



# Observations

A Monthly Publication Of The  
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 29, No. 12 **Three-Time** Winner of the Astronomical League's Mabel Sterns Award ☼ 2006, 2009 & 2016 December 2021

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## Goodbye Year 2021!



## Membership Renewals Due

12/2021	Damerau DeAngelo DellaPenna Etherington Moynihan O'Leary Orso Watson & Metts
01/2022	Belczyk Carlton Johnson Kellerman Kovaacs McElwee Reese Reynolds
02/2022	McCaffrey Ruggeri Sutton Tronel

## December 2021 Dates

- 4th • New Moon, 2:43 a.m. EST
- 6th-9th • The Moon slides below Venus, Saturn and Jupiter
- 10th • First Quarter Moon, 8:35 p.m. EST
- 14th • The Geminid meteor shower peaks near 3 a.m.
- 18th • Full Moon, the Full Cold Moon or the Full Long Night Moon, 11:35 p.m. EST
- 21st • Winter solstice, the longest night of the year
- 26th • Last Quarter Moon, 9:23 p.m. EST



## CCAS Holiday Party

We are happy to announce that our 2021 CCAS Holiday Gathering will be in person on Tuesday December 14<sup>th</sup> at 6:00 p.m. at Be Here Brewing in Avondale, PA. It is in the historic bank building in the center of Avondale at 122 Pennsylvania Avenue, Avondale, PA 19311.

Everyone is responsible for their own bar and dinner bill and no outside food or beverage may be brought in. We encourage you to have dinner and enjoy the beers that are made at the brew pub. Sodas, non-alcoholic beer and Pennsylvania wine is available. The menu is typical pub fare and it is well made on site. All family members are invited. We hope to see you there!

## Autumn/Winter Society Events

### December 2021

**14th** • CCAS Annual Holiday Party at 6:00 p.m. at Be Here Brewing in Avondale, PA. It is in the historic bank building in the center of Avondale at 122 Pennsylvania Avenue, Avondale, PA 19311. Everyone is responsible for their own bar and dinner bill and no outside food or beverage may be brought in. We encourage you to have dinner and enjoy the beers that are made at the brew pub. Sodas, non-alcoholic beer and Pennsylvania wine is available. The menu is typical pub fare and it is well made on site. All family members are invited.

**20th** • Open call for articles and photographs for the January 2022 edition of [Observations](#).

**21st** • Winter Solstice, 10:59 a.m. EST; first day of winter.

**26th** • Deadline for newsletter submissions for the January 2022 edition of [Observations](#).

### January 2022

**11th** • Monthly CCAS Meeting in Room 113, Merion Science Center, WCU. The meeting starts at 7:30 p.m. Guest Speaker: Brian Matisak, Deputy Director, Systems Engineering & Integration Office, NASA Space Launch System Program at the Marshall Space Flight Center. His presentation is entitled "Space Launch System: Countdown to Launch."

**20th** • The von Kármán Lecture Series: [SWOT: Looking at the Earth's Water](#) starting at 10:00 pm EDT. Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

**20th** • Open call for articles and photographs for the February 2022 edition of [Observations](#).

**26th** • Deadline for newsletter submissions for the February 2022 edition of [Observations](#).

## November 2021 Monthly Meeting Minutes

by *Bea Mazziotta, CCAS Secretary*

- Dave Hockenberry welcomed members and guests to the meeting which was held via Zoom and YouTube only. The guest speaker's presentation was virtual. Dave announced that annual CCAS holiday party would be held at the Be Here Pub in Avondale on Tuesday December 14th. With membership now at 140 it was determined that renting a venue would be necessary to accommodate all who want to attend. The pub will be open to CCAS club members only. It will not be open to the public. Members will be able to purchase their own food and drinks from the pub menu.
- Don Knabb invited members to seek out *Asimov* magazine to read a short story by Jack McDevitt entitled, "Tau Ceti Said What?" The author joined us via zoom. Jack had planned to attend the October 2016 CCAS meeting and give a brief presentation. Sadly hurricane Matthew forced him to cancel.
- With the current heightened interest in finding habitable planets nearby Tau Ceti is intriguing. It is a main sequence star with at least 4 planets in its orbit and is 'only' 12 light years distant from us.
- Don also informed us that the viewing had been good though sporadic at the final 2021 BRC observing session.
- The evening's speaker was Steven Levin and his topic, the "Juno Mission - It's a Whole New Jupiter." He gave an overview of Juno's findings since it entered Jupiter's orbit in 2016, 5 years after its launch. The big takeaway - mostly everything we'd assumed about Jupiter isn't so. We learned that the first planet that formed in our solar system is mostly hydrogen and helium gas and both are liquid at the center. There are clusters of cyclones at both poles and they consistently form a hexagonal pattern. Its core is not dense, but diluted and fuzzy forming only half of the planet's diameter. The deep atmosphere is 'mushy'. The swirling gases we see are 3,000 km deep and the magnetic field is very large, complex and more intense than that of earth. It is indeed a whole new Jupiter.
- Steven Levin has been with JPL since 1990. His areas of interest include CMB, SETI, magnetic fields and radio astronomy. He is currently Project Manager for the Juno mission, lead Co - 1 for the Juno Microwave Radiometer and lead scientist for the Goldstone Apple Valley Radio Telescope project.

## January 2022 CCAS Meeting Agenda

by *Bruce Ruggeri, CCAS Program Chair*

Our next meeting will be held on January 11, 2022, in Room 113, Merion Science Center, WCU. The meeting starts at 7:30 p.m. Guest Speaker: Brian Matisak, Deputy Director, Systems Engineering & Integration Office, NASA Space Launch System Program at the Marshall Space Flight Center. His presentation is entitled "Space Launch System: Countdown to Launch."

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 2021-2022 season and beyond. If you are interested in presenting, or know someone who would like to participate, please contact me at [programs@ccas.us](mailto:programs@ccas.us).

## Astronomers Find Sub-Neptune Planet That May Have Liquid Water, Vital Ingredient for Life

by Robert Lea, Newsweek.com



An illustration of a Sub-Neptune planet. Astronomers have discovered a new Sub-Neptune that is twice as large as Earth and could harbor liquid water.  
© Hubble/M.Kornmesser/ESA

A team of astronomers has discovered a new sub-Neptune planet orbiting a nearby dwarf star. The icy exoplanet, twice the size of the Earth with over five times its mass, orbits its star at a distance that could allow it to harbor liquid water.

That isn't all that is extraordinary about this world's orbit, however. It passes around its parent star, TOI-2257, in an extremely flattened elliptical orbit.

Yet because the exoplanet, designated TOI-2257b, is so close to its stars at just around 135 million miles away, it completes an orbit once roughly every 35 earth days.

The team's investigation of this star and its planet, which are around 188 light-years from Earth, has been pre-published on

the arXiv pre-print server.

Astronomers from institutions across the globe discovered the planet using [NASA's](#) Transiting Exoplanet Survey Satellite (TESS). The space-based telescope detects tiny dips in light that planets cause when they pass in front of their parent stars, a process known as the transit method of exoplanet detection.

TESS has been employing this technique since its launch in 2018 to search for exoplanets around 200,000 of the brightest stars in close proximity to the sun.

In its three years of operation, it has detected 4,600 possible exoplanets, of which 167 have been confirmed.

After spotting a possible trans-

iting exoplanet around the M-dwarf star TOI-2257, the team performed a follow-up investigation with telescopes here on Earth. This confirmed the presence of an exoplanet with 2.19 times the radius of earth and 5.7 times its mass.

Just because the planet is larger than Earth, that doesn't mean that its star is greater in size than our own, however.

The eight billion year-old-star TOI-2257 has just one-third the mass of the sun, and around a third of our star's mass also. It is also cooler than our star at around 3,200 degrees Celsius compared to our star's average temperature of 5,500 degrees Celsius.

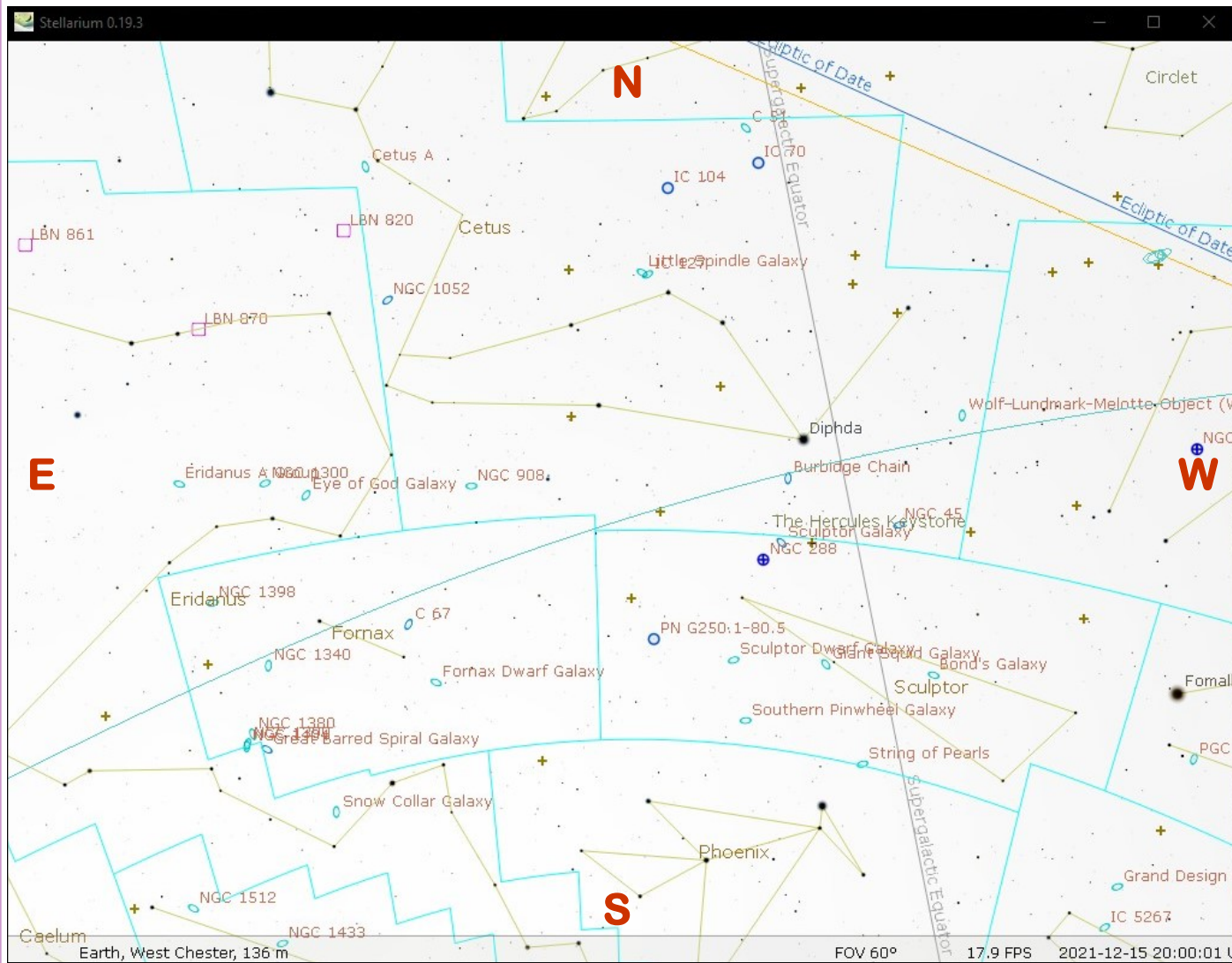
Sub-Neptunes are considered

*(Continued on page 9)*

# The Sky Over Chester County

December 15, 2021 at 8:00 p.m. ET

Note: This screen capture is taken from Stellarium, the free planetarium software available for download at [www.stellarium.org](http://www.stellarium.org).



Date	Civil Twilight Begins	Sunrise	Sunset	Civil Twilight Ends	Length of Day
12/01/2021	6:35 a.m. EST	7:05 a.m. EST	4:37 p.m. EST	5:07 p.m. EST	9h 32m 33s
12/15/2021	6:46 a.m. EST	7:17 a.m. EST	4:38 p.m. EST	5:08 p.m. EST	9h 21m 06s
12/31/2021	6:53 a.m. EST	7:24 a.m. EST	4:47 p.m. EST	5:17 p.m. EST	9h 23m 14s

Moon Phases					
			New Moon	12/04/2021	2:43 a.m. EST
First Quarter	12/10/2021	8:35 p.m. EST	Full Moon	12/18/2021	11:35 p.m. EST
Last Quarter	12/26/2021	9:23 p.m. EST			

## December 2021 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

4	<b>New Moon and total solar eclipse in Antarctica</b>
4	<b>Venus is at its brightest</b>
6	<b>Earliest sunset of the year at 4:39 p.m.</b>
6-9	<b>The Moon slides below Venus, Saturn and Jupiter</b>
10	<b>First Quarter Moon, 8:35 p.m. EST</b>
12	<b>The Lunar Straight Wall is visible</b>
14	<b>The Geminid meteor shower peaks near 3 a.m.</b>
16	<b>The nearly Full Moon is between the Hyades and the Pleiades</b>
18	<b>Full Moon, the Full Cold Moon, or the Full Long Night Moon, 11:35 p.m. EST</b>
21	<b>Winter solstice, the longest night of the year</b>
22	<b>The Ursid meteor shower peaks</b>
26	<b>Last Quarter Moon, 9:23 p.m. EST</b>
30	<b>Mercury is near Venus in early evening</b>

**The best sights this month:** There is a prediction of a comet that will be visible in binoculars in mid-December, Comet Leonard. On December 17<sup>th</sup> Comet Leonard will be 5° below Venus in the early evening sky. There will be a nice progression to watch from December 6<sup>th</sup> to 9<sup>th</sup> as the Moon slides below Venus, then Saturn, then Jupiter. And if you are willing to get up at 3 a.m. for the best viewing, the Geminid meteor shower peaks on December 14<sup>th</sup>.

**Mercury:** The end of the month presents a great opportunity to add Mercury to your viewing list. On December 28<sup>th</sup> Mercury is 4° away from Venus and by New Year's Eve Mercury is higher than Venus. Look for them about 45 minutes after sunset.

**Venus:** Our sister planet shines at its brightest of the year on December 4<sup>th</sup>, shining at a brilliant magnitude -4.9. Venus acts as a guide during December, helping us find Comet Leonard and Mercury. And on December 6<sup>th</sup> Venus is only 3° from the waxing crescent Moon.

**Mars:** Mars has entered the dawn sky and can be seen low in the southeast as morning twilight begins.

**Jupiter:** Jupiter is still quite bright at magnitude -2.3 but will dim as the month progresses. The Moon is near Jupiter on December 8<sup>th</sup> and 9<sup>th</sup>.

**Saturn:** Take your last look of 2021 at the rings of Saturn early in December. After that Saturn is too low for good viewing.

**Uranus and Neptune:** Neptune sets around 11 p.m. so seek out this distant, cold world not long after sunset. Uranus is up much later and with a good astronomy app you can star hop to this green/blue world with binoculars.

**The Moon:** Full Moon is on December 18<sup>th</sup>. This is the Full Cold Moon; or the Full Long Night Moon. It is also sometimes called the Moon before Yule. The term Long Night Moon is appropriate because the midwinter night is indeed long, and because the Moon is above the horizon for a long time. The midwinter full Moon has a high trajectory across the sky because it is opposite a low Sun. Native Canadians called this the Chief Moon.

**Constellations:** Although the temperatures are dropping, December is a wonderful time of the year for naked eye star gazing and constellation viewing. You can make great progress on the Astronomical League Constellation Hunters Club pin because as early as 6:00 several of the summer constellations are still visible such as Hercules, Lyre, Cygnus and Aquila. Then go out again at 9:00 to catch some winter constellations such as Auriga, Taurus and Orion, then take one more trip around midnight and you will see the early spring constellations such as Cancer, Gemini and even Leo the Lion leaping up from the eastern horizon.

**Messier/deep sky:** The Orion Nebula leads the list for first light with any new equipment you get for Christmas, but don't forget the three open clusters in Auriga, open cluster M35 in Gemini and the Bee-

*(Continued on page 7)*

## A Lost Piece of the Moon Has Been Discovered Orbiting the Earth and Sun

by Monisha Ravisetti, CNET.com



An artist's impression of Earth quasi-satellite Kamo`oalewa near the Earth-moon system. Astronomers using the Large Binocular Telescope have shown that it might be a lost fragment of the moon. © Addy Graham/University of Arizona Provided by CNET.

Every April, for a fleeting few weeks, the faint glow of a near-Earth asteroid curiously shimmers on scientists' telescopes. Religiously catching the annual event, a group of astronomers pieced together a surprising revelation about the little shard: It doesn't appear to be any old space rock. It looks like a broken piece of the moon.

The Ferris wheel-sized chip goes by the Hawaiian name of Kamo`oalewa, and evidence for its lunar identity was published Thursday in the journal *Nature Communications Earth & Environment*.

"I looked through every near-Earth asteroid spectrum we had access to, and nothing matched," Ben Sharkey, a graduate student in the department of planetary sciences at the University of Ari-

zona and the paper's lead author, said in a statement.

Instead, Sharkey and fellow researchers realized that the rock had a pattern of reflected light, or spectrum, very closely related to moon rocks brought back from NASA's Apollo missions.

"These challenging observations were enabled by the immense light gathering power of the twin 8.4-meter (27.5 feet) telescopes of the Large Binocular Telescope," Al Conrad, a staff scientist at the Large Binocular Telescope Observatory and co-author of the study, said in a statement.

But that's not the only proof of Kamo`oalewa's lunar origins. The quasi-satellite -- a subcategory of near-Earth asteroids that orbit both the sun and the Earth -- travels around our planet with

an unusual tilt, which is why it only shows up in the night sky once yearly.

"It is very unlikely that a garden-variety near-Earth asteroid would spontaneously move into a quasi-satellite orbit like Kamo`oalewa's," Renu Malhotra, a professor of planetary sciences at the University of Arizona, said in a statement.

She notes that the fragment won't remain in this particular orbit for very long. Estimating that it arrived in its current position 500 years ago, Malhotra believes its trajectory will change in about 300 years.

However, even with such powerful machinery and detailed orbital analysis, the team traversed a long road to unlock

*(Continued on page 11)*

## Observing (Cont'd)

(Continued from page 5)

hive Cluster M44 in Cancer, if you stay out late. Also, with Cassiopeia high in the sky this is a great time of year to see the open cluster NGC 457, also called the Owl Cluster or the ET Cluster. It really does look like the ET with bright eyes and his arms outstretched.

**Comets:** Comet C/2021 A1 Leonard has the potential to be the best comet since NEOWISE! The comet appears in the evening sky starting December 12<sup>th</sup>, with good viewing possible by the 17<sup>th</sup> when Comet Leonard will be 5° below Venus. You can find sky charts at the website of Astronomy magazine on the Sky This Week page, or use a good astronomy app.

(Continued on page 11)

## Classic La Para by Nicholas La Para

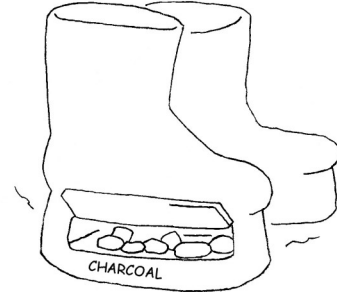
### GIFT IDEAS FOR ASTRONOMERS

USE WITH ANY TELESCOPE...

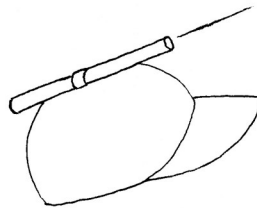
...FILTER  
WHEEL



FOOT-WARMING  
OBSERVING BOOTS



HANDS-OFF ANSWER TO

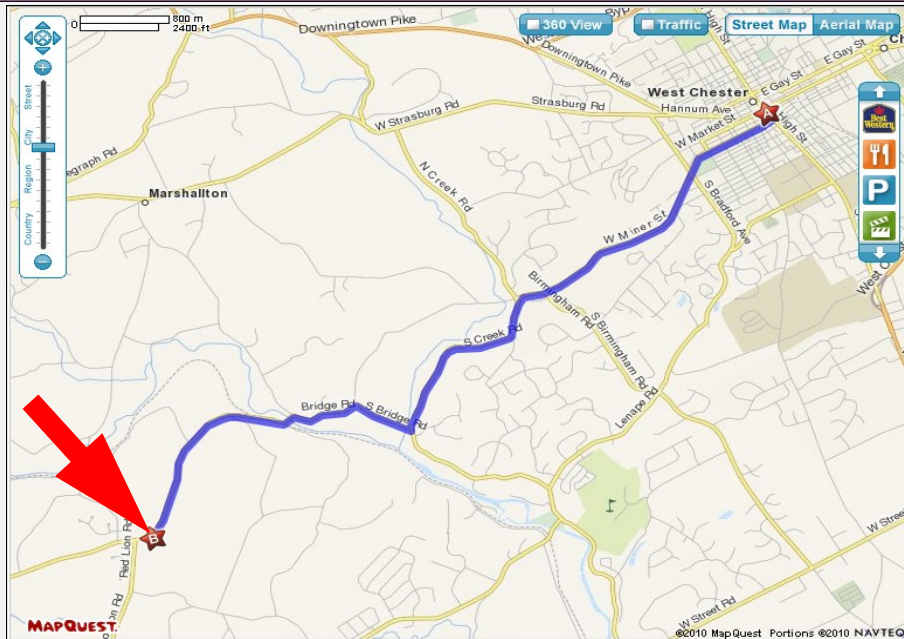


"WHAT ARE YOU LOOKING  
AT?"

SPECIALTY T-SHIRTS



## 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.

## Weird Exoplanets Made of Rocks Unlike Anything Found in the Solar System

by Robert Lea, *Newsweek.com*

Astronomers have carried out the first estimates of rock types that exist on planets orbiting nearby stars. The team found the rock types are composed of exotic and diverse materials not found anywhere in the solar system.

While astronomers have thus far discovered over 4,000 planets outside the solar system, there has not been a good consensus on what types of material make up these worlds.

In an attempt to discover this, and find out if these worlds resemble our planet, National Science Foundation's (NSF) Noirlab astronomer Siyi Xu teamed with California State University, Fresno, geologist Keith Putirka. Their findings were published in the journal *Nature Communications*.

"While some exoplanets that once orbited polluted white dwarfs appear similar to Earth, most have rock types that are exotic to our solar system," Xu said in a press release from the NSF. "They have no direct counterparts in the Solar System."

The duo studied the atmospheres around white dwarfs, the stellar remnants that are left behind when stars of a similar size to the sun exhaust their nuclear fuel and undergo gravitational collapse, shedding their outer layers in supernova explosions.

These dense collapsed stellar cores are a good choice to conduct such a survey because they are composed mostly of material that was once part of the star's core, hydrogen, and helium. However, the atmospheres around white dwarfs become

"polluted" when material from the rocky bodies, such as planets and asteroids, fall into them.

That means, that astronomers can discover what these rocky bodies were made of by studying these atmospheres and detecting materials that aren't supposed to be there.

Xu and Putirka selected 23 white dwarfs located within 650 light-years of the sun where elements such as calcium, silicon, magnesium and iron had previously been detected by telescopes like the Hubble Space Telescope.

They reconstructed the minerals and rocks that would have deposited the measured abundances of these elements.

The white dwarfs they studied had much more varied and exotic materials than is found in the inner solar system's rocky bodies. This suggests that the planets around the white dwarfs they studied had a wider range of rock types than is found in our solar system.

In fact, some of these rock types were so exotic, the duo had to provide new names for them, including "quartz pyroxenites" and "periclase dunites."

"Some of the rock types that we see from the white dwarf data would dissolve more water than rocks on Earth and might impact how oceans are developed," Putirka explained. "Some rock types might melt at much lower temperatures and produce thicker crust than Earth rocks, and some rock types might be weaker, which might facilitate the development of plate tectonics."

Previous research of polluted white dwarfs discovered elements including calcium, aluminum and lithium, which in small part compose rocks here on Earth. What Xu and Putirka suggest is that to know what kind of rocks made up exoplanets that once existed around these stellar remnants, measurements of major Earth-

*(Continued on page 9)*



*An illustration showing rocky debris around a distant white dwarf. New research has shown that exoplanets orbiting these stellar remnants could be stranger than we knew. Photo credit: NSF/AURA/J. da Silva/NOIRLab*



## Weird Exoplanets (Cont'd)

*(Continued from page 8)*

rock components like silicon need to be measured.

Because the duo detected high levels of magnesium and low levels of silicon in the atmospheres of the white dwarfs they studied, they suggest that the rocky debris that left it behind came from the interiors of exoplanets, their mantle rather than their crust.

While Putirka and Xu found no evidence of crustal rocks in their research, they can't completely rule out that the exoplanets that fell into the white dwarf had continental crust or other crust types.

Putirka added: "We believe that if crustal rock exists, we are unable to see it, probably be-

cause it occurs in too small a fraction compared to the mass of other planetary components, like the core and mantle, to be measured."

The duo's work marks the unification of astronomy and geology to learn more about the composition of planets outside our solar system and demonstrates that the Milky Way is a varied and exotic galaxy.

"I met Keith Putirka at a conference and was excited that he could help me understand the systems that I was observing," Xu concluded. "He taught me geology and I taught him astronomy, and we figured out how to make sense of these mysterious exoplanetary systems."

## CCAS Original Astrophotography

by Don Knabb, CCAS Treasurer & Observing Chair



*Don Knabb shot this image of the recent lunar eclipse on Thursday, November 18, 2021. The longest eclipse in over 600 years, it was expected to last over three hours.*

## Sub-Neptune (Cont'd)

*(Continued from page 3)*

to be planets that have a smaller radius than Neptune, but could still have more mass. Based on our current understanding, they are the most common planets in the galaxy, which makes it strange that the solar system doesn't have one.

The authors of the paper say that TOI-2257b is currently one of only around 20 known sub-Neptunes that exist in a zone around their star that allows water to exist in a liquid state. TOI-2257.

Despite having this key element for life, the authors add that life at the planet's surface is improbable due to its temperature of around -16 degrees Celsius, and its high pressure. Yet, there remains a chance that living organisms could dwell in its clouds. This is something that has been proposed before for sub-Neptunes such as TOI-2257 before.

The possibility marks this planet out as a potential target for the [James Webb Space Telescope \(JWST\)](https://www.nasa.gov/feature/jwst) following its launch in December this year.

One of the key missions of the JWST will be the investigation of the atmospheres of exoplanets in the search for the tell-tale signatures of living organisms.

The fact that the planet has an orbit with the highest eccentricity ever found around an M-star, and has the third greatest eccentricity of any discovered sub-Neptune makes it an ideal target for the study of planetary systems other than our own.

## Through the Eyepiece: The Coal Car Cluster, NGC 1981

by Don Knabb, CCAS Observing Chair & Treasurer



*Sky map made using Stellarium, the free planetarium software*

As the cold months arrive I always try to find interesting objects that can be seen using hand held binoculars. Once you have them focused, you can scan the sky with your gloves on and not get terribly cold.

Probably the best winter object to view is the Orion Nebula,

M42. NGC 1981 is a nice open cluster that is easily found after you have zeroed in on the nebula. Slowly pan your binoculars upwards from M42 toward Orion's belt stars and you should come across a small cluster of stars. This is known as the "Coal Car Cluster", and is designated

Collinder 73.

The cluster lies 1,300 light years from Earth and consists of around ten or so 6th and 7th magnitude stars forming a distinctive shape. The stars of the cluster are spread over a region

*(Continued on page 11)*

## Eyepiece (Cont'd)



Image credit: David St. Louis - M42 HaRGB Composite Feb 2012 (the original image was cropped for this article) (<https://www.flickr.com/photos/stargazerdave/6889157425/>)

(Continued from page 10)

of the sky nearly half a degree across (only slightly less than the face of the Moon) but the individual stars of the cluster are too faint to be seen with the naked eye. Some see it as the 'coal cart' while others see it as a dog. Some liken its shape to an alligator or crocodile seen from above with the easternmost star as the snout, the westernmost the tail and the two groups of three stars in the middle two sets of legs.

NGC 1981 was discovered by John Herschel on January 4<sup>th</sup>, 1827. Its apparent magnitude is 4.2. The cluster and nearby nebulae are closely related to one another, arranged together at a distance of about 1,300 light years from Earth. Some of the light by which we see the form of the Running Man Nebula to the south is reflected from the stars of the cluster.

NGC 1981 is young cluster of stars only recently formed from their surrounding nebula. Still glowing hot and blue, these stars

are still surrounded by clouds of material, remnants of the nebula from which they originally formed. NGC 1981 is not a densely populated cluster, but its comparatively bright blue stars stand out distinctly against their background. Indeed in many ways this cluster is reminiscent of the much closer Pleiades, though its relatively much greater distance means that at least binoculars are needed to fully appreciate its structure.

So, when the sky is clear and the temperatures are not too cold, take a look for the Coal Car Cluster. And if you see the alligator shape, don't worry, it won't bite.

Information sources:

<http://www.spacegazer.com/index.asp?pageid=681757>  
[https://en.wikipedia.org/wiki/NGC\\_1981](https://en.wikipedia.org/wiki/NGC_1981)  
<https://www.glyphweb.com/esky/clusters/ngc1981.html>  
<https://skyandtelescope.org/observing/overlooked-wonders-in-orions-shadow02102016/>

## Piece of Moon (Cont'd)

(Continued from page 6)

Kamo'oalewa's secret. Because of the dim orb's infrequent emergence, they had to construct their data sets over the course of several years to paint a full picture of the extraterrestrial object -- and find enough proof to confirm its lunar beginnings.

"We doubted ourselves to death," Vishnu Reddy, co-author of the study from the Lunar and Planetary laboratory at the University of Arizona, said in a statement.

The project began in 2016 and ran a few years, but in 2020 the team missed the asteroid's appearance window due to COVID-19 restrictions. Now, in 2021, they finally feel comfortable with the amount of information they've gathered to announce Kamo'oalewa's unique past. Said Sharkey, "This spring, we got much needed follow-up observations and went, 'Wow it is real.' It's easier to explain with

(Continued on page 14)

## Observing (Cont'd)

(Continued from page 7)

**Meteor showers:** The Geminid meteor shower, one of the most reliable meteor showers of the year, peaks on the night of December 13/14. The best viewing is around 3 a.m. on the 14<sup>th</sup> after the Moon has set. Up to 150 "shooting stars" per hour are possible from this shower. The Ursid meteor shower peaks on December 22<sup>nd</sup> but the Moon will wash out nearly all the "shooting stars".

## NASA Night Sky Notes: The James Webb Space Telescope: Ready for Launch!

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](https://nightsky.jpl.nasa.gov) to find local clubs, events, stargazing info and more.

NASA's James Webb Space Telescope is ready for lift-off! As of this writing (November 15), the much-anticipated next-generation space telescope is being carefully prepared for launch on December 18, 2021, and will begin its mission to investigate some of the deepest mysteries of our universe.

The development of the Webb began earlier than you might expect – the concept that would develop into Webb was proposed even before the launch of the Hubble in the late 1980s! Since

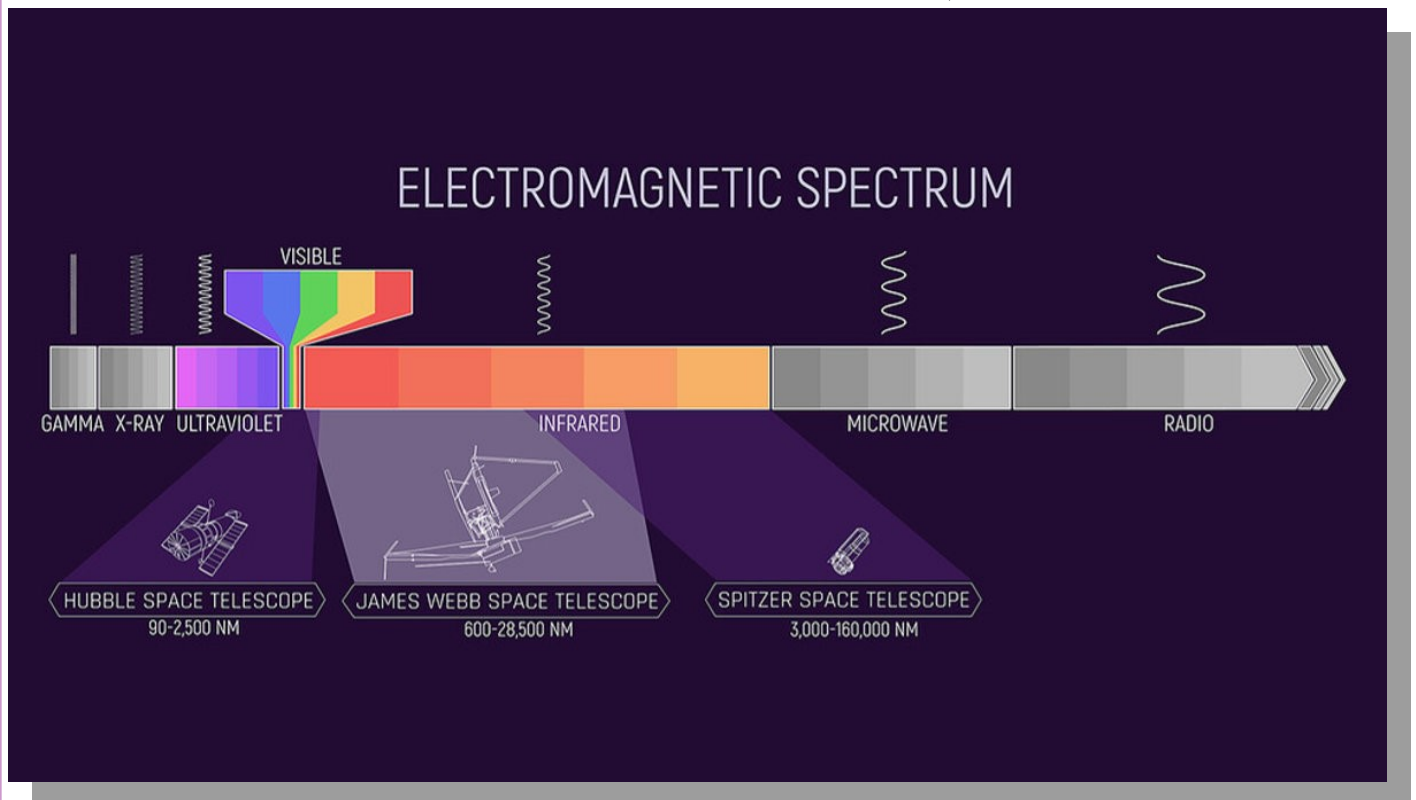


then, its design underwent many refinements, and the telescope experienced a series of delays during construction and testing. While frustrating, the team needs to ensure that this extremely complex and advanced scientific instrument is successfully launched and deployed. The Webb team can't take any

chances; unlike the Hubble, orbiting at an astronaut-serviceable 340 miles (347 km) above Earth, the Webb will orbit about one million miles away (or 1.6 million km), at Lagrange Point 2. Lagrange Points are special positions where the gravitational influence between two different bodies, like the Sun and Earth, "balance out," allowing objects like space telescopes to be placed into stable long-term orbits, requiring only minor adjustments - saving Webb a good deal of fuel.

Since this position is also several times further than the Moon, Webb's sunshield will safely cover the Moon, Earth, and Sun and block any potential interfer-

*(Continued on page 13)*



Webb will observe a wide band of the infrared spectrum, including parts observed by the Hubble - which also observes in a bit of ultraviolet light as well as visible - and the recently retired Spitzer Space Telescope. Webb will even observe parts of the infrared spectrum not seen by either of these missions! Credits: NASA and J. Olmstead (STScI)

## Night Sky Notes (Cont'd)

(Continued from page 12)

ence from their own infrared radiation. Even the seemingly small amount of heat from the surfaces of the Earth and Moon would interfere with Webb's extraordinarily sensitive infrared observations of our universe if left unblocked. More detailed information about Webb's orbit can be found at [bit.ly/webborbitinfo](http://bit.ly/webborbitinfo), and a video showing its movement at [bit.ly/webborbitvideo](http://bit.ly/webborbitvideo).

Once in its final position, its sunshield and mirror fully deployed and instruments checked out, Webb will begin observing! Webb's 21-foot segmented mirror will be trained on targets as fine and varied as planets, moons, and distant objects in our outer Solar System, active centers of galaxies, and some of the most distant stars and galaxies in our universe: objects that may be some of the first luminous objects formed after the Big Bang! Webb will join with other observatories to study black holes - including the one lurking in the center of our galaxy, and will study solar systems around other stars, including planetary atmospheres, to investigate their potential for hosting life.

Wondering how Webb's infrared observations can reveal what visible light cannot? The "Universe in a Different Light" Night Sky Network activity can help - find it at [bit.ly/different-light-nsn](http://bit.ly/different-light-nsn). Find the latest news from NASA and Webb team as it begins its mission by following #UnfoldTheUniverse on social media, and on the web at [nasa.gov/webb](http://nasa.gov/webb).

## Astronomical League Constellation Hunter Program

by Don Knabb, CCAS Treasurer & Observing Chair



Lapel pin awarded by Astronomical League upon completion of the Constellation Hunter Program.

As a member of the Chester County Astronomical Society, you are a member of the Astronomical League (AL), and AL members qualify to participate in over 60 observing programs offered by the Astronomical League.

The Constellation Hunter Program is a great way for new members to enjoy astronomy by learning the night sky. And for any long-time member who has not yet learned the sky, doing so will expand their observing skills.

The purpose of this program is to provide an orientation to the sky for novice astronomers. No special observing equipment is needed. All you need is a sky chart (paper or electronic) and a reference for the brighter star names. The objectives are to:

1. Provide a forum for the novice observer to become more

2. familiar with the constellations and brighter stars;
2. Begin to learn to navigate among the stars;
3. Provide a solid foundation for moving on to other observation programs.

Upon completion, you will receive a certificate, a lapel pin and your name will be listed in the Astronomical League quarterly magazine, *The Reflector*.

So – what do you need to do? Observe and sketch all the constellations in the Northern sky. This can take up to a year for all the constellations to come into view (unless you like staying up really late or getting up well before the Sun).

Resources can be found on the website of the Mid East Region of the Astronomical League (MERAL) here: <https://www.meralastronomy.org/constellation-hunter>

## 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).



### Piece of Moon (Cont'd)

*(Continued from page 11)*

the moon than other ideas."

There's just one unanswered question: How did Kamo'olewa break off the moon?

As this is the first near-Earth asteroid to indicate lunar properties, it's still unclear whether the space rock is an anomaly or if there are other moon fragments lurking in the solar system, waiting to be found.

### CCAS Membership Information and Society Financials

#### Treasurer's Report by Don Knabb

##### Nov. 2021 Financial Summary

Beginning Balance	\$542
Deposits	\$140
Disbursements	-\$0
Ending Balance	\$682

#### New Member Welcome!

Welcome to our new CCAS member Ashesh Gandhi from West Chester, 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](mailto: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**

PENNSYLVANIA OUTDOOR



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](mailto:newsletter@ccas.us)

Or mail the contribution, typed or handwritten, to:

**Dr. John C. Hepler**  
21 Medinah Drive  
Reading, PA 19607

### 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](mailto: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](mailto: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  
484-883-0533

**Public Relations:** Ann Miller  
610-558-4248



### CCAS Membership Information

The 2021 membership rates are as follows:

**REGULAR MEMBER.....**\$30/year  
**SENIOR MEMBER.....**\$15/year  
**STUDENT MEMBER.....**\$ 5/year  
**JUNIOR MEMBER.....**\$ 5/year  
**FAMILY MEMBER.....**\$40/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](mailto:treasurer@ccas.us)

### Sky & Telescope Magazine

The club membership subscription cost for *Sky and Telescope* magazine has increased to **\$43.95**. This is still a good saving from the regular rate of **\$54.95**.

There is no need to go through the CCAS treasurer for subscriptions or renewals. Just go to the Sky and Telescope website and select "Magazine", then under the FAQs you can subscribe at the club rate.

<https://skyandtelescope.org/subscribe/>

If you have **any** questions call Don Knabb 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).

There is no need to go through the CCAS treasurer for subscriptions or renewals. Just call customer service at 877-246-4835 and request the club rate for your new subscription or renewal.