



Observations

A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

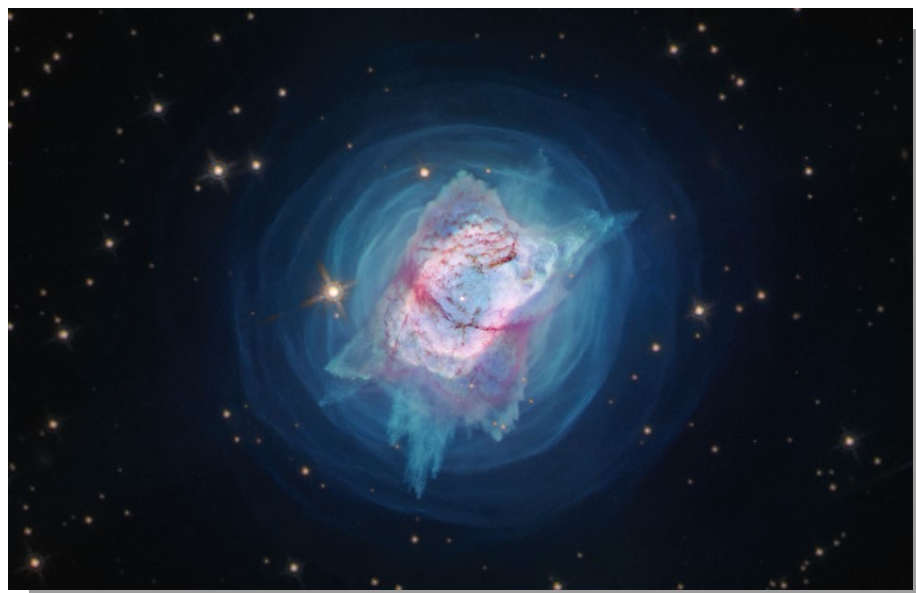
Vol. 28, No. 7 **Three-Time Winner of the Astronomical League's Mabel Sterns Award** ☼ 2006, 2009 & 2016

July 2020

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Bright Planetary Nebula NGC 7027 from Hubble



NGC 7027 is one of the smallest, brightest, and most unusually shaped planetary nebulas known. Given its expansion rate, NGC 7027 first started expanding about 600 years ago. For much of its history, the planetary nebula has been expelling shells, as seen in blue in the featured image. In modern times, though, for reasons unknown, it began ejecting gas and dust (seen in red) in specific directions that created a new pattern that seems to have four corners. These shells and patterns have been mapped in impressive detail by recent images from the Wide Field Camera 3 onboard the Hubble Space Telescope. About 3,000 light years away, NGC 7027 was first discovered in 1878 and can be seen with a standard backyard telescope toward the constellation of the Swan (Cygnus). Image Credit: NASA, ESA, Joel Kastner (RIT) et al.; Processing: Alyssa Pagan (STScI).

Membership Renewals Due

07/2020	Barasatian Bissinger & Family Hockenberry & Miller Hunsinger McGuigan Morgan Piehl
08/2020	Bogard Borowski Buki Johnston & Stein Knabb Kruss Lurcott, L. Tiedemann Tredinnick Trunk Zulitti
09/2020	Armored Holloway Johnson Lee Lurcott, E. Squire

July 2020 Dates

- 5th** • Full Moon, the Full Buck Moon or the Full Thunder Moon, 12:44 a.m. EDT.
- 5th** • The Moon, Jupiter and Saturn form a large triangle
- 12th** • Last Quarter Moon, 7:29 p.m. EDT.
- 14th** • Jupiter is at opposition
- 20th** • New Moon, 1:32 a.m. EDT.
- 27th** • First Quarter Moon, 8:32 a.m. EDT.
- 29th-30th** • The Delta Aquarid meteor shower peaks.



CCAS Upcoming Nights Out

In addition to our monthly observing sessions at the Myrick Conservancy Center, BRC (see pg. 2), CCAS has several special "nights out" scheduled over the next few months. Members are encouraged to help out during these events any way they can. See below for more information.

☼ **Monthly observing sessions at Myrick Conservancy Center, BVA, and special observing dates have been cancelled until further notice as part of the national effort to limit the spread of the coronavirus. For more information about future observing opportunities, contact our Observing Chair, Don Knabb.**

Summer Society Events

July 2020

9th-10th • The von Kármán Lecture Series: [A Day in the Life of the Deep Space Network](#). Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

14th-17th • Cherry Springs Camping & Observing Trip.

20th • Open call for articles and photographs for the August 2020 edition of [Observations](#).

26th • Deadline for newsletter submissions for the August 2020 edition of [Observations](#).

August 2020

20th • Open call for articles and photographs for the September 2020 edition of [Observations](#).

20th-21st • The von Kármán Lecture Series: [Venus: Earth's Evil Twin or Just Misunderstood?](#), Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

26th • Deadline for newsletter submissions for the September 2020 edition of [Observations](#).

Minutes from the June 9, 2020, CCAS Monthly Meeting

by Bea Mazziotti, CCAS Secretary

- Dave Hockenberry welcomed 23 members and guests to the June 2020 CCAS meeting. Zoom was again the platform. The club will continue to use Zoom through the fall.
- Dave confirmed that the upcoming July Cherry Springs event will proceed as planned with appropriate social distancing measures in place.
 - The dates are 7/14/20 through 7/17/20.
 - Bad weather dates will be 7/21/20 through 7/24/20.
- Don Knabb took us on a short tour of the splendid June night sky. Some highlights we can observe include the Virgo galaxy cluster, star clusters Tweedle Dee and Tweedle Dum in Ophiuchus and Graff's cluster in Serpens Cauda.
- Don also told members about the online SpaceX Docking Simulator.
 - It familiarizes users with the actual interface NASA astronauts use to manually pilot the SpaceX 2 Dragon to the ISS.
 - Don found it a challenging but fun exercise. <https://iss-sim.spacex.com/>
- Bruce Ruggeri, program chair, introduced the evening's speaker, CCAS member and NASA Solar System and JPL Ambassador John Conrad.
 - His career in Astronomical Engineering, which began in the U.S. Air Force, enables him to provide unique insights into the wealth of lunar science discoveries made since the start of the Space Age.
 - NASA robots have given us an unprecedented understanding of our moon from below its surface to its atmosphere.

September 2020 CCAS Meeting Agenda

by Bruce Ruggeri, CCAS Program Chair

Our next meeting will be held on September 9, 2020, starting at 7:30 p.m. The meeting will be held ONLINE via [Zoom.us](#). Speaker: TBA.

Please note that inclement weather or changes in speakers' schedules may affect the program. In the event there is a change, CCAS members will be notified via e-mail with as much

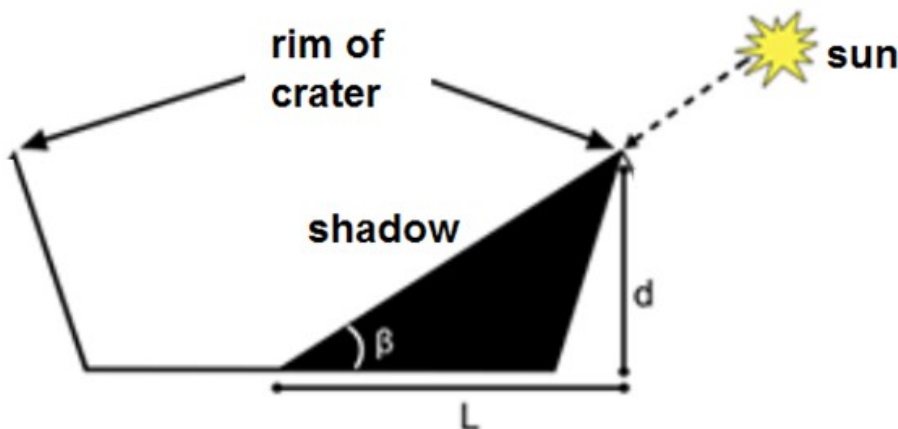
advance notice as possible.

As for future meetings, we are looking for presenters for our 2020-2021 season. If you are interested in presenting, or know someone who would like to participate, please contact me at programs@ccas.us.

How High is the Rim of Copernicus Crater?

by Frank Angelini, CCAS Member

I recently completed the Astronomical League, Lunar II Observing Program. One of the optional questions had to do with measuring the height (altitude) of a feature on the surface of the moon. This assumes that the target object (crater, mountain, ridge, etc.) casts a shadow that is distinct enough to measure. The Astronomical League recommends Mt. Piton or Mons Piton because it is located in a rather isolated region of Mare Imbrium. However, I wanted to select another target, the famous Copernicus Crater, one of my favorite lunar features.



The image above is a simplistic diagram showing the cross section of a typical crater, where: β is angle of the incoming sun light; L is the length of the shadow; and d is the depth of the crater, or height of the rim from the crater floor; and Therefore $\tan \beta = d/L$, and $d = L \times \tan \beta$.



See the archival photo of Copernicus above, taken January 7, 2017. Copernicus is visible using binoculars and is located slightly northwest of the center of the Moon's Earth-facing hemisphere. South of

(Continued on page 6)

Scientists Estimate Number of Contactable Alien Civilizations

by Nicola Davis, *The Guardian*

According to new calculations there could be more than 30 intelligent civilizations in our galaxy today capable of communicating with others. Experts say the work not only offers insights into the chances of life beyond Earth but could shed light on our own future and place in the cosmos.

“I think it is extremely important and exciting because for the first time we really have an estimate for this number of active intelligent, communicating civilizations that we potentially could contact and find out there is other life in the universe – something that has been a question for thousands of years and is still not answered,” said Christopher Conselice, a professor of astrophysics at the University of Nottingham and a co-author of the research.

In 1961 the astronomer Frank Drake proposed what became known as [the Drake equation](#), setting out seven factors that would need to be known to come up with an estimate for the number of intelligent civilizations out there. These factors ranged from the average number of stars that form each year in the galaxy through to the timespan over which a civilization would be expected to be sending out detectable signals.

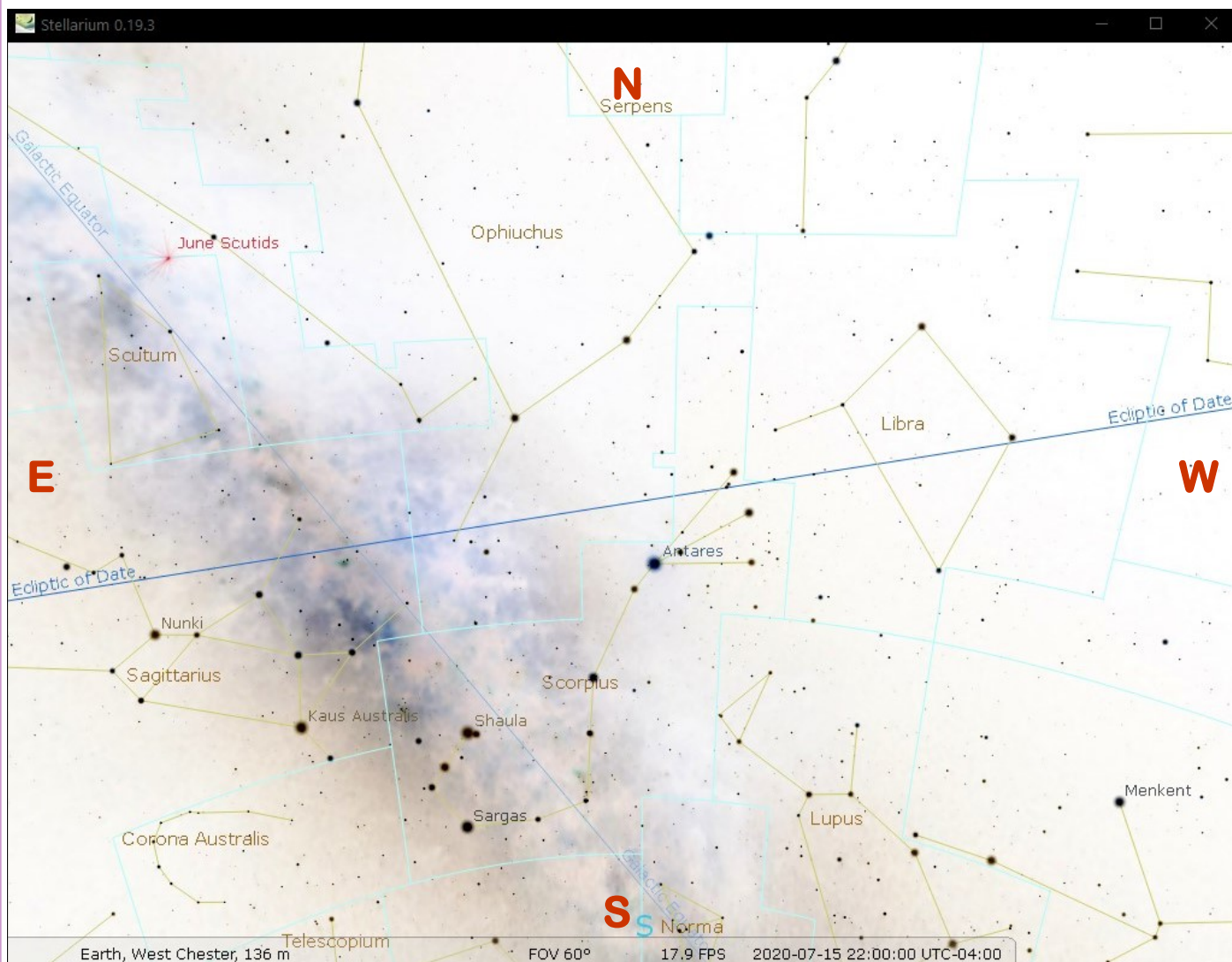
But few of the factors are measurable. “Drake equation estimates have ranged from zero to a few billion [civilizations] – it is more like a tool for thinking about questions rather than something that has actually been

(Continued on page 11)

The Sky Over Chester County

July 15, 2020 at 10:00 p.m. ET

Note: This screen capture is taken from Stellarium, the free planetarium software available for download at www.stellarium.org.



Date	Civil Twilight Begins	Sunrise	Sunset	Civil Twilight Ends	Length of Day
07/01/2020	5:05 a.m. EDT	5:37 a.m. EDT	8:34 p.m. EDT	9:07 p.m. EDT	14h 57m 10s
07/15/2020	5:14 a.m. EDT	5:46 a.m. EDT	8:29 p.m. EDT	9:01 p.m. EDT	14h 42m 58s
07/31/2020	5:30 a.m. EDT	6:00 a.m. EDT	8:16 p.m. EDT	8:46 p.m. EDT	14h 15m 57s

Moon Phases					
Last Quarter	07/12/2020	7:29 p.m. EDT	Full Moon	07/05/2020	12:44 a.m. EDT
First Quarter	07/27/2020	8:32 a.m. EDT	New Moon	07/20/2020	1:32 a.m. EDT

July 2020 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

5	Full Moon, the Full Buck Moon or the Full Thunder Moon, 12:44 a.m. EDT.
5	The Moon, Jupiter and Saturn form a large triangle
12	Last Quarter Moon, 7:29 p.m. EDT.
14	Jupiter is at opposition
20	New Moon, 1:32 a.m. EDT.
20	Saturn is at opposition
22	Mercury is at greatest western elongation in the predawn sky
27	First Quarter Moon, 8:32 a.m. EDT.
28	The Lunar Straight Wall is visible
29/30	The Delta Aquariid meteor shower peaks

The best sights this month: Jupiter and Saturn take center stage in July as both gas giants reach opposition near mid-month. This beautiful pair will dance across the sky hand in hand nearly all night, so set up your telescope and enjoy the show!

Mercury: Mercury is in the morning sky late in the month and reaches greatest elongation at 22° west of the Sun on July 22nd. On that day at magnitude 0.2 Mercury is reasonably bright, rising about an hour before sunrise.

Venus: Our sister planet is jumping higher into the predawn sky every day and by month's end rises over 3 hours before the Sun. And at magnitude -4.7 you can't miss it; in fact, you might be able to find it a bit after sunrise.

Mars: The red planet rises around midnight and is steadily brightening and growing larger and will continue to do so as it heads toward opposition in October.

Jupiter: The king of the planets reaches opposition on July 14th when it will be visible nearly all night. When I glance out the window after an early morning trip to the litter box Jupiter is like a beacon in the south shining at nearly magnitude -3!

Saturn: The ringed planet reaches opposition on July 20th and will waltz through the sky with Jupiter by its side. The rings are tilted at 22° so they will really stand out in a telescope.

Uranus and Neptune: Neptune rises about an hour before Mars and Uranus rises about an hour after Mars, so they are best viewed in the hours before dawn.

The Moon: The Moon is full on July 5th at 12:44 a.m. so it will be part of the fireworks on the evening of July 4th! Native Americans called this the Full Buck Moon because July is normally the month when the new antlers of buck deer push out of their foreheads with coatings of velvety fur. It was also often called the Full Thunder Moon since thunderstorms are most frequent during this time of year. This Full Moon has also been called the Full Hay Moon. Native Canadians called this the Birds Shed Feathers Moon.

There is a penumbral eclipse at 12:30 a.m. on July 5th but the eclipse is too slight for the eye to detect.

Constellations: Fireflies, warm nights, and the hazy stars of summer; this is July! This is one of the few months of the year when you can lay a blanket down on the lawn and not be cold, so enjoy it even if it is hot and humid during the day. Arcturus will be setting in the west and the Summer Triangle will be nearly at the zenith. If you sit up for a bit and look to the south you will see the big bug of summer, Scorpius. Then grab your binoculars and scan from Scorpius up the Milky Way through Sagittarius, on to Aquila and Cygnus and beyond!

Messier/deep sky: Globular clusters and nebula rule the summer sky for anyone with a telescope or binoculars. Sagittarius is full of Messier objects such as the Trifid and the Lagoon nebula. In Scorpius is M4, a globular cluster that is easy to find using Antares as a guide. If you have a low western horizon look for NGC 6231 where the tail of Scorpius turns to the east. This open cluster is called the Northern Jewel Box. Then look high overhead with binoculars and find the coat hanger cluster between Vega and Altair. This is a great object to share with friends.

Comets: Comet PanSTARRS (C/2017 T2) continues to be in excellent viewing position through all

(Continued on page 14)

Crater (Cont'd)

(Continued from page 3)

the crater is the Mare Insularum and north of Copernicus are the Montes Carpatum, which lie at the south edge of Mare Imbrium. Photo image dimensions are 2655 x 1675 pixels.

On January 7, 2017, the distance from the earth to the moon was approximately 363,238 km. The metadata accompanying the photo image indicates that each pixel is approximately 0.18 arcseconds.

Since there are 3600 arcseconds in a degree:

$$\begin{aligned}
 1 \text{ pixel} &= 0.18 \text{ arcsec}/3600 \\
 \text{arcsec/deg} &= .000050 \text{ degrees} \\
 1 \text{ pixel} &= D \text{ (km)} * \tan \\
 &= (0.00005 \text{ degrees}) = \\
 &= x .00000087 \\
 &= .3160 \text{ km}
 \end{aligned}$$

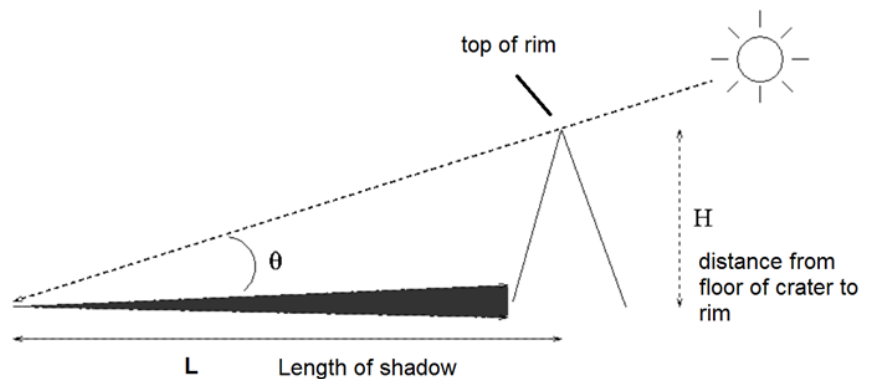
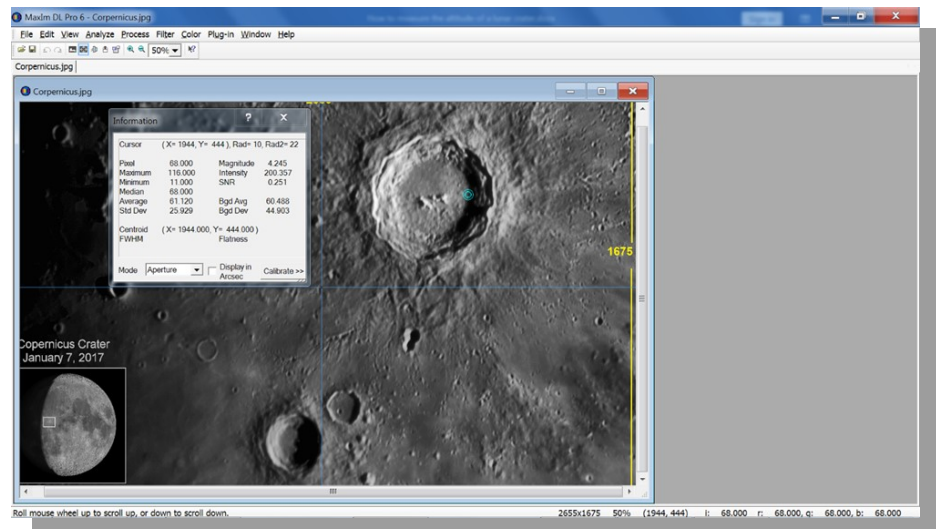
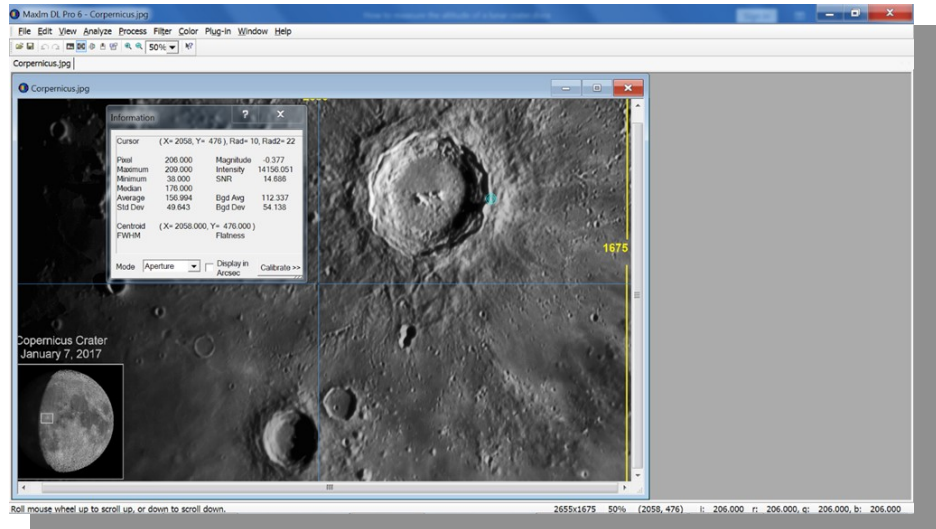
Measuring the Apparent Length of Shadows

For pixel measurement, I used Maxim DL, a program that I also use for imaging. Maxim allows us to measure the features of this crater. It is able to see the cursor coordinates, in units of pixels, while moving the cursor around the image.

The screen shots to the right of Maxim DL show the x and y coordinates (measured in pixels) of the eastern edge of the crater rim and the western edge of the shadow, as 2058,476 and 1944,476. So, the length of the shadow is $2058 - 1944 = 114$ pixels or $114 \times .3160 \text{ km/pixel} = 36 \text{ km}$.

Dealing with Foreshortening

An image of the central region of the lunar disk (near the lunar equator, halfway between the eastern and western limbs) has



little or no distortion because the lunar surface is roughly face-on to the imaging camera. However, an image of any other area will be tilted with respect to the camera; the closer the area is to the

limb of the moon, the larger the tilt. This tilt causes foreshortening, and makes shadows appear shorter than actual. I assumed that Copernicus is close enough

(Continued on page 7)

Crater (Cont'd)

Enter UT date in yyyyymmdd.hhmm format - 20170107.0315

Results: Physical Ephemeris of Moon

Selenographic longitudes towards Mare Crisium are taken as positive. All figures here are based on geocentric coordinates, and position angles relate to the North Celestial Pole.

Libration in Latitude (B)	-5.8
Libration in Longitude (L)	-3.9
Colongitude of the Sun (Co)	-21.11
Subsolar point Lat (Bo)	1.2
Subsolar point Long (Lo)	88.9
Selenographic Longitude of terminator	-21.1
Illuminated fraction of Moon's disc	0.648
Position angle of bright limb	249.2
Position angle of polar axis	20.3

Results: Time

Days since J2000.0	6215.6354
Julian Day Number	2457760.6354

Results: Sun's position

Distance (AU)	0.9833
Right Ascension	19.23
Declination	-22.35

Results: Moon's position

Distance (Earth radii)	57.78
Right Ascension	2.232
Declination	-8.66

Calculation Results on Moon Ephemeris Site

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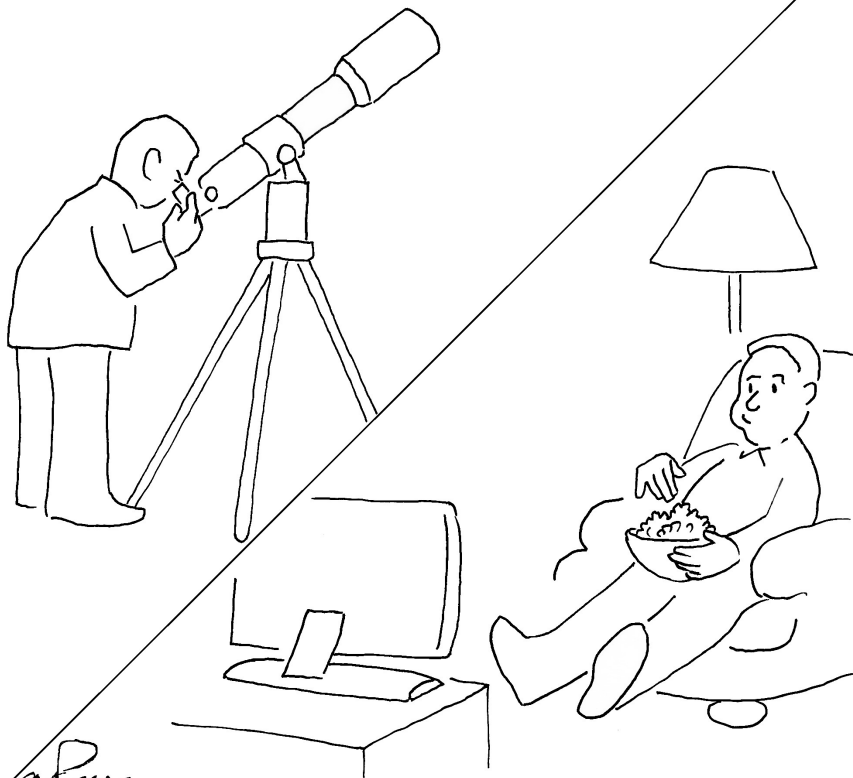
to the center of the moon to ignore any foreshortening.

more any foreshortening.

Determining the altitude of the

Classic La Para by Nicholas La Para

OBSERVANT ASTRONOMER



LAPSED ASTRONOMER

[Editor's Note: The Shelter-in-Place order and uncooperative weather turned many amateur astronomers into armchair astronomers this past spring. JCH]

sun over the crater rim at the time the image was taken

In order to determine the height of the crater rim, based on the length of its shadow, we need to know the altitude of the sun above the lunar horizon at the moment in time of that the image was taken. This requires some very complex calculations.

We can take a short cut by going to <http://www.lunar-occultations.com/rlo/ephemeris.htm>. This takes us to an online calculator for the physical ephemeris of the moon. Here we can calculate, Co: Colongitude of the Sun and Bo: Subsolar point Lat, by entering the date and time of the observation.

Co: Colongitude of the Sun
Bo: Subsolar point Lat

For January 7, 2017 at approximately 21:15 EST.

We also need the latitude and longitude of Crater Copernicus. According to my *Atlas of the Moon* these values are: 9° 37' 12" N, 20° 4' 48" W. Now we are ready to calculate the angle (x, in degrees) of the Sun above Copernicus Crater.

Step 1, solve for x:

$$x = \sin(Bo) * \sin(\text{latitude}) + \cos(Bo) * \cos(\text{latitude}) * \sin(Co + \text{longitude})$$

$$x = \sin(1.2) * \sin(9.6167) + \cos(1.2) * \cos(9.6167) * \sin(21.11 + 20.0667)$$

$$x = .10227$$

Step 2, solve for Θ

$$\Theta = \arcsin(x) = 5.87 \text{ degrees}$$

Where Θ is the elevation of the Sun above the horizon of the Moon, as seen from Copernicus Crater.

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Through the Eyepiece: The Lagoon and Trifid Nebulas in Sagittarius

by Don Knabb, CCAS Treasurer & Observing Chair

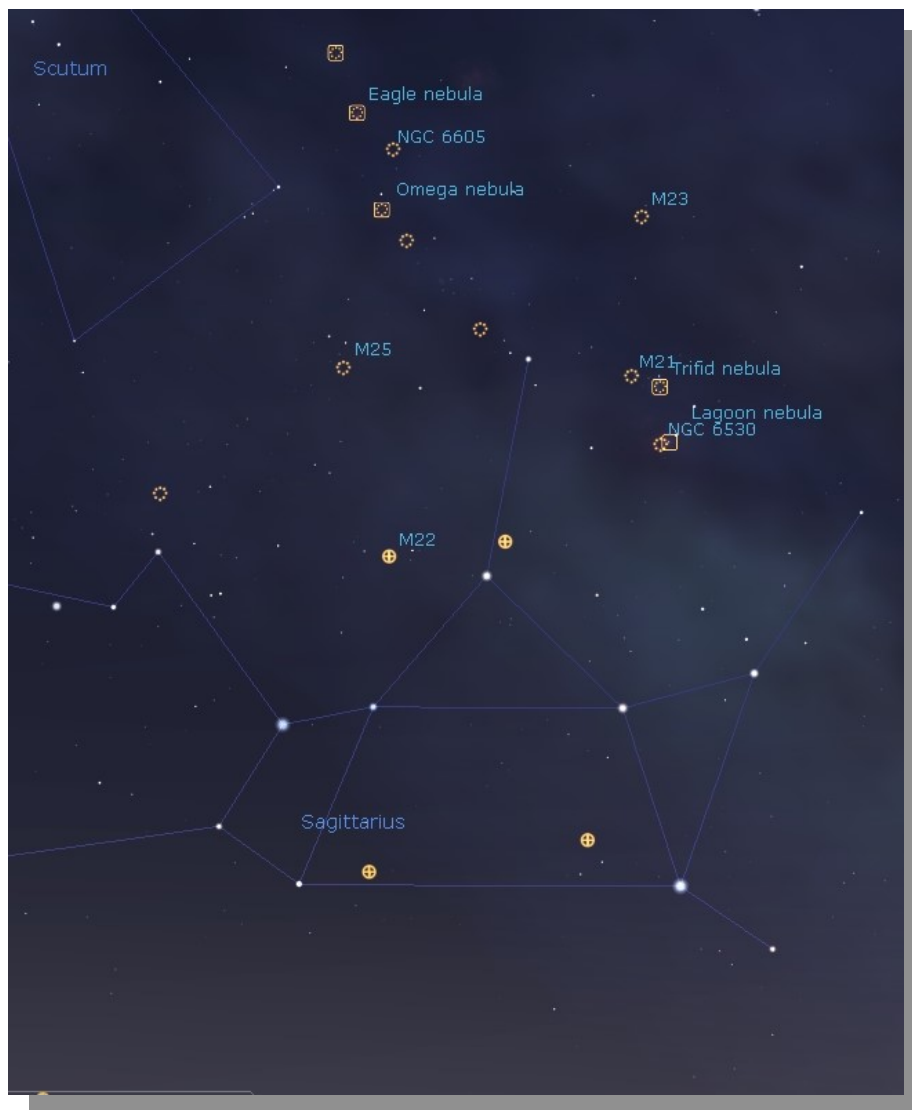
We only have a few months to enjoy the deep southern sky with Sagittarius and Scorpius spending their brief time near the horizon. Without fail, the first two objects I look for when I pick up my binoculars or set up my telescope are the Lagoon Nebula (Messier 8) and the Trifid Nebula (Messier 20). These giant clouds of glowing gas are within one field of view in binoculars.

To find them look to the northwest of the “teapot” of Sagittarius. I usually find the two stars that define the top of the spout of the teapot and scan upward until I find the two bright fuzzy spots that are M8 and M20.

My favorite object in this area is Messier 8, the Lagoon Nebula. For me, this is the summer equivalent of the Orion Nebula. This object is vastly larger than our solar system but is more than 5,000 light years away. It is an emission nebula, which is a vast cloud of gas that is glowing like a neon tube due to ultraviolet radiation from hot, young stars within.

The name Lagoon Nebula is derived from the dark channel, the “lagoon”, that seems to divide the object in two. In binoculars, the Lagoon is a distinct oval cloud-like patch with a definite core, like a pale celestial flower. The nebula has a fragile star cluster superimposed on it, making this one of the leading celestial sights of summer night skies.

From a very dark site such as Cherry Springs State Park, the Lagoon Nebula is visible to the unaided eye. The Lagoon nebula



Sky map from Stellarium, the free planetarium software

is a beautiful sight in any size telescope.

The Lagoon Nebula is also a magnificent object for the amateur astrophotographer. On the opposite page is a picture from Brent Crabb of Southern California.

Just above the Lagoon Nebula is a smaller fuzzy grey area. This is the Trifid Nebula, M20. The nebula's name means "divided into three lobes." The object is a remarkable collection of open

cluster, emission nebula (the lower, red portion), reflection nebula (the upper, blue portion) and dark nebula (the separation within the emission nebula).

On page 10 is a striking photo of M20, again from Brent Crabb of Southern California.

The energetic processes of star formation create not only the colors but the chaos in this beautiful deep sky object. The red-glowing gas results from high-

(Continued on page 9)

Eyepiece (Cont'd)



Photo credit: Brent Crabb, Astrophotographer, Orange County, California

(Continued from page 8)

energy starlight striking interstellar hydrogen gas. The dark dust filaments that lace M20 were created in the atmospheres of cool giant stars and in the debris from supernovae explosions. Which bright young stars light up the blue reflection nebula is still being investigated. The light from M20 we see today left perhaps 3,000 years ago, although the exact distance to the nebula remains unknown.

The sources I researched for this article vary in their opinion of who discovered the Trifid

Nebula. One source says it was discovered by the French astronomer Legentil de La Galaisière before 1750 and named by the English astronomer Sir John Herschel for the three dark rifts that seem to divide the nebula and join at its center. Other articles state that Charles Messier discovered this object on June 5, 1764, and described it as a cluster of stars of 8th to 9th magnitude, enveloped in nebulosity.

So grab your binoculars or set up your telescope and enjoy these and the numerous other deep sky objects in Sagittarius!

Information credits:

- Pasachoff, Jay M. 2000. A Field Guide to the Stars and Planets. New York, NY. Houghton Mifflin.
- Dickinson, Terence 2006. Nightwatch: a practical guide to viewing the universe. Buffalo, NY. Firefly Books
- 2008 Skywatch. Sky and Telescope magazine
- <http://www.seds.org/messier/m/m008.html>
- http://www.astropix.com/HTML/D_SUM_S/M8.HTM

(Continued on page 10)

Eyepiece (Cont'd)



Photo credit: Brent Crabb, Astrophotographer, Orange County, California

(Continued from page 9)

• <http://www.britannica.com/>

• [EBchecked/topic/605155/
Trifid-Nebula](http://EBchecked/topic/605155/Trifid-Nebula)

• [http://www.seds.org/messier/
m/m020.html](http://www.seds.org/messier/m/m020.html)

Civilizations (Cont'd)

(Continued from page 3)

solved,” said Conselice. Now Conselice and colleagues [report in the Astrophysical Journal](#) how they refined the equation with new data and assumptions to come up with their estimates.

“Basically, we made the assumption that intelligent life would form on other [Earth-like] planets like it has on Earth, so within a few billion years life would automatically form as a natural part of evolution,” said Conselice.

The assumption, known as the Astrobiological Copernican Principle, is fair as everything from chemical reactions to star formation is known to occur if the conditions are right, he said. “[If intelligent life forms] in a scientific way, not just a random way or just a very unique way,

then you would expect at least this many civilizations within our galaxy,” he said. He added that, while it is a speculative theory, he believes alien life would have similarities in appearance to life on Earth. “We wouldn’t be super shocked by seeing them,” he said.

Under the strictest set of assumptions – where, as on Earth, life forms between 4.5bn and 5.5bn years after star formation – there are likely between four and 211 civilizations in the Milky Way today capable of communicating with others, with 36 the most likely figure. But Conselice noted that this figure is conservative, not least as it is based on how long our own civilization has been sending out signals into space – a period of just 100

(Continued on page 13)

Crater (Cont'd)

(Continued from page 7)

cus Crater, on January 7, 2017, at approximately 21:15 EST.

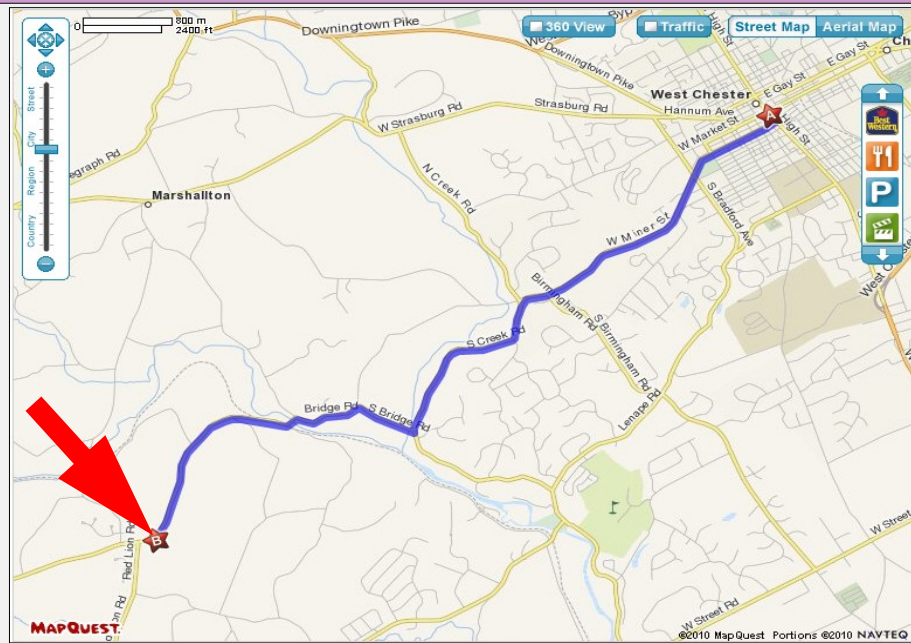
$$\tan \Theta = H/L$$

$$H = L \tan \Theta = 36 \times .1028 = 3.7 \text{ km. QED}$$

The above calculations are rather crude, and assumptions were made. However, the calculated distance between the floor of Copernicus Crater and the eastern rim of 3.7 km agrees favorably with the official value of 3.8 km.

Just imagine standing at the bottom of that crater and looking up at the eastern rim some 12,439 feet above – more than a mile higher than the highest point east of the Mississippi River!

CCAS Directions



Brandywine Red Clay Alliance

The monthly observing sessions (held February through November) are held at the Myrick Conservation Center of the Brandywine Red Clay Alliance.

To get to the Myrick Conservation Center from West Chester, go south on High Street in West Chester past the Courthouse. At the next traffic light, turn right on Miner Street, which is also PA Rt. 842. Follow Rt. 842 for about 6 miles. To get to the observing site at the BRC property, turn left off Route 842 into the parking lot by the office: look for the signs to the office along Route 842. From that parking lot, go left through the gate and drive up the farm lane about 800 feet to the top of the hill. The observing area is on the right.

If you arrive after dark, *please turn off your headlights and just use parking lights* as you come up the hill (so you don’t ruin other observers’ night vision).

Brandywine Red Clay Alliance

1760 Unionville Wawaset Rd
West Chester, PA 19382
(610) 793-1090

<http://brandywinewatershed.org/>

BRC was founded in 1945 and is committed to promoting and protecting the natural resources of the Brandywine Valley through educational programs and demonstrations for all ages.

NASA Night Sky Notes: Mars's Latest Visitor—NASA's Perseverance Rover by David Prosper

This article is distributed by the NASA Night Sky Network, a coalition of hundreds of astronomy clubs across the US dedicated to astronomy outreach.

Visit nightsky.jpl.nasa.gov to find local clubs, events, stargazing info and more.

NASA's latest Mars rover, Perseverance, is launching later this month! This amazing robot explorer will scout the surface of Mars for possible signs of ancient life and collect soil samples for return to Earth by future missions. It will even carry the first off-planet helicopter: Ingenuity. Not coincidentally, Perseverance will be on its way to the red planet just as Mars dramatically increases in brightness and visibility to eager stargazers as our planets race towards their closest approach in October of this year.

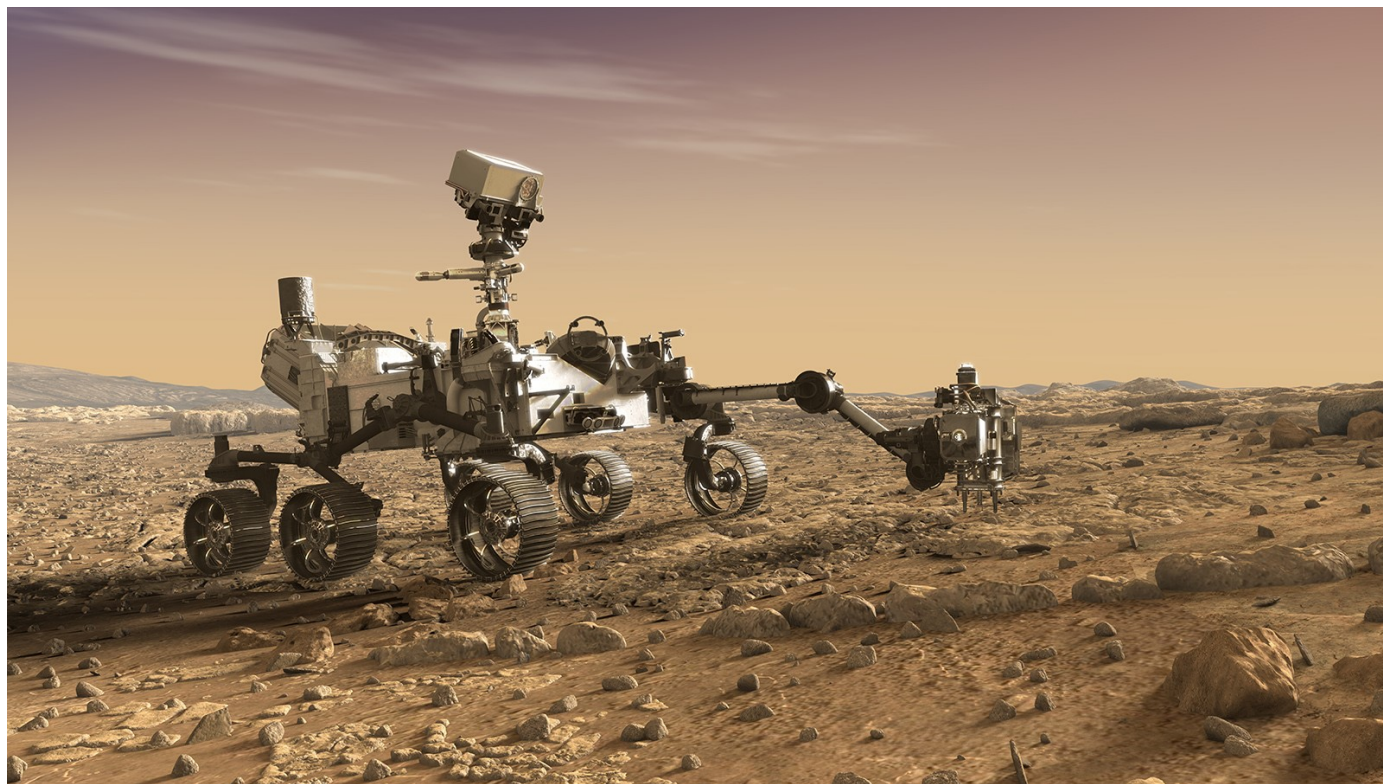
Perseverance's engineers built upon the success of its engineering cousin, Curiosity, and its de-



sign features many unique upgrades for a new science mission! In February of 2021, Perseverance will land at the site of an ancient river delta inside of Jezero Crater and ready its suite of seven primary scientific instruments. The rover will search for traces of past life, including possible Martian fossils, with WATSON and SHERLOC, two advanced cameras capable of

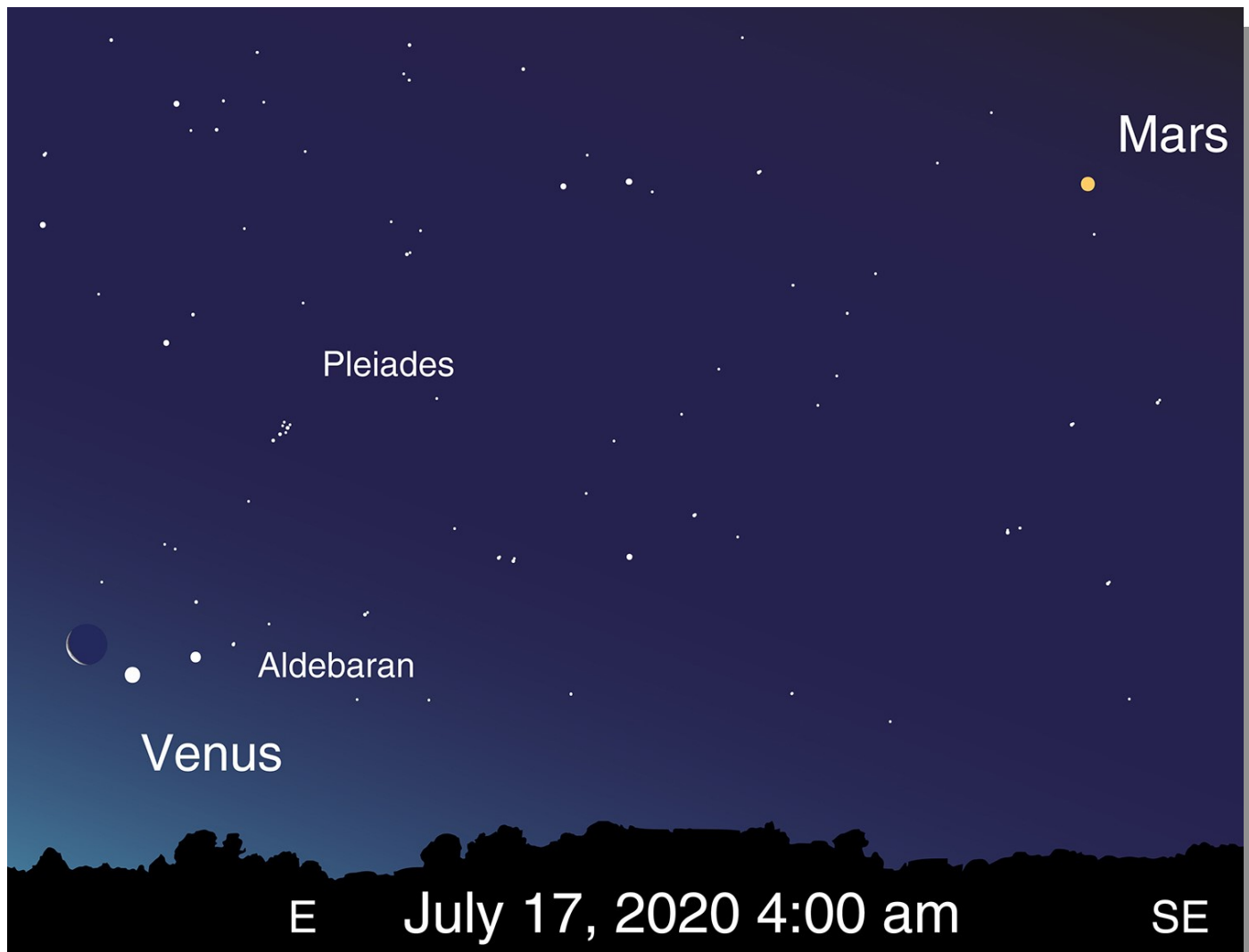
seeing tiny details. The rover also carries an amazing instrument, SuperCam, to blast rocks and soil outside of the rover's reach with lasers to determine their chemical makeup with its onboard suite of cameras and spectrometers. Perseverance will also take core samples of some of the most promising rocks and soil, storing them for later study with its unique caching system. Future missions will retrieve these samples from the rover and return them for detailed study by scientists on Earth. Perseverance also carries two microphones so we can hear the sounds of Mars and the noises of its instruments at work. It will even launch a small helicopter - Ingenuity - into the Martian atmosphere as a trial for future aerial exploration!

(Continued on page 13)



Perseverance inspects a cluster of interesting Martian rocks with its instruments in this artist rendering by NASA JPL/Caltech

Night Sky Notes (Cont'd)



Observe Mars yourself over the next few months! Mars can be found in early morning skies throughout July, and by the end of the month will rise before midnight. Mars gradually brightens every night until the close approach of Mars in October. The pre-dawn skies of July 17 present an especially nice view, as the waning crescent Moon will appear near Venus and Aldebaran.

(Continued from page 12)

Would you like to contribute to Mars mission science? You can help NASA's rover drivers safely navigate the Martian surface by contributing to the AI4Mars project! Use this tool to label terrain features on photos taken of the Martian surface by NASA missions to help train an artificial intelligence algorithm to better read their surrounding landscape: bit.ly/AI4Mars

The launch of Mars Persever-

ance is, as of this writing, scheduled for July 20, 2020 at 9:15am EDT. More details, updates, and livestreams of the event are available on NASA's official launch page: bit.ly/Mars2020Launch. Dig deep into the science of the Mars 2020 mission and the Perseverance rover at: mars.nasa.gov/mars2020/. Find out even more about past, present, and future Mars missions at nasa.gov.

Civilizations (Cont'd)

(Continued from page 11)

years so far.

The team added that our civilization would need to survive at least another 6,120 years for two-way communication. "They would be quite far away ... 17,000 light years is our calculation for the closest one," said Conselice.

[Read the entire article at <https://bit.ly/2DbQdo1>]

CCAS Directions

West Chester University Campus

The monthly meetings (September through May) are held in Room 112 in Merion Science Center (formerly the Boucher Building), attached to the Schmucker Science Center. The Schmucker Science Center is located at the corner of S. Church St & W. Rosedale Ave. Parking is generally available across Rosedale in the Sykes Student Union parking lot (Lot K).



Observing (Cont'd)

(Continued from page 5)

of July. At 9th to 10th magnitude it was an easily visible fuzzy gray blob when I observed it in late June. To find T2 use your favorite astronomy app or you can find a sky chart in the July issue of Astronomy magazine.

Meteor showers: The Delta Aquariid meteor shower peaks the night of July 29/30. We will not have an impressive shower, but one might see 25 fast meteors per hour from a dark site. This meteor shower has a broad peak, so you can look a day or two before or after the peak and still see meteors.

CCAS Membership Information and Society Financials

Treasurer's Report

by Don Knabb

June 2020 Financial Summary

Beginning Balance	\$1028
Deposits	\$456
Disbursements	-\$600
Ending Balance	\$884

New Member Welcome!

Welcome new CCAS members Scott & Valery Wendell and Felix Lint, West Grove, PA; and James Goss, Oxford, PA. We're glad you decided to join us under the stars! Clear skies to you!

Membership Renewals

You can renew your CCAS membership by writing a check payable to "Chester County Astronomical Society" and sending it to our Treasurer:

Don Knabb
988 Meadowview Lane
West Chester PA 19382

The current dues amounts are listed in the *CCAS Information Directory*. Consult the table of contents for the directory's page number in this month's edition of the newsletter.

Join the Fight for Dark Skies!



You can help fight light pollution, conserve energy, and save the night sky for everyone to use and enjoy. Join the nonprofit International Dark-Sky Association (IDA) today. Individual memberships start at \$30.00 for one year. Send to:

International Dark-Sky Association
3225 North First Avenue
Tucson, AZ 85719

Phone: 520-293-3198
Fax: 520-293-3192
E-mail: ida@darksky.org

For more information, including links to helpful information sheets, visit the IDA web site at:

<http://www.darksky.org>

Dark-Sky Website for PA



The Pennsylvania Outdoor Lighting Council has lots of good information on safe, efficient outdoor security lights at their web site:

<http://www.POLCouncil.org>

Find out about Lyme Disease!

Anyone who spends much time outdoors, whether you're stargazing, or gardening, or whatever, needs to know about Lyme Disease and how to prevent it. You can learn about it at:

<http://www.LymePA.org>

Take the time to learn about this health threat and how to protect yourself and your family. It is truly "time well spent"!

Good Outdoor Lighting Websites

One of the biggest problems we face in trying to reduce light pollution from poorly designed light fixtures is easy access to good ones. When you convince someone, a neighbor or even yourself, to replace bad fixtures, where do you go for good lighting fixtures? Check out these sites and pass this information on to others. Help reclaim the stars! And save energy at the same time!



Light pollution from poor quality outdoor lighting wastes billions of dollars and vast quantities of valuable natural resources annually. It also robs us of our heritage of star-filled skies. Starry Night Lights is committed to fighting light pollution. The company offers the widest selection of ordinance compliant, night sky friendly and neighbor friendly outdoor lighting for your home or business. Starry Night Lights is located in Park City, Utah.

Phone: 877-604-7377
Fax: 877-313-2889

<http://www.starrynightlights.com>



Lighthouse Outdoor Lighting is a dedicated lifetime corporate member of the [International Dark-Sky Association](#). Lighthouse's products are designed to reduce or eliminate the negative effects outdoor lighting can have while still providing the light you need at night.

Phone: 484-291-1084

<https://www.lighthouse-lights.com/landscape-lighting-design/pa-west-chester/>

Local Astronomy-Related Stores

Listing retail sites in this newsletter does not imply endorsement of any kind by our organization. This information is provided only as a service to our members and the general public.



Skies Unlimited is a retailer of telescopes, binoculars, eyepieces and telescope accessories from Meade, Celestron, Televue, Orion, Stellarvue, Takahashi, Vixen, Losmandy and more.

Skies Unlimited
Suburbia Shopping Center
52 Glocker Way
Pottstown, PA 19465

Phone: 610-327-3500 or 888-947-2673
Fax: 610-327-3553

<http://www.skiesunlimited.net>



Located in Manayunk, Spectrum Scientifics educates and entertains customers with an array of telescopes, microscopes, binoculars, science toys, magnets, labware, scales, science instruments, chemistry sets, and much more.

4403 Main Street
Philadelphia, PA 19127

Phone: 215-667-8309
Fax: 215-965-1524

Hours:
Tuesday thru Saturday: 10AM to 6PM
Sunday and Monday: 11AM to 5PM

<http://www.spectrum-scientifics.com>

CCAS Information Directory

CCAS Lending Telescopes

Contact Don Knabb to make arrangements to borrow one of the Society's lending telescopes. CCAS members can borrow a lending telescope for a month at a time; longer if no one else wants to borrow it after you. Don's phone number is 610-436-5702.

CCAS Lending Library

Contact our Librarian, Barb Knabb, to make arrangements to borrow one of the books in the CCAS lending library. Copies of the catalog are available at CCAS meetings, and on the CCAS website. Barb's phone number is 610-436-5702.

Contributing to *Observations*

Contributions of articles relating to astronomy and space exploration are always welcome. If you have a computer, and an Internet connection, you can attach the file to an e-mail message and send it to: newsletter@ccas.us

Or mail the contribution, typed or handwritten, to:

Dr. John C. Hepler
21103 Stripper Run
Rock Hall, MD 21661

CCAS Newsletters via E-mail

You can receive the monthly newsletter (in full color!) via e-mail. All you need is a PC or Mac with an Internet e-mail connection. To get more information about how this works, send an e-mail request to Dr. John Hepler, the newsletter editor, at: newsletter@ccas.us.

CCAS Website

Dr. John Hepler is the Society's Webmaster. You can check out our Website at:

<http://www.ccas.us>

Dr. Hepler welcomes any additions to the site by Society members. The contributions can be of any astronomy subject or object, or can be related to space exploration. The only requirement is that it is your own work—no copyrighted material! Give your contributions to Dr. Hepler at (410) 639-4329 or e-mail to webmaster@ccas.us

CCAS Purpose

The Chester County Astronomical Society was formed in September 1993, with the cooperation of West Chester University, as a non-profit organization dedicated to the education and enjoyment of astronomy for the general public. The Society holds meetings (with speakers) and observing sessions once a month. Anyone who is interested in astronomy or would like to learn about astronomy is welcome to attend meetings and become a member of the Society. The Society also provides telescopes and expertise for "nights out" for school, scout, and other civic groups.

CCAS Executive Committee

For further information on membership or society activities you may call:

President: Dave Hockenberry
610-558-4248

Vice President: Pete Kellerman
610-873-0162

**ALCor,
Observing, &
Treasurer:** Don Knabb
610-436-5702

Secretary: Beatrice Mazziotta
610-933-2128

Librarian: Barb Knabb
610-436-5702

Program: Bruce Ruggeri
484-883-5092

Education: Don Knabb
610-436-5702

Dennis O'Leary
610-701-8042

**Webmaster &
Newsletter:** John Hepler
410-639-4329

Public Relations: Ann Miller
610-558-4248



CCAS Membership Information

The present membership rates are as follows:

REGULAR MEMBER.....\$25/year
SENIOR MEMBER.....\$10/year
STUDENT MEMBER.....\$ 5/year
JUNIOR MEMBER.....\$ 5/year
FAMILY MEMBER.....\$35/year

Membership Renewals

Check the Membership Renewals on the front of each issue of *Observations* to see if it is time to renew. If you need to renew, you can mail your check, made out to "Chester County Astronomical Society," to:

Don Knabb
988 Meadowview Lane
West Chester PA 19382-2178

Phone: 610-436-5702
e-mail: treasurer@ccas.us

Sky & Telescope Magazine Group Rates

Subscriptions to this excellent periodical are available through the CCAS at a reduced price of **\$32.95**, much less than the newsstand price of \$66.00, and also cheaper than individual subscriptions (\$42.95)! Buying a subscription this way also gets you a 10% discount on other Sky Publishing merchandise.

To **start** a new subscription, make **sure** you make out the check to the **Chester County Astronomical Society**, note that it's for *Sky & Telescope*, and mail it to Don Knabb.

To **renew** your "club subscription" contact Sky Publishing directly. Their phone number and address are in the magazine and on their renewal reminders. If you have **any** questions call Don first at 610-436-5702.

Astronomy Magazine Group Rates

Subscriptions to this excellent periodical are available through the CCAS at a reduced price of **\$34.00** which is much less than the individual subscription price of \$42.95 (or \$60.00 for two years). If you want to participate in this special Society discount offer, **contact our Treasurer Don Knabb**.