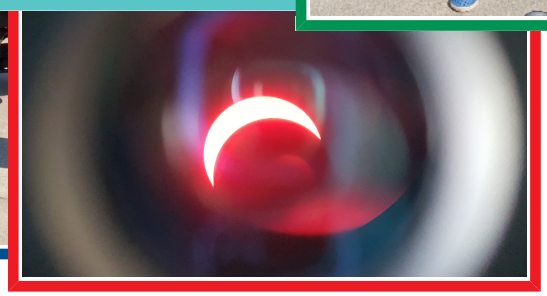


Courtesy of © Nancy McNutt
Lexington, Kentucky

Courtesy of © Bill Davidson
Crestwood, Missouri

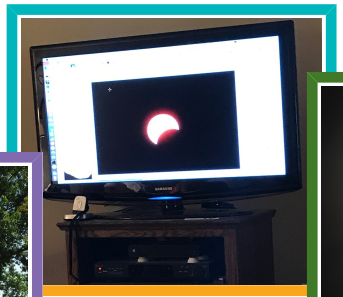
continuation of The Great American Get Together

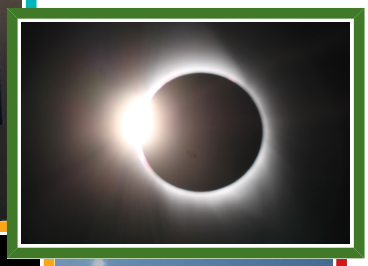
Many ***RAC*** members traveled to Wyoming, Nebraska, and even to Crestwood, Missouri, southwest of St. Louis. Member **Kirk Severson** took his family and telescope to Silver Lake Park, in Rochester, to provide public viewing of the partial eclipse.

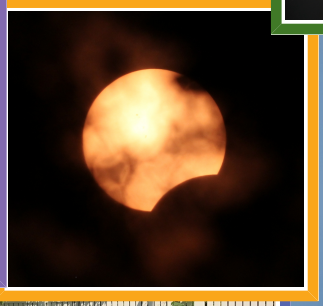


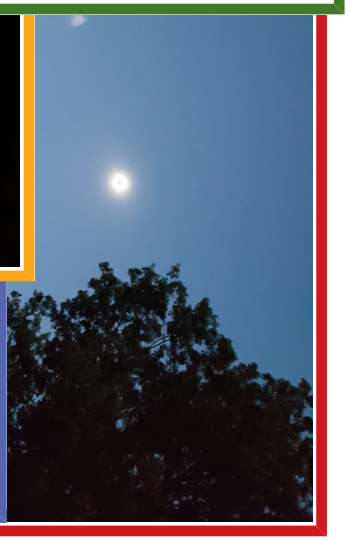
Photos curiosity of Kirk Severson (above) and Bill Davidson (below)

Member **Bill Davidson** positioned himself just within the narrow corridor in Crestwood, Missouri, providing family indoor coverage of the partial eclipse in the sweltering St. Louis heat and humidity through his set-up, while automatically photographing totality as he and his family watched the incredible event unfold outside in the elements, including witnessing and explaining what **shadow bands** (click here) were as they creepily appeared on darkening surfaces.



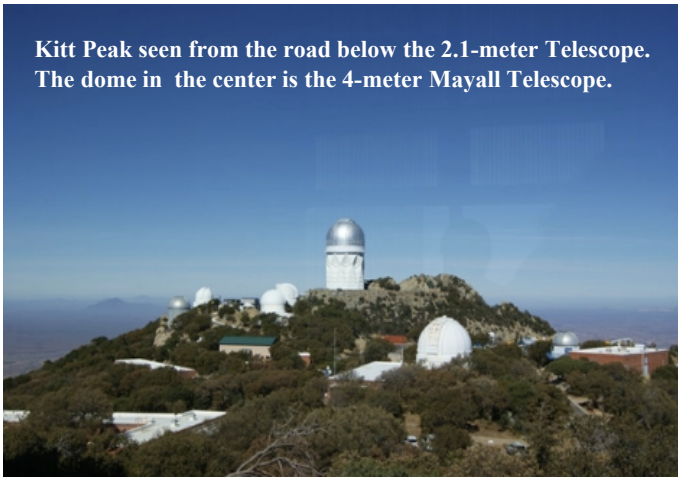






High Adventure at Kitt Peak National Observatory

John Attewell



Kitt Peak seen from the road below the 2.1-meter Telescope. The dome in the center is the 4-meter Mayall Telescope.

One of the highlights of my winter was a day-trip to Kitt Peak National Observatory. Kitt Peak is located within the picturesque Tohono O'odham Indian Nation in southern Arizona. The one-hour drive from Tucson was easy and relaxing. We cruised over the flat floor of the Sonoran Desert among creosote bushes and mesquite trees under a crystalline blue sky.

The desert is about 3,300 feet above sea level and it is punctuated by towering granite uplifts that rise above the landscape another two to three thousand feet more. Kitt Peak is at 6,875 feet above sea level. The drive from the base to the top is along a meandering switchback road that is, remarkably, in excellent condition. In fact, we met several semi-trucks traveling in the opposite direction but had not the slightest problem navigating the road with them.

During the early twentieth century a half dozen American observatories dominated astronomical research. All but one was a private enterprise. The National Science Foundation was created in 1950. It granted the first astronomical research funds in 1952. In that same year, a proposal was prepared to search for a suitable location for a new astronomical observatory that could be used jointly by the Universities of Arizona, Indiana, and Ohio State. After the funds were granted a nationwide search was conducted for a site. At the time, Dr. Robert McMath was the President of the American Astronomical Society and he became the head of the project to find a site. He organized and hired other astronomers. The tale is told that the first US rockets were launched from White Sands, New Mexico and the photographs that those rockets took of the earth's surface from that high altitude helped in the initial search for a site. Once they had some likely targets they paid pilots to fly over the mountains and observe them. Among others, Kitt Peak and an adjacent mountain, Baboquivari, further scrutinized. One of the were elevations selected to be young astronomers, Helmut Abt, owned a Jeep and, on that basis, he was selected to mount an expedition to explore and survey Kitt Peak.

These two mountains are on the Tohono O'odham Indian Nation and Baboquivari is a sacred site to them. Of the two, Kitt Peak proved to be the most suitable for astronomical observations. However, the Tohono Indians originally denied access. But the astronomers took tribal leaders to another telescope to show them what their work entailed. The Indians were impressed and called the astronomers "those with long eyes." The project got permission to lease the mountain in perpetuity but only for astronomical purposes. The Indians also wanted jobs. They wanted to be allowed to have a gift shop located at the observatory site. The Tohono Indians operate a really nice gift shop that sells all sorts of astronomy related material as well as Indian crafts. I bought a pair of high quality binoculars and a laminated sky map of Messier objects that I use almost daily.

Today, Kitt Peak has the largest collection of astronomical instruments

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The Mayall Observatory houses the 4-meter telescope.

in the northern hemisphere. There is a diverse collection of 26 telescopes. Twenty-four of these telescopes (2 radio and 22 optical) are still working on cutting edge astronomical research. Books have been filled with all the wonderful discoveries that have been made by these instruments but I would like to tell you about my experience of visiting two of them. The first thing you should know about Kitt Peak is that, even though serious research work is being conducted, they are very receptive and prepared for tourists. Most of the "campus" is handicap accessible but it does require some effort to move from building to building and some viewing areas can only be accessed by fit individuals. There is food and drinks available but the selection is very limited so a picnic lunch is advised. There is a very nice central visitors center where docents gather visitors before conducting tours of various instruments. Most of the docents are retired engineers or science teachers and they are very knowledgeable about the telescopes and really enjoy giving tours. There are three different tours per day with the first beginning at 10 am. There is a nominal fee for each tour. We didn't arrive in time for the first tour but the second and third were superb. Let me tell you about them.

The first tour was of the "2.1-meter telescope." The National Science Foundation started building this telescope in 1962. It saw first light in 1964. This telescope was the second largest in the world (82.7") for 40 years (the 200" Hale telescope on Mount Palomar was the biggest). The Hubble telescope is 2.4 meters (94.8"). This instrument has made important discoveries of the first gravitational lens, the first pulsating white dwarf, intergalactic neutral hydrogen gas clouds using Lyman-alpha electron transition spectroscopy, the study of binary stars, and has also made images of planetary nebula.

If you look closely at the photo you will see that the yolk is actually an equatorial mounting. It is made by a company that makes bridges. The 2.1-meter mirror was ground at the "Mirror Lab" at the University of Arizona, which is in nearby Tucson. The "Mirror Lab" creates the largest mirrors made in the US. The biggest are at 8.4 meters! The reason they can't be made any larger is because the grinding lab is beneath the sports stadium and the girders surrounding the exit doors are 8.4 meters wide. The "first surface" of giant mirrors are usually aluminum and these mirrors must be re-aluminized every 3 to 4 years. When the 2.1 meter mirror was transported to Kitt Peak the moving truck traveled at 3 miles an hour with the mirror lying flat on the truck. Upon reaching the base of the mountain it was then propped-up at an angle to make its ascent.

Kent Ford used the 2.1-meter telescope at Kitt Peak (and other instruments at Flagstaff) to measure star speeds within galaxies. He worked with Vera Rubin, who used his advanced spectrometer in her studies of space and matter which led to the theory of dark matter. At the time this research was called the "backwater of astronomy."

The 2.1-meter is now used by Caltech and it's been outfitted with adaptive optics. It has 140 deflection points on the mirror that can vibrate at 1200 times per second. The adaptive optics generate an artificial star with an ultraviolet laser in a pulse to the altitude of six miles. Ultraviolet light doesn't interfere with aircraft pilots but the Air Force needs to know because some foreign satellites don't like it.

It is always warm during the day but, at night, the ambient temperature is usually about 40°. The thermal time constant of this telescope is high because the mirror is solid and not honeycombed like newer mirrors. To begin observations, the glass must have a temperature within 2° of the air to eliminate diffraction. The docent told us the astronomers use Orvis horse shampoo, deionized water, and special towels to clean the optical surfaces of this telescope. The bigger mirrors at Kitt Peak use frozen carbon dioxide as a cleaning "solvent."

2.1-Meter Telescope at Kitt Peak, Arizona

John Attewell's **High-Adventures at Kitt Peak National Observatory** will continue in the next issue of ***RochesterSki*** .

Welcome to the Rochester Astronomy Club

Please check out our calender of public Night Sky Viewing Events.
All are welcome!

The ***RAC*** has a new look on the internet, thanks to member **John Martin** and others working with him. John commented in an email, dated 16 Jun 2018, that the previous website is still available and has moved to the following location: http://site1.rochesterskies.org/

He, also, stated that The Club Forum remains unchanged and it still is available at the following URL or from the FORUM link on the right portion of the header on the new website.

http://www.rochesterskies.org/forums/

John wishes the ***RAC*** membership to continue sending him emails at

jjm8bit@gmail.com

if you have suggestions or noticed anything not working.

Additional functionality will be coming in the next few months. Look for updates via email and at the ***RAC*** meetings.

Left: **John Attewell, Kirk Severson, Josef Chlachula, Bob Fealey, Randy Hemann, Bill Davidson and Dean Johnson.**

NCRAL 2018 Conference in Sturgeon Bay, WI

The *RAC* is one of 42 organizations that are members of the *North Central Region of the Astronomical League* (NCRAL) encompassing 6½ states: North and South Dakota, Minnesota, Iowa, Upper Peninsula of Michigan and Illinois. There are 10 regions of the Astronomical League covering all the United States (including Hawaii and Alaska). Most years the ***NCRAL*** holds a regional conference in the April/May time frame (***RAC*** has hosted two conferences: 2013 "Believing is Seeing" and 2017 "Astronomical Observing") providing a gathering of amateur astronomers with speakers on topics of interests. If you haven't participated in one of these conferences, I encourage you to do so. The next conference is May 3-4, 2019, in Moline, Illinois (find information on the first page).

The ***RAC*** was well represented at the conference with 7 members attending. This year's theme was "Dark Skies for Bright Stars," focusing primarily on the problem and some solutions to light polluted skies. The event was hosted by the **Door Peninsula Astronomical Society** with nearly 70 registrants and guests in attendance. The event, also, celebrated the recent designation of nearby Newport State Park as an **International Dark Sky Site**, the first in Wisconsin and only the 13th in the entire United States, 49th in the entire world. For more information select *Newport State Park, Wisconsin*.

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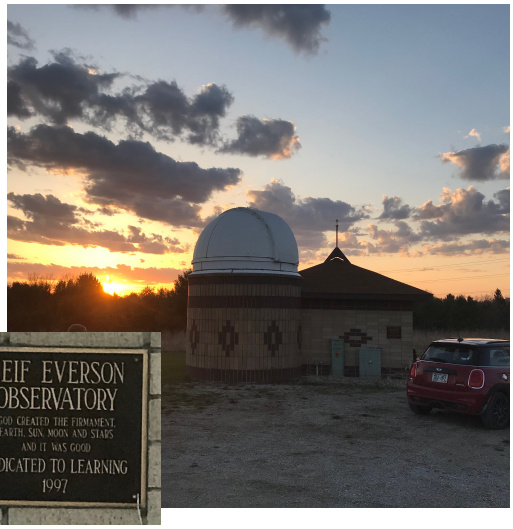
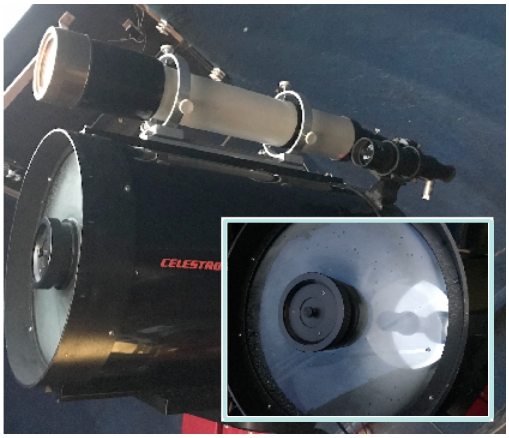
NCRAL 2018 continues



Friday evening (May 4th) began with a welcome from the president of the Door Peninsula Astronomical Society, Gary Henkelmann, and afterwards most of the participants traveled about a mile away to the DPAS Leif Everson Observatory. This observatory houses a 14" Schmidt-Cassegrain telescope that is equip with live video streaming and ability to do deep space photography from a main control room. Due to a rare blizzard that brought high winds and more than 30 inches of snow on April 15th the observatory fell victim to the storm as snow had been blown into the enclosure and coated several inches of snow on all equipment. Unfortunately, the 14" SCT had snow inside its body (which melted) making it useless as water dripped out from the bottom the SCT's casing. Not discouraged members brought out their telescopes and binoculars for viewing at the Star Garden that had binocular mounts cemented into the ground. The night sky was very dark, clear and steady. The weather was cool enough to keep the flying pests away. One individual from Lexington, KY, joined the conference since he resides in Door County temporarily during the year, set-up an Orion 8" f/4 Newtonian Astrograph Reflector Telescope and through an ZWO camera was live stacking images of galaxies like the Whirlpool Galaxy.



Saturday (May 5th) was food, speakers, judging photographs and poetry submissions, and a lot of camaraderie. The day speakers were:

BETH BARTOLI, who is the ranger at Newport State Park, gave an interesting program about the long process of getting the Dark Sky designation for Newport.

TYLER LINDER spoke about his job as a NASA contractor who operates a group of telescopes in Chile to conduct astrometric measurements of near Earth asteroids. He does his work from the basement of his home in central Illinois.

AUDREY FISCHER, lifelong advocate for dark skies, talked about her efforts to curb light pollution, but especially in the Chicago area where she lives.

KATE MEREDITH gave an interesting program about her job as Education Director at Yerkes Observatory and her interest in helping special needs students especially those with low vision.

The keynote speaker was **KEVIN POE**, the Dark Ranger, who worked many years as a park ranger giving tours of the night sky to visitors at Bryce Canyon National Park in Utah. He built his Dark Ranger Observatory near Bryce Canyon and conducts stargazing programs year-round in one of the darkest sites in North America.

ADD YOUR EMAIL ADDRESS TO THE NCRAL MEMBER DATABASE

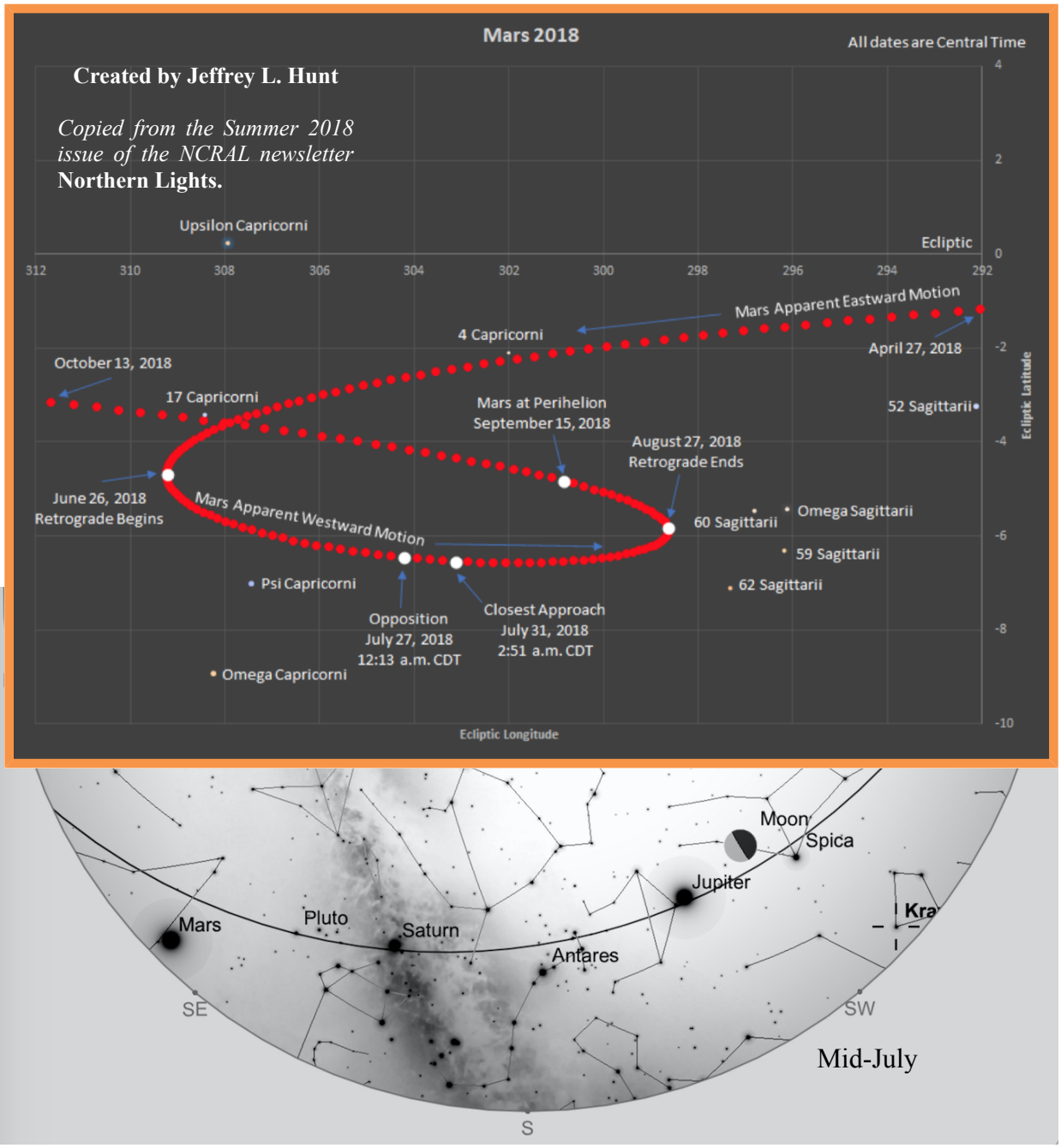
Add your email address to the NCRAL member database so you can get direct mailings of ***Northern Lights***, the NCRAL newsletter, and important and timely announcements about Regional conventions, star parties, and so forth. Your email address will never be shared with or sold to outside entities. Only blind addressing (Bcc:) will ever be used with this email list so that others will not see your email address.

Sign-up takes only about a minute. You'll need to provide your name, email address, astronomy club affiliation (or indicate at-large membership) and let us know if you hold specific positions within your club. Go to the following case-sensitive URL to add your information to our database: https://goo.gl/gsS8SF

Mars 2018

Mars makes its closet approach to Earth since 2003, when it was 0.373 A.U. away. This month Mars will be in a perihelion opposition, when Mars' opposition is near its perihelion. Mars will be at its closet at 0.386 A.U. on July 31st at 2:51 am CDT, in the constellation of Capricorn. The Red Planet will have an apparent magnitude of -2.8 and a diameter of 20º.1 arcsecs, this is about 1/100th the apparent size of the full Moon.

After opposition, Mars fades quickly in brightness and apparent size. By years end it will only appear as a "bright" star. The next opposition will occur October 13, 2020, when it will be 0.418 A.U. from Earth and appear in the constellation Pisces. On that date Mars' apparent magnitude will be -2.6 with apparent size of 22º.4 arcsecs.

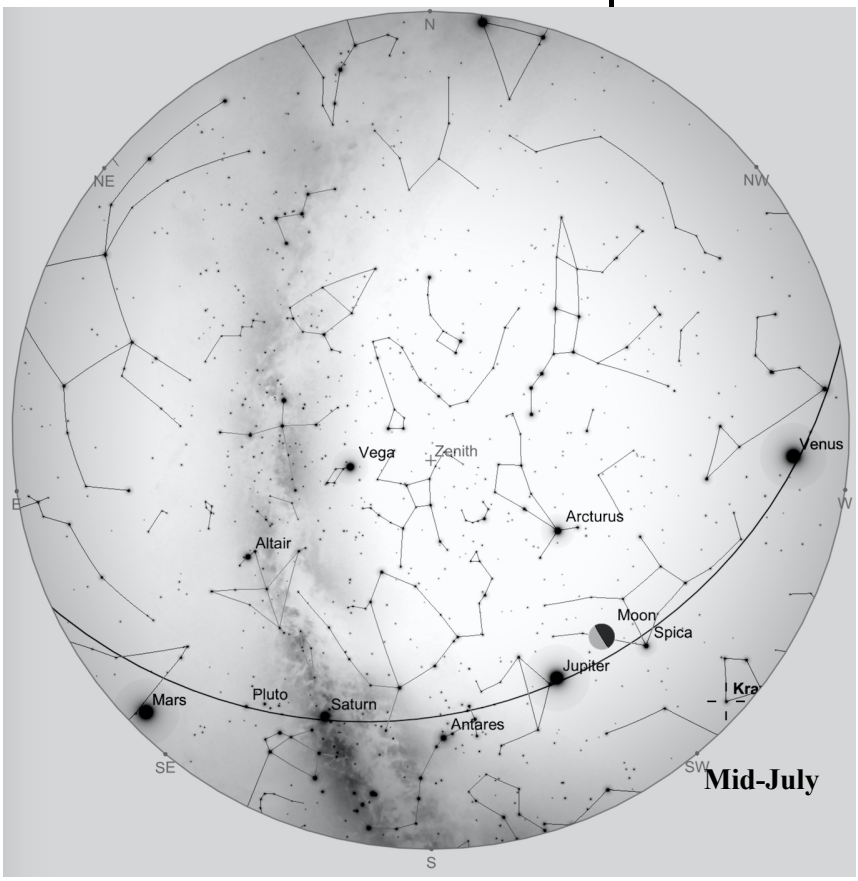


July 2018 Sky Events

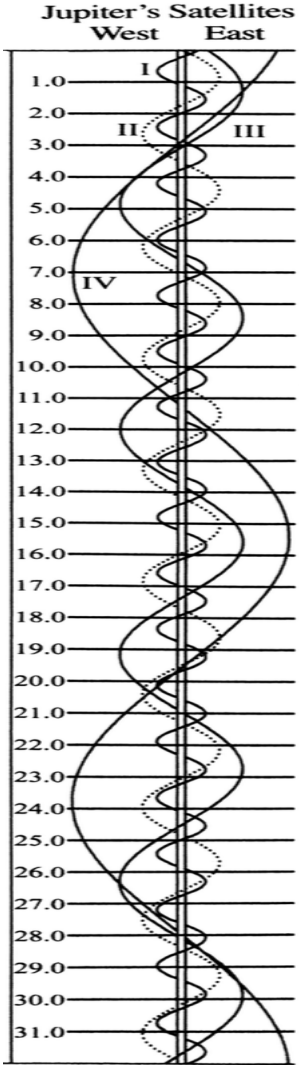
all times in 24-hour Central Daylight Time

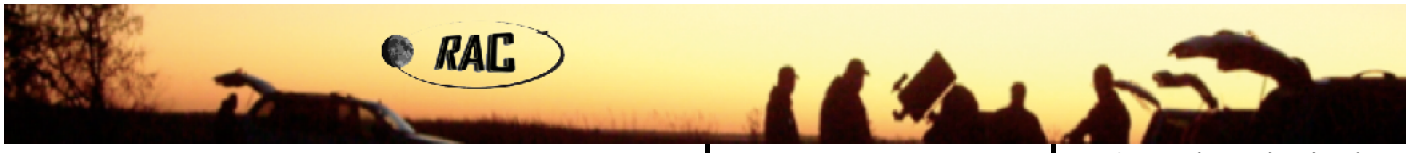
Bold for observable event
Underline see definition on next page
Italicized is an interesting event

(Wed)	04	10:00	Mercury 0.7°S of Beehive **M44**
(Fri)	06	02:57	**LAST QUARTER MOON**
		12:00	*Earth at aphelion* (94,507,803 mi)
(Mon)	09	15:00	Venus 1.1°N of Regulus
(Tue)	10	05:00	**Aldebaran 1.1°S of Moon;** occultation
		23:00	*Jupiter stationary*
(Thu)	12	00:00	Mercury greatest elongation E (26°)
		05:00	*Pluto at opposition*
		21:48	**NEW MOON** (lunation 1182)
			Partial Solar Eclipse in southern Australia
(Fri)	13	03:00	*Moon at perigee* (222,097 mi)
(Sat)	14	01:00	Moon 1.4°S of Beehive **M44**
		17:00	Mercury 2°S of Moon
(Sun)	15	12:00	Regulus 1.8°S of Moon
		23:00	**Venus 1.6°S of Moon**
(Thu)	19	14:52	**FIRST QUARTER MOON**
(Fri)	20		*Mercury at aphelion*
		19:00	**Jupiter 4°S of Moon**
(Wed)	25	01:00	**Saturn 2°S of Moon**
		02:00	*Mercury stationary*
(Fri)	27	00:00	**Mars at opposition**
		01:00	*Moon at aphelion* (252,415 mi)
		15:20	**Full Moon** (smallest in 2018)
			Total Lunar Eclipse in the region of the Indian Ocean
(Tue)	31	03:00	**Mars at closet approach**



I = Io
II = Europa
III = Ganymede
IV = Callisto





August 2018 Sky Events

all times in 24-hour Central Daylight Time

Bold for observable event
Italicized is an interesting event

(Sat)	04	13:18	**LAST QUARTER MOON**
(Fri)	10	13:00	*Moon at perigee (222,500 mi)*
(Sat)	11	04:58	**NEW MOON** (lunation 1183) *Partial Solar Eclipse* in Europe, Asia, Africa
(Sun)	12	20:00	**PERSEID METEORS PEAK**
(Sun)	16	19:08	**Double shadow transit on Jupiter**
(Sat)	18	02:49	**FIRST QUARTER MOON**
(Thu)	23	06:00	*Moon at apogee (252,119 mi)*
(Sun)	26	06:56	**FULL MOON**
(Tue)	28	05:00	*Mars is stationary*

Astronomy Terms

aphelion: the point where the body comes farthest from the Sun.

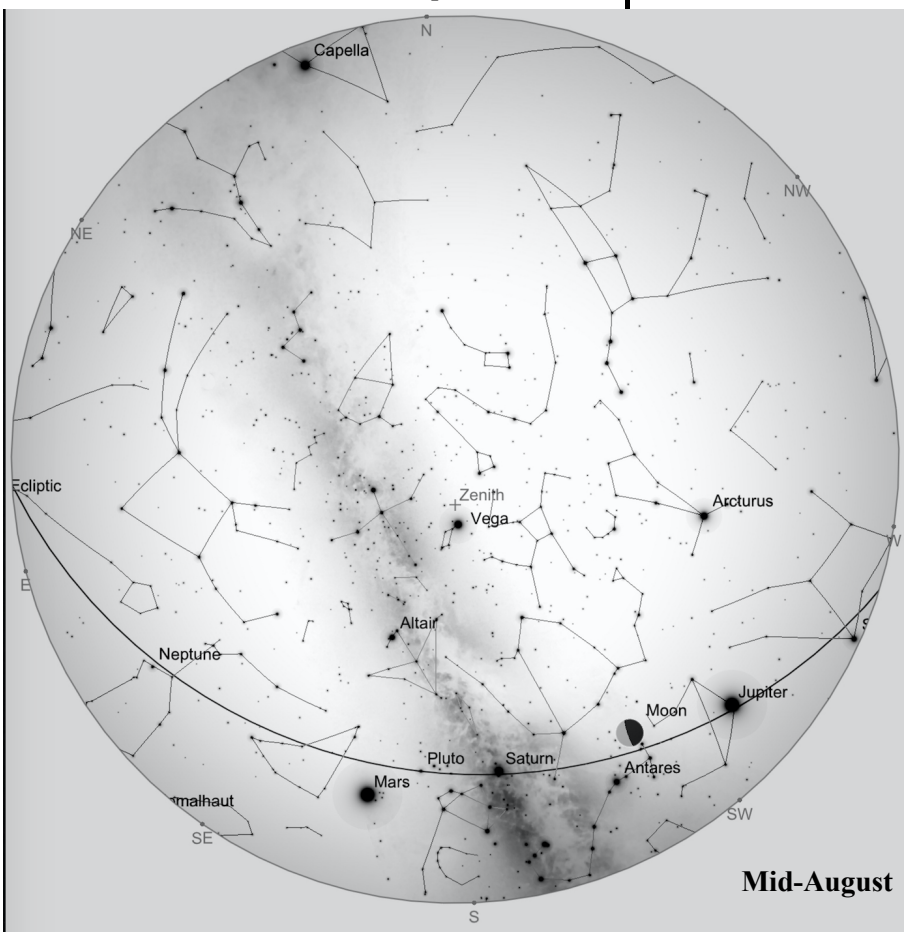
apogee: the point in the orbit of the moon or a satellite at which it is furthest from the earth.

lunation: the common lunation number (LN) used is a number of New Moons since 17 Jan 1923.

occultation: when one object is hidden by another object that passes between it and the observer.

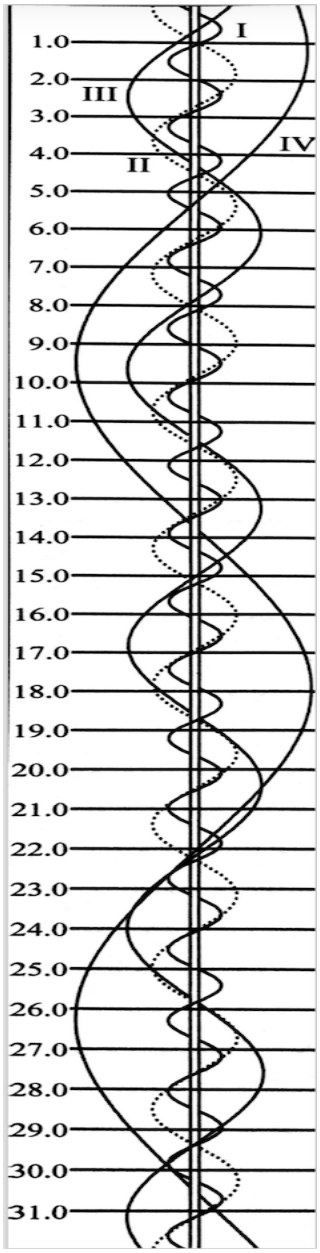
perigee: the point in the orbit of the moon or a satellite at which it is nearest to the earth.

perihelion: the point where the body comes nearest to the Sun.



Mid-August

Jupiter's Satellites



Sept 6-10, 2018
Iowa Star Party
website

Oct 4-6, 2018
Illinois Dark Skies
Star Party website

Sept 7-9, 2018 Eastern
Iowa Star Party website

Sept 5-9, 2018
Northern Nights Star Fest website

Officers

President:	Randy Hemann
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Web Master:	Don Schlosnagle
AL Coord: Star Party Coord-Eagle Bluff	Dean Johnson
Star Party Coord-Rochester	Luka Bazje
Newsletter Editor: ***NCRAL Rep to AL***	Bill Davidson

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