Observations

A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 30, No. 12 ***Three-Time*** *Winner of the Astronomical League's Mabel Sterns Award ☼ 2006, 2009 & 2016* *December 2022*

In This Issue

Membership Renewals Due

12/2022	Damerau DeAngelo DellaPenna Gandhi Moynihan O'Leary Orso Watson & Metts
01/2023	Carlton Johnson Kellerman Kovacs LaFrance McDevitt McElwee Reynolds Schier
02/2023	Murphy Ruggeri Sutton Tronel

Merry Christmas & Happy New Year!

Best wishes for a healthy and happy new year, with plenty of clear, dark skies!

December 2022 Dates

1st • The Moon is near Jupiter

7th • Mars brushes by the Full Moon around 11 p.m. EST

7th • Full Moon, the Full Cold Moon or the Full Chief Moon, 11:08 P.M. EST

16th • Last Quarter Moon, 3:56 P.M. EST

17th • The Geminid meteor shower peaks

21st • Winter solstice, 4:48 P.M. EST

23rd • New Moon, 5:17 a.m. EST

29th • First Quarter Moon, 8:21 p.m. EST

CCAS Holiday Party

CCAS will host its annual holiday party for members and their families on Tuesday, December 6, 2022. This year, well meet at Iron Hill Brewery in West Chester from 6 p.m. to 9 p.m. The restaurant is located at 3 West Gay St. and its phone number is 610-738-9600.

The restaurant has a back room that will be ours for the evening. We can order anything off the full menu and we will be provided separate checks.

As is common for all large groups at a restaurant, a gratuity will be added to everyone's check. There are two parking garages about one block away.

Autumn / Winter Society Events

December 2022

6th • Annual Holiday Party, Iron Hill Tavern, West Chester, PA. From 6pm to 9pm..

9th • Planetarium show at the Mather Planetarium at WCU, "Once in a Blue Moon…" For more information, visit the WCU Public Planetarium Shows webpage.

20th • Open call for articles and photographs for the January 2023 edition of Observations.

21st • Winter Solstice (4:48 P.M. EST) - The South Pole of the earth will be tilted toward the Sun, which will have reached its southernmost position in the sky and will be directly over the Tropic of Capricorn at 23.44 degrees south latitude. This is the first day of winter (winter solstice) in the northern hemisphere and the first day of summer (summer solstice) in the southern hemisphere.

26th • Deadline for newsletter submissions for the January 2023 edition of Observations.

January 2023

10th • CCAS Monthly Meeting, Merion Science Center, Room 112. Guest Speaker: TBA.

20th • Open call for articles and photographs for the February 2023 edition of Observations.

26th • Deadline for newsletter submissions for the February 2023 edition of Observations.

27th • Planetarium show at the Mather Planetarium at WCU, "Jupiter: King of the Planets." For more information, visit the WCU Public Planetarium Shows webpage.

Monthly Meeting Minutes: November 8, 2022

by Bea Mazziotta, CCAS Secretary

- Dave Hockenberry welcomed members and guests to the meeting which was held in person at WCU and online via zoom and YouTube.
- He thanked participating members for the recent successful viewing event at Wolf's Hollow Park in Atglen. Approximately 45 attended, including many Girl Scouts.
- He announced the date (12/6) for the annual CCAS holiday gathering. Original plans to meet at a brew pub in Avondale were recently changed. The event will now take place at Iron Hill in West Chester. The party will be held in lieu of the December meeting.
- He advised members that some changes to the club constitution had been made at a recent executive board meeting. A vote on the final draft will take place in early 2023.
- Don Knabb took attendees on a tour of the November night sky. Objects to view now include the Cygnus Star Chain (good for binocular viewing), Andromeda galaxy, Herschel's garnet star in Cepheus and Orion with its amazing nebula.
- Bruce Ruggeri introduced the evening's guest speaker, Dr. Joseph "Joey" Neilsen.
  - Dr. Neilsen is an Assistant Professor of Physics at Villanova University. He is an expert in X-ray observations of black holes. His presentation was titled: *The Shadow of a Sleeping Giant - An Astrophysical Adventure.*
  - Dr. Neilsen, a member of the Event Horizon Telescope Collaboration, helped produce the first image of the supermassive black hole at the center of the Milky Way.
  - The team networked telescopes from around the globe and stitched them together to create the one giant telescope needed to image our black hole.
  - Sagittarius A is about 400 times the mass of our sun and 27,000 light years away from earth.
  - Dr. Neilsen discussed the team's efforts and physical processes that occur around astrophysical black holes.

January 2023 CCAS Meeting Agenda

by Bruce Ruggeri, CCAS Program Chair

Our next meeting will be held on January 10, 2023, in person (as well as via Zoom) at West Chester University's Merion Science Center, Room 112. The Science Center is located at 720 S. Church St., West Chester, PA. The meeting agenda was still being finalized as of publication of this month's newsletter.

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 2023-2024 season and beyond. If you are interested in presenting, or know someone who would like to participate, please contact me at programs@ccas.us.

Non-Detection of Key Signal Allows Astronomers to Determine What the First Galaxies Were Like

by University of Cambridge, courtesy ScienceDaily.com

The indigenously-made SARAS3 telescope was deployed over a lake in northern Karnataka in early 2020.

Researchers have been able to make some key determinations about the first galaxies to exist, in one of the first astrophysical studies of the period in the early Universe when the first stars and galaxies formed, known as the cosmic dawn.

Using data from India's SARAS3 radio telescope, researchers led by the University of Cambridge were able to look at the very early Universe—just 200 million years after the Big Bang—and place limits on the mass and energy output of the first stars and galaxies.

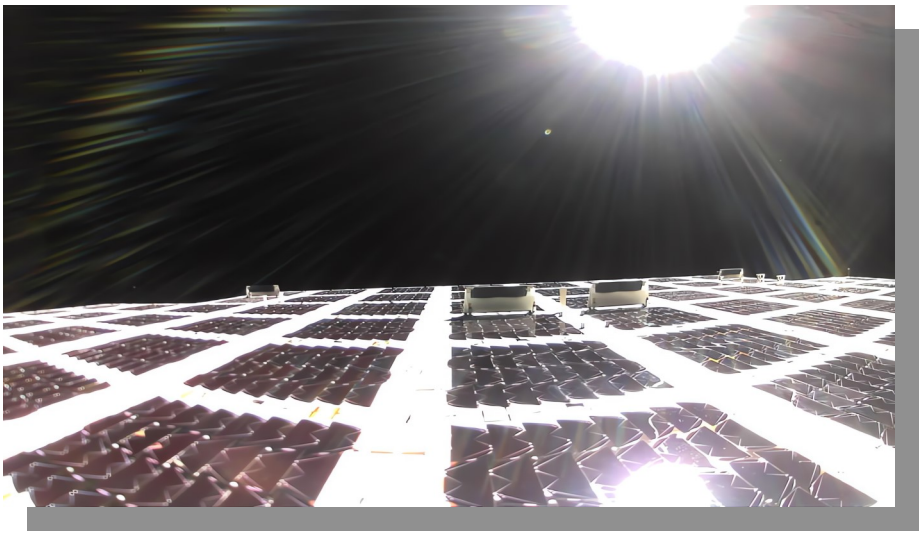
Counterintuitively, the researchers were able to place these limits on the earliest galaxies by not finding the signal they had been looking for, known as the 21-centimetre hydrogen line.

This non-detection allowed the

(Continued on page 12)

A New Satellite Is One of the Brightest Objects in the Sky, and It's a Big Problem

by David Nield, courtesy ScienceAlert.com



693-square foot array on Blue Walker 3 successfully completed deployment. (Photo: Business Wire)

We're putting more and more satellites into orbit, and along with all the welcome technological and scientific advances that brings, there are also potential problems.

Intended to be the start of an orbiting communications network that can be accessed by standard smartphones, the recently launched prototype BlueWalker 3 satellite is now one of the brightest objects in the night sky.

For experts and enthusiasts who peer out into space, that's a major issue. While astronomers have a few telescopes high above, many of our observations on the Universe are logged from Earth's surface.

All but the brightest stars can now be outshone by the satellite's glare, according to the International Astronomical Union Center for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference (IAU CPS).

"BlueWalker 3 is a big shift in the constellation satellite issue and should give us all reason to pause," says Piero Benvenuti, the Director of the IAU CPS.

"It's like exactly what astronomers don't want," astronomer

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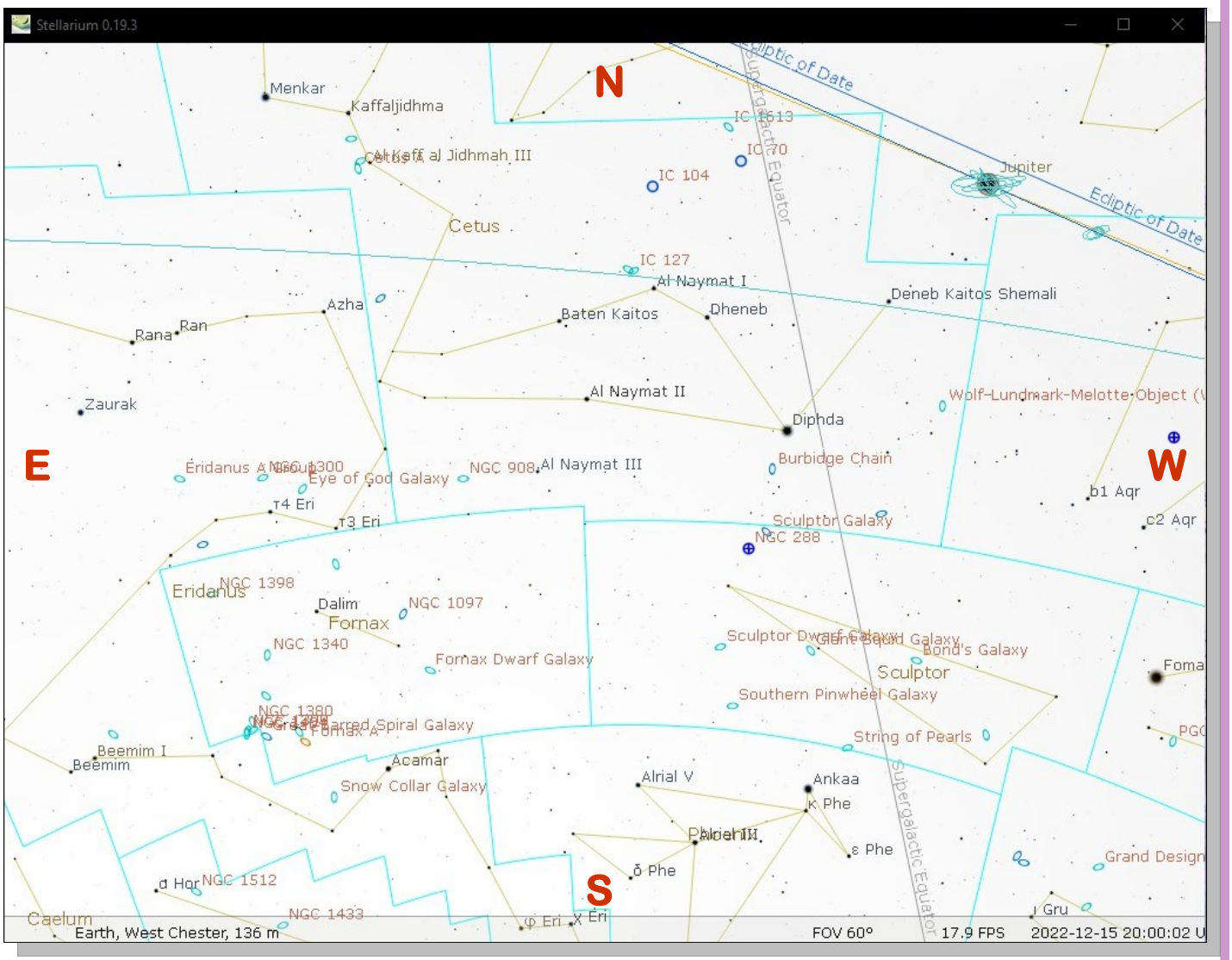
The Sky Over Chester County

December 15, 2022 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.



Date	Civil Twilight Begins	Sunrise	Sunset	Civil Twilight Ends	Length of Day
12/01/2022	6:34 a.m. EST	7:04 a.m. EST	4:37 p.m. EST	5:07 p.m. EST	9h 32m 51s
12/15/2022	6:46 a.m. EST	7:16 a.m. EST	4:38 p.m. EST	5:08 p.m. EST	9h 21m 11s
12/31/2022	6:53 a.m. EST	7:24 a.m. EST	4:47 p.m. EST	5:17 p.m. EST	9h 23m 04s

Moon Phases					
			Full Moon	12/07/2022	11:08 p.m. EST
Last Quarter	12/16/2022	3:56 p.m. EST	New Moon	12/23/2022	5:17 a.m. EST
First Quarter	12/29/2022	8:21 p.m. EST			

December 2022 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

1	The Moon is near Jupiter
1	The Lunar Straight Wall is visible this evening
1	Mars closest approach to Earth for this year
7	Mars brushes by the Full Moon around 11 p.m.
7	Full Moon, the Full Cold Moon or the Full Chief Moon, 11:08 P.M. EST
8	Mars is at opposition, 1 a.m. EST
14	The Geminid meteors peak today, best viewed in the pre-dawn sky
16	Last Quarter Moon, 3:56 P.M. EST
21	Mercury at greatest elongation this evening
21	Winter solstice, 4:48 P.M. EST
22	Ursid meteors peak today, best viewed in the pre-dawn sky
23	New Moon, 5:17 A.M. EST
29	First Quarter Moon, 8:21 P.M. EST
31	The Lunar Straight Wall is visible this evening

Best viewing this month: Mars is the lead performer during December. On December 1st Mars is at its closest approach of the year. Then on December 7th around 11 p.m. Mars brushes by the Moon, almost touching. The next day is when Mars is at opposition, the point in its orbit when it is opposite the Sun and therefore in the sky all night.

The other highlight of every December is the Geminid meteor shower, the most reliable shower of the year. This year the shower peaks during the early morning hours of December 14th. Over 100 meteors per hour are possible at the peak.

And it is impossible to miss bright Jupiter shining high in the south just after sunset. Binoculars will reveal the 4 Galilean moons and a telescope will allow you to see the cloud bands on the planet.

Mercury: Look for Mercury on December 21st when it will be at its highest point in the sky for the month, but you will still need a view with a low western horizon.

Venus: Our sister planet reappears in the evening sky at the very end of December. Look for it low in the west just as the sky darkens at the end of the month.

Mars: As mentioned in the monthly highlights, on December 1st Mars is at its closest approach of the year. Then on December 7th around 11 p.m. Mars brushes by the Moon, almost touching. The next day is when Mars is at opposition, the point in its orbit when it is opposite the Sun and therefore in the sky all night. In late November I observed Mars and was able to see dark surface features and perhaps a hint of a polar ice cap!

Jupiter: Jupiter is at center stage as darkness falls. Don't miss the opportunity to see the king of the planets!

Saturn: Look for Saturn just after the sky darkens, low in the west. Saturn sets around 8 p.m. at the end of the month.

Uranus and Neptune: Uranus is about half-way between Jupiter and Mars and can be found using binoculars and an app on a mobile device by star hopping. Neptune requires a telescope to be viewed and is to the right of Jupiter with some careful star hopping.

The Moon: Full Moon is on December 7th. 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 or the Elder Moon.

Constellations: Ah, December skies! It's cold enough to be quite clear, but not the freezing, bone chilling cold of January and February. It seems odd to go outside after sunset and still see the Summer Triangle, but indeed there it is diving into the west. Look to the east and you will see the constellations that make it worth dressing warmly and spending some time outside during the cold December nights.

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Through the Eyepiece: NGC 2169, the "37 Cluster"

by Don Knabb, CCAS Observing Chair & Treasurer

Since I mentioned the "37 Cluster" at our November meeting, I thought I'd provide more information about this unique cluster.

The constellation Orion the Hunter is a joy to behold on cold winter nights. With just a set of binoculars we can see the fuzzy spot that is the Orion Nebula, M42. With a telescope the nebula comes alive with structure and the Trapezium, the 4 stars at the heart of the nebula, are visible. I also enjoy using binoculars to see the "S" curve of stars that are on the right side of Orion's belt.

But that's not all that Orion has to offer stargazers. There are numerous less flashy but interesting deep sky objects scattered about the constellation.

One of my favorites is NGC 2169, an open cluster that was perhaps discovered by Giovanni Batista Hodierna before 1654 (but his description is not sufficient for a confirmed identification) and was independently discovered by William Herschel on October 15, 1784.

Photo credit https://commons.wikimedia.org/wiki/File:NGC_2169.jpg by Scott Rak, Creative Commons file

NGC 2169 is also called the "37 Cluster" and the reason for this name can be seen in the photo by Scott Rak from the Wikipedia page on this cluster.

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Chart credit: screen print from Stellarium planetarium software (Stellarium.org)

Eyepiece (Cont'd)

(Continued from page 6)

The brighter stars of open cluster NGC 2169 seem to form a cosmic 37. Of course, the improbable numerical asterism appears solely by chance and depending on the optics of your telescope it might be an upside down 37 or a backward 73. As far as galactic or open star clusters go, NGC 2169 is a small one, spanning about 7 light-years.

It is not difficult to find NGC 2169. The 37 Cluster is near the elbow of the arm Orion is using to hold his club overhead and forms a triangle with Nu and Xi Orionis as seen in the screen capture I took from Stellarium planetarium software.

At its distance of about 3600 light-years, open cluster NGC

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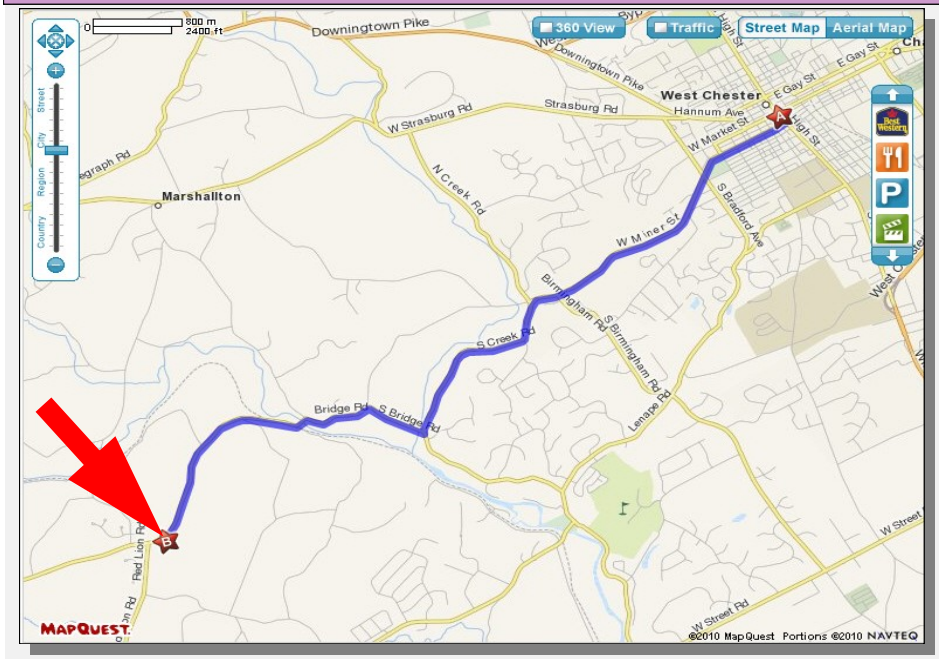
Classic La Para

by Nicholas La Para

CCAS Directions



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.

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).

NASA's James Webb Telescope Unveils a Stunning New View of the Pillars of Creation
by Sam Tonkin, courtesy DailyMail.com

Almost 30 years ago the Pillars of Creation stunned the astronomy world when they were captured by NASA's famed Hubble Space Telescope. Now a new generation can enjoy a fresh view of the haunting scene after the U.S. space agency's $10 billion super space telescope James Webb imaged the same finger-like tendrils of gas and dust (pictured).

Almost 30 years ago the Pillars of Creation stunned the astronomy world when they were captured by NASA's famed Hubble Space Telescope.

Now a new generation can enjoy a fresh view of the haunting scene after the US space agency's $10 billion super space telescope James Webb imaged the same finger-like tendrils of gas and dust.

Resembling a ghostly hand, the Pillars of Creation are part of the Eagle Nebula - which is 6,500 light-years away from Earth - and are known for being a source of star formation.

This week NASA and the European Space Agency revealed

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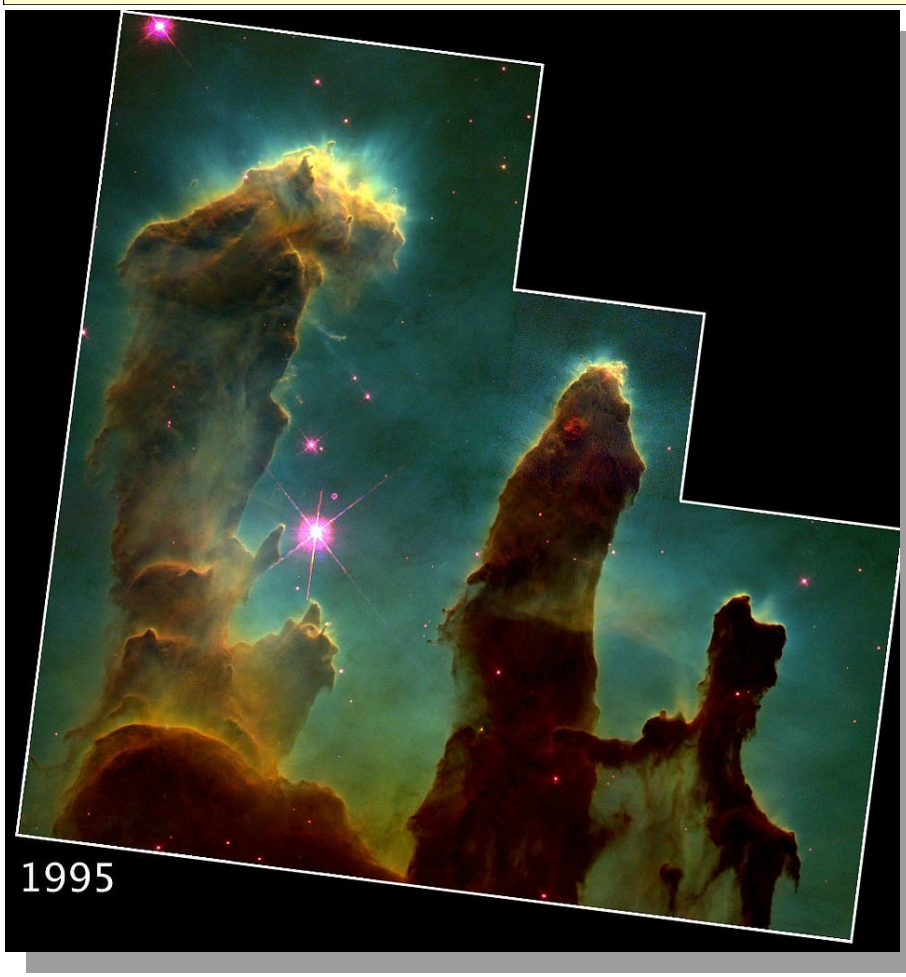
Pillars of Creation (Cont'd)



The first image of the Pillars of Creation was taken by Hubble in 1995. It provided the first evidence that stars could be birthed within the pillars. Image courtesy NASA.

(Continued from page 8)

another look at the pillars from the sharp eyes of Webb.

The latest image was taken in mid-infrared light, which blocks out the brightness of stars so it only captures the flowing gas and dust. This provided a new way of experiencing and understanding the stunning formation.

Webb has instruments that see in different wavelengths of infrared.

In October, experts released a Pillars of Creation image from the Near-Infrared Camera (NIRCam), before following that up with an image from its Mid-Infrared Instrument (MIRI).

They have now put the images together to produce a haunting image that features the best of both views, showcasing glowing edges of dust where young stars are beginning to form.

NIRCam reveals newly-formed stars in orange outside the pillars, while MRI showcases the layers of dust in the formation.

"This is one of the reasons why the region is overflowing with stars - dust is a major ingredient of star formation," NASA said.

The glowing red fingertip on the second pillar suggests active star formation, but the stars are just babies—NASA estimates them to be only a few 100,000 years old. They take millions of years to fully form.

"By combining images of the iconic Pillars of Creation from two cameras aboard NASA's James Webb Space Telescope, the universe has been framed in its infrared glory," the Webb team wrote.

They said it "set this star-forming region ablaze with new details."

When knots of gas and dust with sufficient mass form in the pillars, they begin to collapse under their own gravitational attraction, slowly heat up, and eventually form new stars.

"Newly-formed stars are especially apparent at the edges of the top two pillars—they are practically bursting onto the scene," the Webb team said.

Almost everything you see in this scene is local. The distant universe is largely blocked from our view both by the interstellar medium, which is made up of sparse gas and dust located between the stars, and a thick dust lane in our Milky Way galaxy.

"As a result, the stars take center stage in Webb's view of the Pillars of Creation."

The Pillars of Creation are located in the constellation Serpens.

NASA Night Sky Notes: Cepheus—A House Fit for a King

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.

Do you want to peer deeper into the night sky? Are you feeling the urge to buy a telescope? There are so many options for budding astronomers that choosing one can be overwhelming. A first telescope should be easy to use and provide good quality views while being affordable. As it turns out, those requirements make the first telescope of choice for many stargazers something unexpected: a good pair of binoculars!

Binoculars are an excellent first instrument because they are

generally easy to use and more versatile than most telescopes. Binoculars can be used for activities like stargazing and birdwatching, and work great in the field at a star party, along the hiking trail, and anywhere else where you can see the sky. Binoculars also travel well, since they easily fit into carry-on luggage – a difficult feat for most telescopes! A good pair of binoculars, ranging in specifications from 7x35 to 10x50, will give you great views of the Moon, large open star clusters like the Pleiades (M45), and, from dark skies, larger bright galaxies like the Andromeda Galaxy (M31) and large nebulae like the Orion Nebula (M42). While you likely won't be able to see Saturn's rings, as you practice your observing skills you may be able to spot Jupiter's moons, along with some globular clusters and fainter nebulae from dark sites, too.

What do the numbers on those binocular specs actually mean?

(Continued on page 11)

The two most popular types of binocular designs are shown here: roof-prism binoculars (left) and porro-prism binoculars (right). Roof prisms tend to be more compact, lighter, and a bit more portable, while porro-prisms tend to be heavier but often offer wider views and greater magnification. What should you choose? Many birders and frequent fliers often choose roof-prism models for their portability. Many observers who prefer to observe fainter deep-sky objects or who use a tripod with their observing choose larger porro-prism designs. There is no right answer, so if you can, try out both designs and see which works better for you.

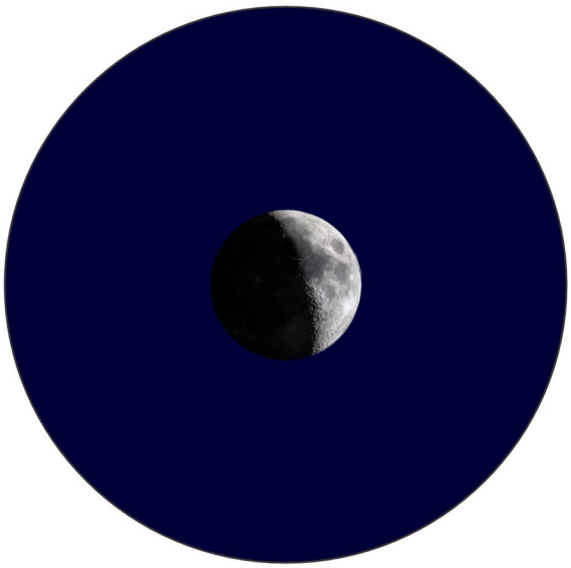
Night Sky Notes (Cont'd)

(Continued from page 10)

The first number is the magnification, while the second number is the size in millimeters (mm) of the lenses. So, a 7x35 pair of binoculars means that they will magnify 7 times using lenses 35 mm in diameter. It can be tempting to get the biggest binoculars you can find, but try not to get anything much more powerful than a 10x50 pair at first. Larger binoculars with more power often have narrower fields of vision and are heavier; while technically more powerful, they are also more difficult to hold steadily in your hands and "jiggle" quite a bit unless you buy much more expensive binoculars with image stabilization, or mount them to a tripod.

Would it surprise you that amazing views of some astronomical objects can be found not just from giant telescopes, but also from seemingly humble binoculars? Binoculars are able to show a much larger field of view of the sky compared to most telescopes. For example, most telescopes are unable to keep the entirety of the Pleiades or Andromeda Galaxy entirely inside the view of most eyepieces. Binoculars are also a great investment for more advanced observing, as later on they are useful for hunting down objects to then observe in more detail with a telescope.

If you are able to do so, real-world advice and experience is still the best for something you will be spending a lot of time with! Going to an in-person star party hosted by a local club is a great way to get familiar with telescopes and binoculars of all kinds – just ask permission before taking a closer look! You can find clubs and star parties near you on the Night Sky Network's Clubs & Events page at bit.ly/nsnclubsandevents, and inspire your binocular stargazing sessions with NASA's latest discoveries at nasa.gov.



A pair of good binoculars can show craters on the Moon around 6 miles (10 km) across and larger. How large is that? It would take you about two hours to hike across a similar-sized crater on Earth. The "Can You See the Flag On the Moon?" handout showcases the levels of detail that different instruments can typically observe on the Moon, available at bit.ly/flagmoon. Moon image courtesy Jay Tanner

Observing (Cont'd)

(Continued from page 5)

Bright Capella in Auriga is high in the east to the upper left of the "V" of Taurus the Bull. Just behind Taurus is Orion the Hunter, the most easily recognized constellation of the winter months.

Messier/deep sky: There is so much to see in the December sky you won't be lacking targets if Santa brought you any new astronomy equipment! If it is not too cold, there is a long list of beautiful objects in easy reach of even a small telescope or any pair of binoculars. First look for the Andromeda galaxy high in the south, then head east to the three open clusters in Auriga. Use a low power eyepiece in your telescope and zoom in to the Pleiades, although they are better captured in binoculars. Then look nearly straight up and find the Double Cluster in Perseus. And of course, don't miss M42, the Orion Nebula, which is a truly awesome telescopic object.

Comets: There are no bright comets visible during December.

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 after 11:00 p.m. on the 13th through the early morning hours of the 14th. Over 100 "shooting stars" per hour are possible from this shower. Then of December 22nd the Ursid meteor shower peaks. This shower pales in comparison to the Geminids but is still worth a look.

First Galaxies (Cont'd)

(Continued from page 3)
researchers to make other determinations about the cosmic dawn, placing restraints on the first galaxies, enabling them to rule out scenarios including galaxies which were inefficient heaters of cosmic gas and efficient producers of radio emissions.

While we cannot yet directly observe these early galaxies, the results, reported in the journal Nature Astronomy, represent an important step in understanding how our Universe transitioned from mostly empty to one full of stars.

Understanding the early Universe, when the first stars and galaxies formed, is one of the major goals of new observatories. The results obtained using the SARAS3 data are a proof-of-concept study that paves the way to understanding this period in the development of the Universe.

The SKA project -- involving two next-generation telescopes due to be completed by the end of the decade -- will likely be able to make images of the early Universe, but for current telescopes the challenge is to detect the cosmological signal of the first stars re-radiated by thick hydrogen clouds.

This signal is known as the 21-centimetre line -- a radio signal produced by hydrogen atoms in the early Universe. Unlike the recently launched JWST, which will be able to directly image individual galaxies in the early Universe, studies of the 21-centimetre line, made with radio telescopes such as the Cambridge-led REACH (Radio Experiment for the Analysis of Cosmic Hydrogen), can tell us about entire populations of even earlier galaxies. The first results are expected from REACH early in 2023.

To detect the 21-centimetre line, astronomers look for a radio signal produced by hydrogen atoms in the early Universe, affected by light from the first stars and the radiation behind the hydrogen fog. Earlier this year, the same researchers developed a method which they say will allow them to see through the fog of the early universe and detect light from the first stars. Some of these techniques have been already put to practice in the current study.

In 2018, another research group operating the EDGES experiment published a result that hinted at a possible detection of this earliest light. The reported signal was unusually strong compared to what is expected in the simplest astrophysical picture of the early Universe. Recently, the SARAS3 data disputed this detection: the EDGES result is still awaiting confirmation from independent observations.

In a re-analysis of the SARAS3 data, the Cambridge-led team tested a variety of astrophysical scenarios which could potentially explain the EDGES result, but they did not find a corresponding signal. Instead, the team was able to place some limits on properties of the first stars and galaxies.

The results of the SARAS3 analysis are the first time that radio observations of the averaged 21-centimetre line have been able to provide an insight to the properties of the first galaxies in the form of limits of their main physical properties.

Working with collaborators in India, Australia and Israel, the Cambridge team used data from the SARAS3 experiment to look for signals from cosmic dawn, when the first galaxies formed. Using statistical modelling techniques, the researchers were not able to find a signal in the SARAS3 data.

"We were looking for a signal with a certain amplitude," said Harry Bevins, a PhD student from Cambridge's Cavendish Laboratory and the paper's lead author. "But by not finding that signal, we can put a limit on its depth. That, in turn, begins to inform us about how bright the first galaxies were."

"Our analysis showed that the hydrogen signal can inform us about the population of first stars and galaxies," said co-lead author Dr Anastasia Fialkov from Cambridge's Institute of Astronomy. "Our analysis places limits on some of the key properties of the first sources of light including the masses of the earliest galaxies and the efficiency with which these galaxies can form stars. We also address the question of how efficiently these sources emit X-ray, radio and ultraviolet radiation."

"This is an early step for us in what we hope will be a decade of discoveries about how the Universe transitioned from darkness and emptiness to the complex realm of stars, galaxies and other celestial objects we can see from Earth today," said

(Continued on page 13)

Eyepiece (Cont'd)

(Continued from page 7)

2169 shines at a total brightness of 5.9 magnitudes. The cluster is made up of approximately 30 stars.

Formed at the same time from the same cloud of dust and gas, the stars of NGC 2169 are only about 8 million years old. Such clusters are expected to disperse over time as they encounter other stars, interstellar clouds, and experience gravitational tides while traveling through the galaxy. Over four billion years ago, our own Sun was likely formed in a similar open cluster of stars.

Information credits:

- http://www.seds.org/messier/xtra/ngc/n2169.html
- http://en.wikipedia.org/wiki/NGC_2169
- http://antwrp.gsfc.nasa.gov/apod/ap051118.html

BlueWalker 3 (Cont'd)

(Continued from page 3)

Meredith Rawls, from the University of Washington in Seattle, told *Science*. "It'll show up as a super bright streak in images and potentially saturate camera detectors at observatories."

BlueWalker 3 is certainly an impressive bit of hardware. Its 693-square-foot (64-square-meter) antenna array is the largest commercial array in low Earth orbit, capable of reflecting much more light than the SpaceX Starlink satellites, for example.

The intention of parent company AST SpaceMobile is to get more than 100 satellites up in the sky by the end of 2024, many potentially even bigger than BlueWalker 3. That's a significant worry for scientists.

There's another concern too: BlueWalker 3 is built to act as a cell phone tower in space, which means it uses terrestrial radio frequencies that might interfere with radio telescopes – telescopes that are currently built well away from areas with mobile phone coverage.

"Frequencies allocated to cell phones are already challenging to observe even in radio quiet zones we have created for our facilities," says Philip Diamond, Director-General at the Square Kilometer Array Observatory, headquartered in the UK.

"New satellites such as BlueWalker 3 have the potential to worsen this situation and compromise our ability to do science if not properly mitigated."

Representatives from the IAU CPS and its partners are also keen to acknowledge the potential for satellites to improve worldwide communications, but they want more discussions to happen over the "equitable and sustainable use of space".

The U.S. Federal Communications Commission (FCC) is responsible for regulating commu-

(Continued on page 14)

First Galaxies (Cont'd)

Dr Eloy de Lera Acedo from Cambridge's Cavendish Laboratory, who co-led the research.

The observational study, the first of its kind in many respects, excludes scenarios in which the earliest galaxies were both more than a thousand times as bright as present galaxies in their radio-band emission and were poor heaters of hydrogen gas.

"Our data also reveals something which has been hinted at before, which is that the first stars and galaxies could have had a measurable contribution to the background radiation that appeared as a result of the Big Bang and which has been travelling towards us ever since," said de Lera Acedo, "We are also establishing a limit to that contribution."

"It's amazing to be able to look so far back in time -- to just 200 million years after the Big Bang-and be able to learn about the early Universe," said Bevins.

The research was supported in part by the Science and Technology Facilities Council (STFC), part of UK Research & Innovation (UKRI), and the Royal Society. The Cambridge authors are all members of the Kavli Institute for Cosmology in Cambridge.

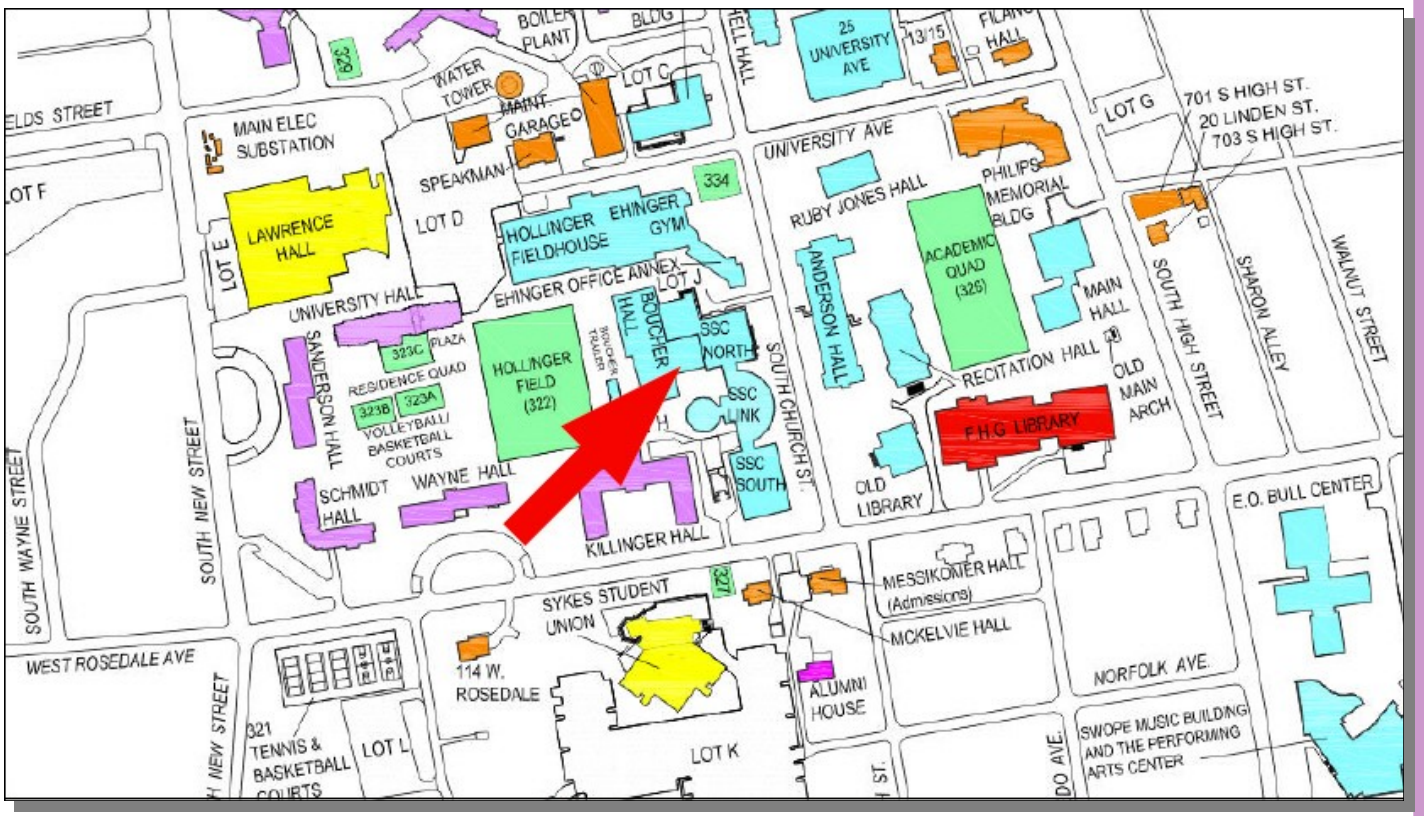
Journal Reference:

H. T. J. Bevins, A. Fialkov, E. de Lera Acedo, W. J. Handley, S. Singh, R. Subrahmanyan, R. Barkana. Astrophysical constraints from the SARAS 3 non-detection of the cosmic dawn sky-averaged 21-cm signal. *Nature Astronomy*, 2022; DOI: 10.1038/s41550-022-01825-6

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).



BlueWalker 3 (Cont'd)

(Continued from page 13)

nications networks both within the US and internationally. It has announced plans to open an office dedicated to space, but in the meantime conversations between the IAU CPS and AST SpaceMobile have already started.

"We're eager to use the newest technologies and strategies to mitigate possible impacts to astronomy," an AST SpaceMobile spokesperson told *New Scientist*.

"We are actively working with industry experts on the latest innovations, including next-generation anti-reflective materials."

CCAS Membership Information and Society Financials

Treasurer's Report
by Don Knabb

Nov. 2022 Financial Summary

Beginning Balance	$1474
Deposits	$205
Disbursements	-$0
Ending Balance	$1679

New Member Welcome!

Welcome to our new CCAS members Jan Battle & her son Rowan Kelly from Coatesville, 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.

CCAS Information Directory

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
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**.

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 (484) 883-5033 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 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**

*Sky & Tel*escope 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 **$56.05**.

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.