



Observations

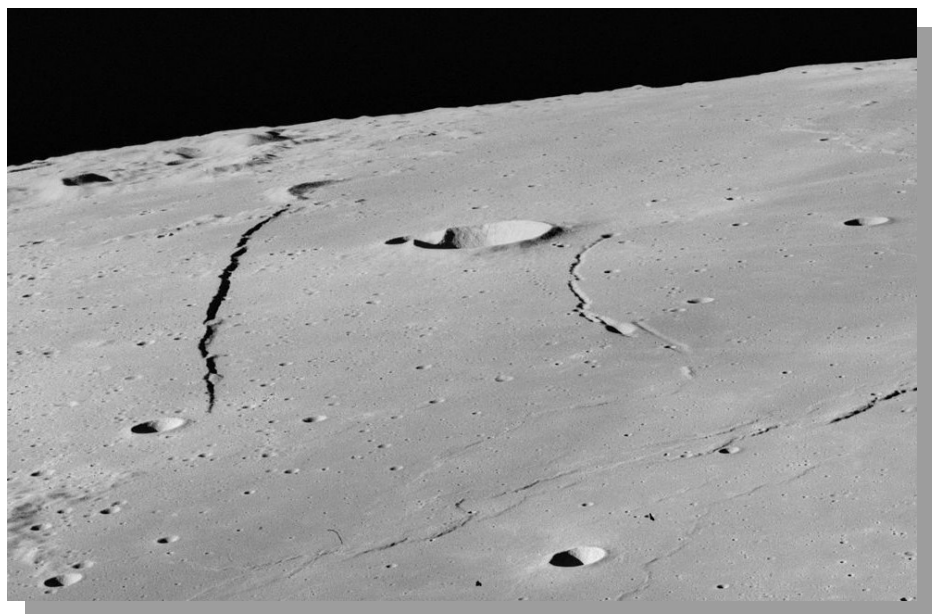
A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 31, No. 3 **Three-Time Winner of the Astronomical League's Mabel Sterns Award** ☼ 2006, 2009 & 2016 March 2023

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Rupes Recta, the Straight Wall on the Moon



Oblique view of Rupes Recta (left), Birt (center), and Rima Birt (right), from Apollo 16. Image Credit: Public domain file. Learn more about Rupes Recta in this month's edition of "Through the Eyepiece" on page 6.

Membership Renewals Due

03/2023	Angelini Colosimo DellaPenna Fulton Rainville Sterrett Zibinski
04/2023	Chisholm Hepler Imburgia Kataria Miles Miller, D. Richey Rossomando Family
05/2023	Blessing Cunningham Malkan O'Hara Ostaneck Rosenstein

March 2023 Dates

- 1st** • Venus and Jupiter are very close in the sky just after sunset
- 7th** • Full Moon, the Full Worm Moon or the Full Maple Sugar Moon, 7:40 a.m. EST
- 12th** • Daylight saving time begins, turn clocks ahead one hour, 2:00 a.m. ET
- 14th** • Last Quarter Moon, 10:08 p.m. EDT
- 21st** • New Moon, 1:23 p.m. EDT
- 28th** • First Quarter Moon and the Lunar X is visible at 1 a.m.
- 28th** •



CCAS Upcoming Nights Out

In addition to our monthly observing sessions at the Myrick Conservancy Center, BRC (see pg. 7), 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.

- ☼ Thursday March 9th, 7:00 – 8:00, Kennett Middle School night sky observing.
- ☼ Wednesday March 15th, 5:30 – 7:30, Great Valley School District.
- ☼ Friday, March 17th • CCAS Monthly Observing Session, Myrick Conservancy Center, BRC. The observing session starts at sunset.

For more information about future observing opportunities, contact our Observing Chair, Don Knabb.

Winter/Spring Society Events

March 2023

9th • CCAS Observing Event: Kennett Middle School night sky observing. 7:00 – 8:00 pm .

9th • The von Kármán Lecture Series: [Exploring Ocean Worlds with EELS \(Exobiology Extant Life Surveyor\)](#), Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech starting at 10:00 p.m. EST.

14th • CCAS Monthly Meeting, Merion Science Center, Room 112. Guest Speaker: Dr. B. Scott Gaudi, Ohio State University, "Completing the Census of Exoplanets ('Hot and Cold') in the Galaxy using the Nancy Grace Roman Space Telescope."

15th • CCAS Observing Event: Great Valley School District. 5:30 – 7:30 pm.

17th • CCAS Monthly Observing Session, Myrick Conservancy Center, BRC. The observing session starts at sunset.

20th • Spring Equinox, 5 p.m. EDT.

20th • Open call for articles and photographs for the April 2023 edition of [Observations](#).

20th • Introduction to Astronomy Class: Spaceship Earth – the Sun and its effects on the Earth, Stetson Middle School, 7 p.m. EDT.

26th • Deadline for newsletter submissions for the April 2023 edition of [Observations](#).

27th • Introduction to Astronomy Class: Our Moon—phases and faces, Stetson Middle School, 7 p.m. EDT.

31st • Planetarium show at the Mather Planetarium at WCU, "Our Amazing Sun." For more information, visit the [WCU Public Planetarium Shows](#) webpage.

April 2023

3rd • Introduction to Astronomy Class: Other Kids on the Block, Stetson Middle School, 7 p.m. EDT.

11th • CCAS Monthly Meeting, Merion Science Center, Room 112. Guest Speaker: Dr. Marc Gagne, West Chester University, "Update on New Images and Discoveries from the James Webb Telescope."

14th • CCAS Monthly Observing Session, Myrick Conservancy Center, BRC. The observing session starts at sunset.

14th • The von Kármán Lecture Series: [A Look at NASA's Earth System Observatory](#), Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech starting at 10:00 p.m. EDT.

17th • Introduction to Astronomy Class: Star Charts and Planetarium Software, Stetson Middle School, 7 p.m. EDT.

20th • Open call for articles and photographs for the May 2023 edition of [Observations](#).

24th • Introduction to Astronomy Class: Using a Telescope, Stetson Middle School, 7 p.m. EDT.

26th • Deadline for newsletter submissions for the May 2023 edition of [Observations](#).

28th • Planetarium show at the Mather Planetarium at WCU, "Twinkle, Twinkle Little Star." For more information, visit the [WCU Public Planetarium Shows](#) webpage.

Monthly Meeting Minutes: February 14, 2023

by Bea Mazziotta, CCAS Secretary

- Filling in for President Dave Hockenberry, Pete Kellerman welcomed members and guests to the meeting which was held in person at WCU and online via Zoom and YouTube.
- After the program Don Knabb gave out the Night Sky Network award to members who had participated in community outreach in 2022. The pin features the JSWebb telescope.
- Details of upcoming events and meetings can be found on the club website www.ccas.us.
- A reminder - CCAS members are once again offering a Beginner Astronomy course. Classes will start on March 20, 2023 at Stetson Middle School in West Chester. For details about registration, class times and subject matter follow the link <https://chestercountynightschool.org/CourseStatus.awp?&course=23SSC1201>
- Bruce Ruggeri, Program Chair, introduced the evening's speaker who joined us live from Genoa, Italy. Dr. Marco Raveri is a cosmologist and astrophysicist from the National Institute of Nuclear Physics at the Università di Genova. Dr. Raveri had previously spoken to CCAS in 2020 while pursuing his post-doctoral studies at the University of Pennsylvania.
- The title of the evening's lecture was 'Is this the end of the cosmological standard model of the universe's expansion?' Our understanding of the universe's expansion, described by the Hubble Constant, has come into question. Technological advances have enabled scientists to make ever more precise measurements but that has led to a discrepancy that is greater than scientists expected and that is still unexplained. Dr. Raveri discussed the various methods for measuring expansion rates, including comparisons of Supernovae, Cepheids and Parallaxes. As seems to be norm, the more we learn the more we realize we have only just scratched the surface.

March 2023 CCAS Meeting Agenda

by Bruce Ruggeri, CCAS Program Chair

Our next meeting will be held on March 14, 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. This month's guest speaker is Dr. B. Scott Gaudi, Ohio State University, "Completing the Census of Exoplanets ('Hot and Cold') in the Galaxy using the Nancy Grace Roman Space Telescope."

Please note that inclement weath-

er 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.

March 2023 Speaker Profile

by Bruce Ruggeri, CCAS Program Chair

Join us on March 14th for our monthly CCAS meeting in West Chester University's Merion Science Center, Room 112 or online via Zoom/YouTube. This month's guest speaker is Dr. B. Scott Gaudi, Ohio State University, "Completing the Census of Exoplanets ('Hot and Cold') in the Galaxy using the Nancy Grace Roman Space Telescope."

Dr. Gaudi's presentation synopsis and biography appear below.

Synopsis: The Nancy Grace Roman Space Telescope, or Roman, is the next flagship astrophysics mission to be launched after JWST. The current launch date for Roman is October 2026, less than four years away! Roman has the aperture of Hubble but has a field of view that is 100 times larger, and can map the sky 1000x faster. This will enable it to map

large areas of the sky very quickly or smaller areas of the sky repeatedly. In particular, Roman will monitor a relatively small portion of the center of our galaxy every fifteen minutes to search for microlensing events – events where one star gravitationally magnifies a background star. Such events are very sensitive to cold exoplanets orbiting their host star, such as our gas and ice giants.



B. Scott Gaudi, Ph.D.

Dr. Gaudi will describe the microlensing exoplanet survey with Roman and show how it will be able to carry out a statistical census of planetary systems in the Galaxy, from the outer habitable zone to free floating (rogue) planets, including analogs to all of the planets in our Solar System with the mass of Mars or greater, thus revolutionizing our understanding of planetary systems.

Dr. Gaudi will also discuss how 'citizen scientists' can get involved in this work.

Bio sketch: Dr. B. Scott Gaudi is the Thomas Jefferson Professor for Discovery and Space Exploration in the Department of Astronomy at The Ohio State University.

Dr. Gaudi has been a faculty member in the Department of Astronomy since 2006 and is a

(Continued on page 13)

Book Review: *Lunar Outfitters*, by Bill Ayrey

by Chris Trunk, CCAS Member

As the Artemis program is ramping-up towards returning astronauts to the moon, the next generation of lunar spacesuit is still a work in progress. It's very informative to take a look back at the Apollo program to see how the first lunar spacesuits were developed and utilized. The Lunar spacesuits were a key component to the success of the Apollo program, and the story behind them is quite compelling. The author of *Lunar Outfitters*, Bill Ayrey, was a spacesuit engineer and company historian for over 40 years at ILC Dover, the Dela-

ware Company that made the suits. Ayrey relates the fascinating behind-the-scenes history of the Apollo Lunar Spacesuit from its inception, manufacture, testing, and individualized fitting, through its use on the Moon. He also describes in detail the various upgrades made while the Apollo program was active and also the special suits used for the Skylab and Apollo-Soyuz missions.

The lunar spacesuits were custom-made for each of the Apollo astronauts based on their individual measurements. The suits are

comprised of 15 layers of various materials that serve to protect their human occupant. The skill and precision needed to sew all these components was supplied by the best seamstresses that were available, many of whom were selected from ILC's Playtex division. The care and attention-to-detail that these women provided resulted in a Lunar suit that performed flawlessly.

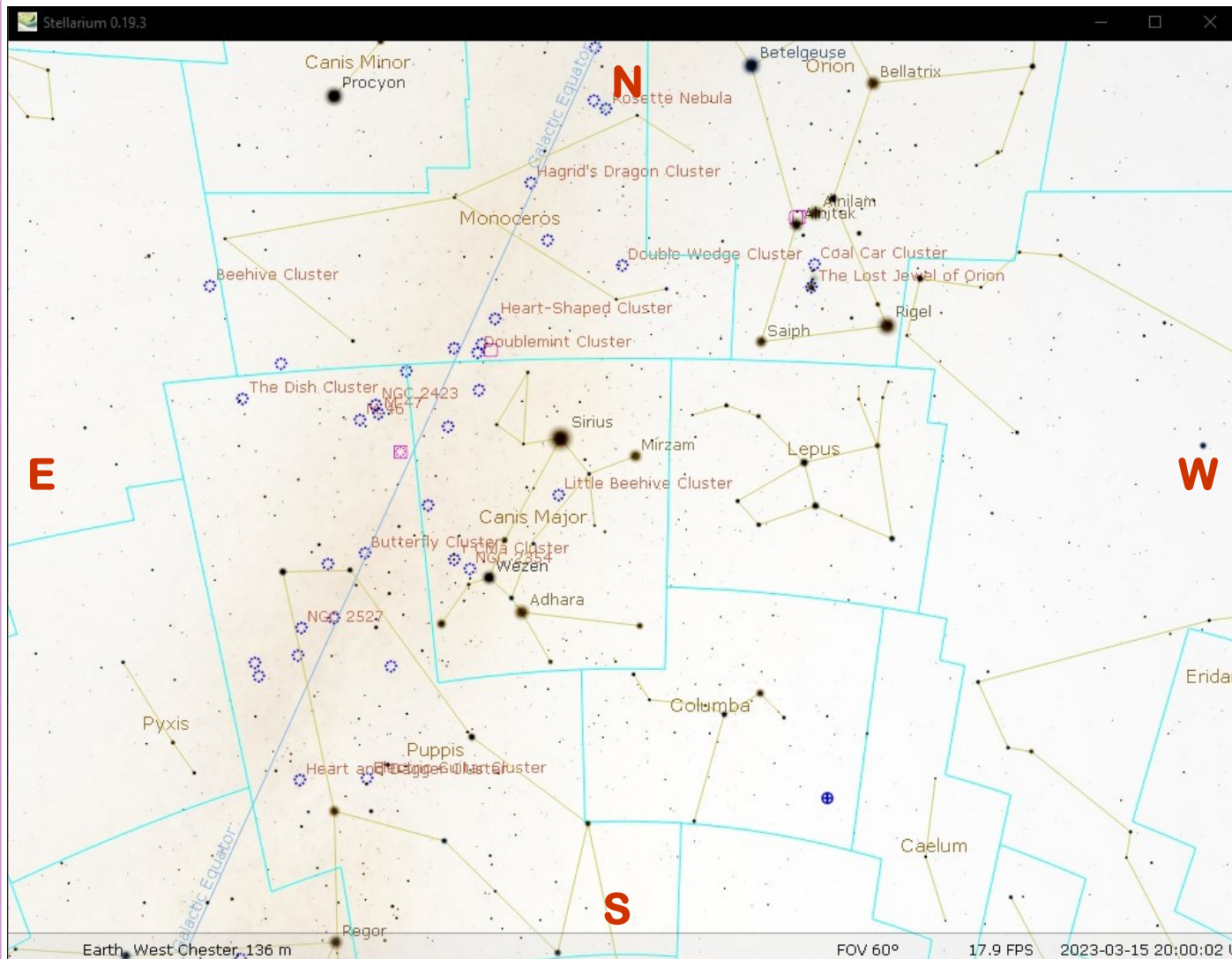
The requirements for a lunar spacesuit are quite different

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The Sky Over Chester County

March 15, 2023 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
03/01/2023	6:08 a.m. EST	6:36 a.m. EST	5:54 p.m. EST	6:21 p.m. EST	11h 18m 04s
03/15/2023	6:47 a.m. EDT	7:14 a.m. EDT	7:09 p.m. EDT	7:36 p.m. EDT	11h 54m 49s
03/31/2023	6:21 a.m. EDT	6:48 a.m. EDT	7:25 p.m. EDT	7:52 p.m. EDT	12h 37m 04s

Moon Phases					
Last Quarter	03/14/2023	10:08 p.m. EDT	Full Moon	03/07/2023	7:40 a.m. EST
First Quarter	03/28/2023	10:32 p.m. EDT	New Moon	03/21/2023	1:23 p.m. EDT

March 2023 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

1	Venus and Jupiter are very close in the sky just after sunset
2	The Moon, Pollux and Castor form a tight group
7	Full Moon, the Full Worm Moon or the Full Maple Sugar Moon, 7:40 a.m. EST
12	Daylight saving time begins, turn clocks ahead one hour, 2:00 a.m. ET
14	Last Quarter Moon, 10:08 p.m. EDT
20	Vernal Equinox, 5:00 p.m. EDT, first day of spring
21	New Moon, 1:23 p.m. EDT
22	Jupiter is near the crescent Moon just after sunset
28	First Quarter Moon and the Lunar X is visible at 1 a.m.
28	Mars is near the Moon
30	The Lunar Straight Wall is visible

The best sights this month: Jupiter and Venus are very close in the fading glow of the sunset on March 1st. Then on March 22nd Jupiter is very close to the crescent Moon. If you haven't seen Uranus you have a good opportunity during March when Uranus is to the left of the Moon on March 24th. Just scan toward 10:00 from the Moon and go about two Moon diameters. That green/blue disk is Uranus.

Mercury: Mercury can be seen very low in the west at the end of the month.

Venus: Venus is visible even before the Sun sets, then as the sky darkens it shines brightly as the "evening star". On March 1st Venus and Jupiter are very close in the glow of the setting Sun.

Mars: Mars can be found between the horns of Taurus the Bull on March 11th.

Jupiter: The king of the planets is falling lower each day into the western horizon. On March 22nd Jupiter and the thin crescent Moon are close, low in the west.

Saturn: Saturn rises about an hour before the Sun by the end of March.

Uranus and Neptune: Uranus can be found, if you use binoculars, near the crescent Moon on March 24th. Just scan toward 10:00 from the Moon and go about two Moon diameters. That green/blue disk is Uranus. Neptune is not visible during March because it passes behind the Sun on March 15th.

The Moon: This is the Full Worm Moon according to Native Americans. As the temperature warms and the ground begins to thaw, earthworm casts appear (an earthworm cast is a nice word for worm poop), heralding the return of the robins. This full moon is also called the Full Crow Moon, the Full Crust Moon and the Full Sap Moon. Native Canadians called this the Maple Sugar Moon or the Blossoming Out Moon.

Constellations: In mid-March around 9:00 p.m. the winter constellations are in the western half of the sky heading toward their summer sleep before too many weeks have passed. Catch the Pleiades, Taurus and Orion before we lose them to the spring constellations that are rising in the east. In the spring group Leo, the Lion is heading toward center stage. The Big Dipper in Ursa Major is high overhead. Follow the arc of the Dipper handle to bright Arcturus in Boötes.

Messier/deep sky: There are many wonderful deep sky sights as winter turns to spring. Early in the evening look to the left of Canis Major, Orion's hunting dog companion, for M46, a beautiful open cluster. The star clusters in Auriga are heading toward the western horizon but are still well positioned for viewing through the minimum amount of atmosphere early in the evening. Later in the night look overhead to find the galaxies M81 and M82 in Ursa Major. And use your binoculars to look for M35 in Gemini, an open star cluster containing several hundred stars in an area the size of the full Moon.

Comets: Comet (C/2022 E3) ZTF can still be observed during March, but you will need a telescope to see the fading gray blob. There is a sky map in the March issue of Astronomy.

Meteor showers: There are no meteor showers during March. However, from March 18th until March

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Through the Eyepiece: Rupes Recta, the Straight Wall on the Moon

by Don Knabb, CCAS Observing Chair & Treasurer

Every month we have an opportunity to see an interesting feature on the moon, Rupes Recta, also known as the Straight Wall. This feature appears around a day after First Quarter and is the most well-known “fault” on the moon. We can see this amazing lunar feature on March 30th.

Around 3 billion years ago the flow of molten lava that formed the lunar seas, or maria, dwindled and the Moon entered a much quieter phase during which impact events and global crustal adjustments began to form the lunar surface we see today. Faults appeared when tension and compression forces exceeded the strength of the lunar crust as the moon cooled and began to reach a state of equilibrium.

“Normal” faults are those where tension forces have pulled the crust apart and gravity pulls down one side of the fault exposing a fault-scarp, or *rupes*. Rupes Recta, the Straight Wall, is the best example of a normal fault on the Moon.

Rupes Recta is not far from the famous Lunar X feature that many of our club members have seen and photographed. It is in the southeastern part of Mare Nubium.

When the Sun illuminates the “Straight Wall” at an oblique angle at about day 8 of the Moon's cycle the fault casts a wide shadow that gives it the appearance of a steep cliff. The fault has a length of 110 km, a typical width of 2–3 km, and a height of 240–300 m. Although it appears to be a vertical cliff in the lunar surface, the grade of

the slope is relatively shallow, as can be seen in the picture taken by the Apollo 16 crew.

To the west of this escarpment is the crater Birt, which is about 17 km in diameter. Also to the west is the Rima Birt rille. A *rille* (German for groove) is a groove, as opposed to a *rupes* which is a cliff. Rima Birt rille is visible in the photograph as a faint curving line to the right of the crater Birt. This rille is not the product of faulting but was cut by erosive forces of lava around 3 billion years ago,

At the southern end of Rupes Recta is a group of hills often called the “Stag's-Horn Mountains”, although this name is not

officially recognized by the IAU.

As the sun rises higher, the shadows are lost, but the feature will re-appear sixteen days later on moon day 24, as the sun strikes the face of the wall, this time transforming it into a gleaming white scarp.

Information credits:

- Grego, Peter. 2004. *Moon Observer's Guide*. Buffalo, NY. Firefly Books
- http://en.wikipedia.org/wiki/Rupes_Recta
- <http://www.astro-nut.com/lunar-03feb09.html>

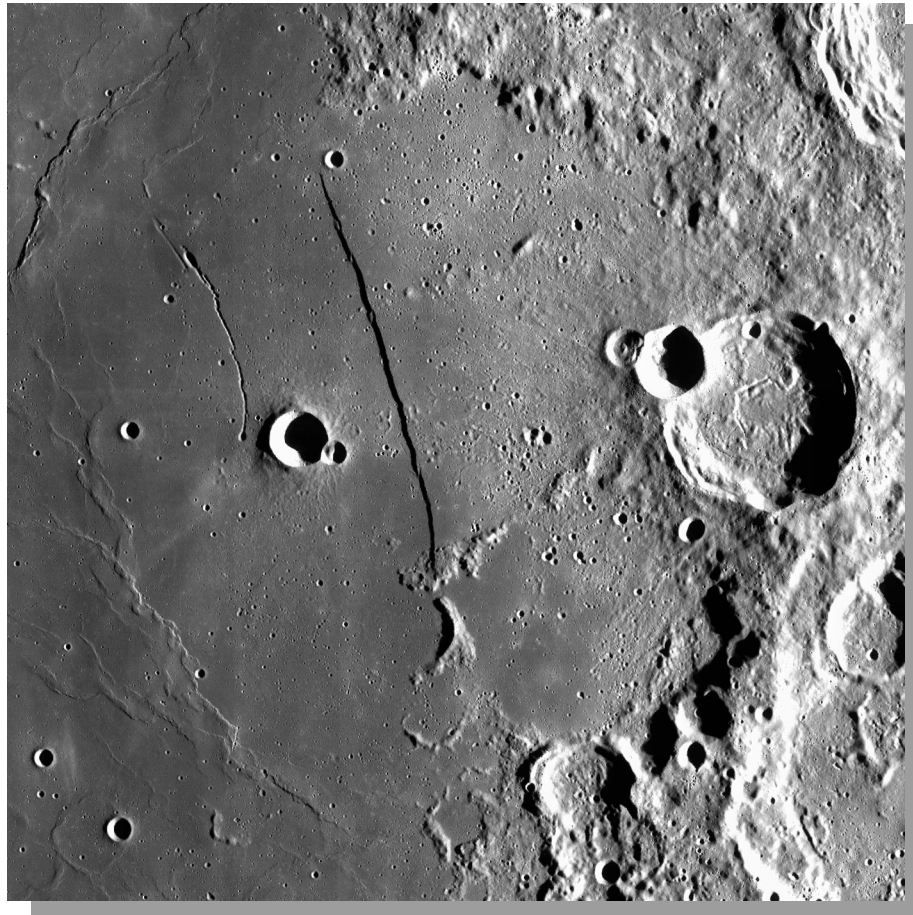


Photo: NASA (image by Lunar Reconnaissance Orbiter), public domain file

Book Review (Cont'd)

(Continued from page 3)

from the typical EVA spacesuit that is used for “spacewalks” in low Earth orbit. Those suits are not used for any physical “walking”. Since the Apollo spacesuits were the very first suits designed for walking, the lower portion had to provide the best mobility possible. There was extensive testing done on the treadmill, while the suit was pressurized, to test the walking performance.

One of the significant modifications made was a complete redesign of the boot to allow for the ankle to flex while pressurized. The details of all the suits components are highlighted in the Figures (photos and diagrams) contained in the text and

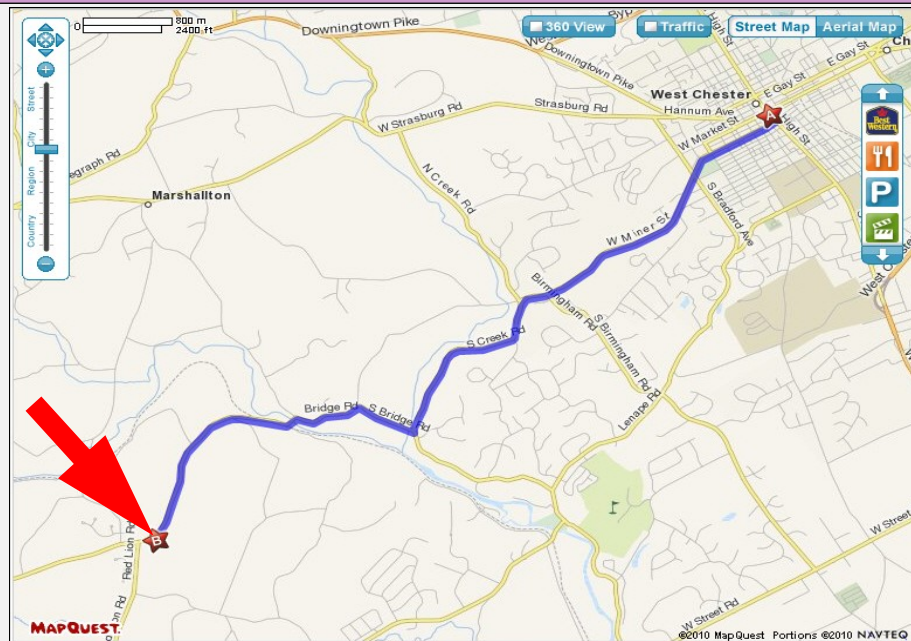
(Continued on page 13)

Classic La Para by Nicholas La Para



PANDORA OPENS HER BOX

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.

Impossible New Ring System Discovered at the Edge of the Solar System

by Robert Lea, courtesy Live Science

Astronomers have discovered an entirely new ring system within the solar system, and it's located at such a great distance from its dwarf planet parent that it should be impossible.

The ring surrounds Quaoar, which is around half the size of Pluto and located beyond Neptune. It is only the third ring to be found around a minor planet and the seventh ring system in the solar system, with the most famous and well-studied rings surrounding the giant planets Saturn, Jupiter, Neptune and Uranus.

"The six [previously known] planets with ring systems all have rings which are quite close to the surface of the planet. So

this really challenges our ring formation theories," study co-author [Vik Dhillon](#), a professor of physics and astronomy at the University of Sheffield in England, told Live Science. "It was previously thought to be impossible to have rings that far out, so in a nutshell, the ring of Quaoar is a real challenge to explain theoretically."

The ring system is located at a distance of seven planetary radii away from Quaoar (that is, seven times Quaoar's radius), which is twice as far out as the theoretical maximum limit for a ring system, known as the *Roche limit*. For comparison, the main part of Saturn's rings sits at just three planetary radii from the gas gi-

ant.

Previously, it was thought that rings past the Roche limit wouldn't be able to survive this far out from their parent body.

"Rings that are formed outside Roche limits aren't meant to be stable; they should rapidly accrete into moonlets, using up all the ring material," Dhillon said. "With this discovery, we have a ring not just outside the Roche limit, but way beyond it."

Dhillon and the team think Quaoar's ring formed similarly to other solar system rings: Collisions of moonlets orbiting the parent planet created debris that settled into a ring made of rock,

(Continued on page 9)

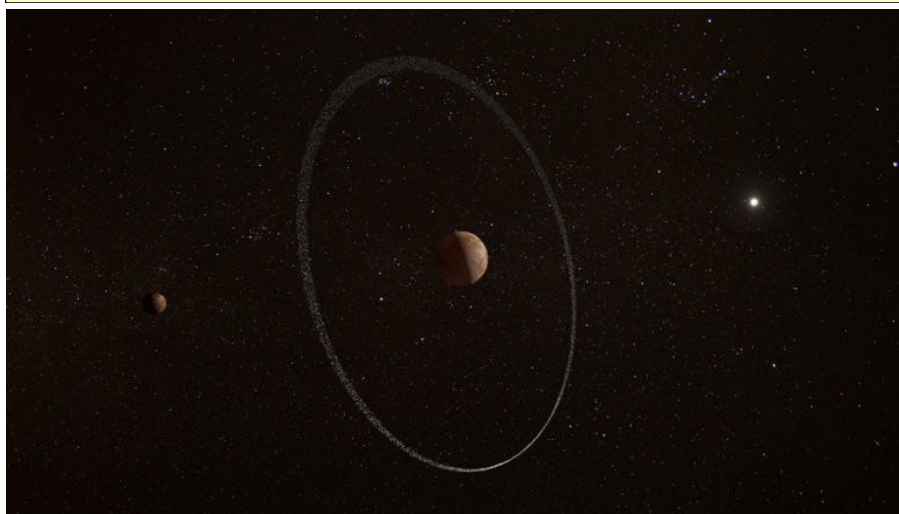
CCAS Original Astrophotography

by Jeff Cunningham



A shot of Jupiter, Venus, crescent moon on February 21, 2023 at 6:30pm (1 day past new with nice earthglow) and Neptune. At least I think its Neptune... Zoom into the small stand of semi-circular trees to the bottom right of the moon, and on the upper left perimeter of the stand you'll find "it". Matches up with Stellarium for date, time and position. Image taken with a Canon Rebel T6 f/4.5 4 seconds 27mm ISO-200. Post processed with Canon Digital Photo Professional 4, for color temperature, contrast, shadow, highlights and saturation. Further post processing with Topaz Photo AI to handle noise and sharpness.

New Ring System (Cont'd)



An artist's impression of the dwarf planet Quaoar, located beyond Neptune © ESA, CC BY-SA 3.0 IGO

(Continued from page 8)

ice and dust particles.

These particles can't reform a moonlet if they are close to the planet and within the Roche limit, because tidal forces from the parent body constantly rip them apart and prevent them from clumping, according to the researchers. But that can't be the case with Quaoar's ring.

"We've got to find some way of stopping that moonlet forming that far out," Dhillon said. "The particles in the ring are colliding all the time, and if these collisions are elastic, it means the particles can't stick together to form a moonlet." (An elastic collision is one in which two colliding objects bounce away from each other rather than clumping together, like a rubber ball hitting a floor.)

Elastic collisions may be possible if the ring particles have an icy outer coating, Dhillon said — something that is plausible, given Quaoar's location at the edge of the solar system. However, more data are needed to

confirm this idea.

The researchers discovered the ring system while investigating whether Quaoar has an atmosphere. The team used the high-speed HiPERCAM instrument on the Gran Telescopio Canarias, a telescope in Spain's Canary Islands that can spot small variations in light from background stars. The ring became visible when it caused a roughly 5% to 10% dip in light from a background star, both before and after the main body of Quaoar passed in front of the star. This event, known as an occultation, lasted less than a minute.

"The discovery came as a bit of a surprise," Dhillon said. "We knew there was a possibility we might find them, but we weren't really looking for them."

The ring of Quaoar is too small and too faint to be seen via direct imaging, even with an instrument as powerful as the Hubble Space Telescope. Dhillon added that other than occultation events, the only way to

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Stars Are Vanishing from the Night Sky

by Eric Mack, courtesy CNET

Light pollution has robbed eight out of 10 Americans, and nearly a third of all humans, of a view of our own home galaxy, according to new research out Thursday. The problem is something called *skyglow*, which is the cumulative, diffuse brightening of the light sky from artificial light sources.

A [new study](#) published in the journal *Science* uses crowd sourced data from a program called [Globe at Night](#), which is run by the National Science Foundation-funded NOIRLab, a network of observatories. It finds that skyglow as perceived by human eyes is more of a problem compared with satellite measurements of artificial light on Earth.

The study is the latest addition to a growing body of scientific literature on light pollution stretching back [at least half a century](#). By analyzing over 50,000 citizen scientist observations, the researchers found an increase in sky brightness of 9.6% over the past decade, com-

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Spring Astronomy Classes!

by Don Knabb, CCAS Education Co-Chair

CCAS has partnered with [Chester County Night School](#) to offer a six-week program meeting Monday nights from 7:00 to 8:00 PM. The classes run from March 20, 2023 through May 1, 2023, with no class April 10th.

- March 20th: Spaceship Earth
- March 27th: Our Moon—Phases and Faces
- April 3rd: Other Kids on the Block
- April 17th: Star Charts and Planetarium Software
- April 24th: Using a Telescope
- May 1st: Beyond Naked-Eye Observing

The cost for the courses is \$59.00 per person. All classes held in person at Stetson Middle School, which is located at 1060 Wilmington Pike (Rte. 202), West Chester 19382.

NASA Night Sky Notes: Spot the Morning and Evening Star—Observe Venus

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.

Venus is usually the brightest planet in our skies, and is called “Earth’s Twin” due to its similar size to Earth and its rocky composition. However, Venus is a nightmare version of our planet, featuring a thick, crushing atmosphere of acidic clouds, greenhouse gasses, howling winds, and intense heat at its surface.



This rocky inner world’s orbit brings it closer to Earth than any of the other planets, and is the second closest to the Sun after

Mercury. Like Mercury, Venus orbits between our planet and the Sun, so Earth-based observers can observe Venus in the morning before sunrise, or in the evening after sunset – but never high in the sky in the middle of the evening, unlike the outer planets. Since Venus is so striking in its twilight appearances, the planet features heavily in sky mythologies worldwide.

Venus’s bright morning and evening appearances are the origin for its dual nicknames:

(Continued on page 11)

Jupiter ●● Venus

**Facing West
After Sunset
March 1, 2023**

West

*Venus and Jupiter continue to move closer together in the evening sky this month. Jupiter will continue its descent towards the horizon while Venus will continue to climb and will be visible in the evenings through mid-summer of 2023. It’s a great year for Venus fans!
Image created with assistance from Stellarium*

Night Sky Notes (Cont'd)

(Continued from page 10)

the Morning Star, and the Evening Star. Some ancient astronomers never made the connection, and assumed the Evening Star and Morning Star were two unrelated objects! Observers can even spot Venus during the daytime, if the sky is very clear and the planet is bright enough. Venus also has phases, similar to the Moon and Mercury.

Galileo's observations of Venus's phases helped turn the astronomy world upside down in the early 1600s, and you can see them yourself using a telescope or even a surprisingly low-power pair of binoculars.

Warning: Please be very careful when observing Venus with a telescope in the early morning or daytime. Never allow the Sun to enter your instrument's field of view, as you could be permanently blinded.

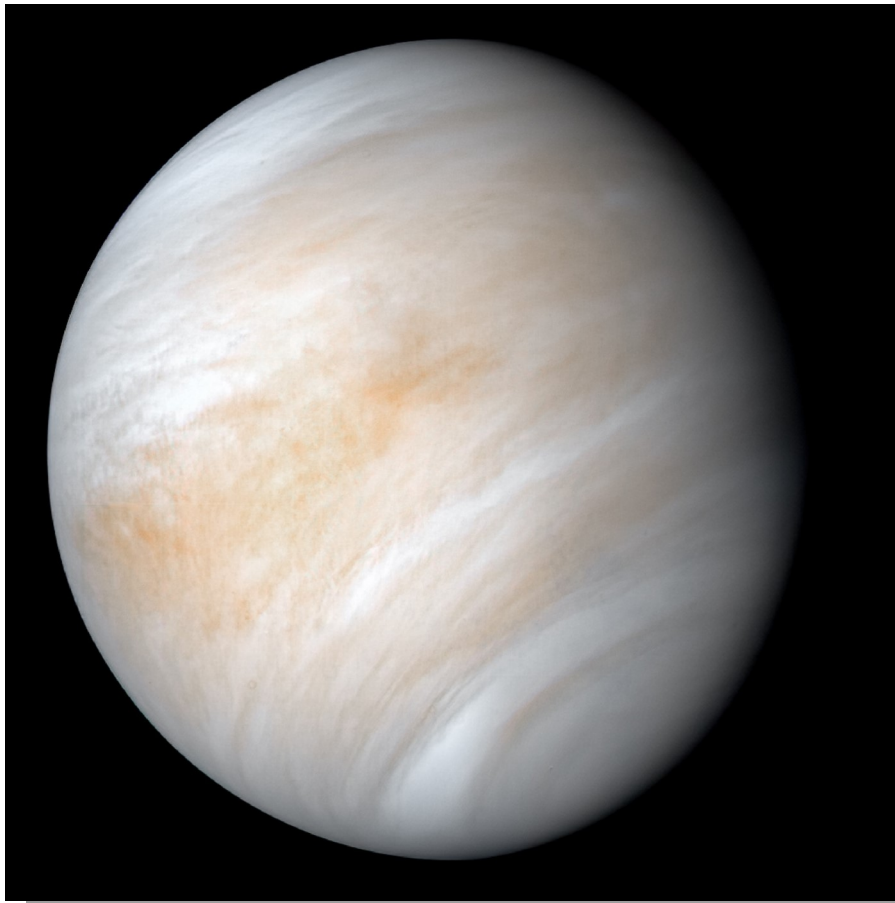
Venus's other moniker of "Earth's Twin" is a bit misleading. In terms of their surface temperatures and atmospheres, Venus and Earth are extremely different! The surface of Venus is warmer than that of Mercury, despite Mercury being many millions of miles closer to the Sun. While Mercury is still a scorching 800 degrees Fahrenheit (427 degrees Celsius), Ve-

nus is even hotter: 900 degrees Fahrenheit (482 degrees Celsius). The vast amount of carbon dioxide in the thick Venusian atmosphere acts as an insulating blanket that retains much of the Sun's heat, creating the runaway greenhouse effect that dominates its present-day climate. The Venusian surface is a crushing 90 Earth atmospheres on top of its absurd temperatures.

These extreme conditions mean that the mission life of any past Venusian robotic landers were measured in **hours** at best – and usually minutes! However, conditions in Venus's upper atmosphere may be much more hospitable, with temperatures and pressures at 30 miles (50 km) above the surface that are much more Earth-like in temperature and pressure.

Studies of the Venusian atmosphere, including seasonal appearances of dark streaks and faint signals of suggestive chemistry, intrigue researchers with the possibility that some sort of life may persist in its clouds. But far more evidence is needed to confirm such a claim, since non-biological factors like volcanism and other processes could also be the source for these signals.

Venus's thick sulfuric acid clouds block direct visual observations of its surface from optical telescopes on Earth. Multi-wavelength observations from space probes show evidence of active volcanoes and possibly some sort of plate tectonics, but follow-up missions will be needed to confirm the presence



The top layers of Venus's cloud pop in this contrast-enhanced image, reprocessed with modern techniques from Mariner 10 data. Credit: NASA/JPL-Caltech. Source: <https://solarsystem.nasa.gov/resources/2524/newly-processed-views-of-venus-from-mariner-10/>

(Continued on page 13)

Vanishing Stars (Cont'd)

(Continued from page 9)

pared to just two per cent per year measured by satellites.

"At this rate of change, a child born in a location where 250 stars were visible would be able to see only around 100 by the time they turned 18," [said the study's lead author Christopher Kyba](#), a researcher at the German Research Centre for Geosciences, in a statement.

The authors estimate that 80% of people in the US and 30% worldwide aren't able to see the ethereal arc of the Milky Way on a clear night. Part of the problem with what we're able to see with unaided eyes has to do with the types of lighting in use.

"LED lights have a strong effect on our perception of sky brightness," said Kyba. "This could be one of the reasons be-

hind the discrepancy between satellite measurements and the sky conditions reported by Globe at Night participants." Satellites also have a hard time detecting light that is emitted horizontally from sources more prominent in cities like billboards or storefronts.

"The rate at which stars are becoming invisible to people in urban environments is dramatic," Kyba adds. The increase in skyglow is most dramatic in North America, followed by Europe.

In addition to obvious impacts on astronomy and skywatching, co-author Constance Walker, who heads Globe at Night, says there are other consequences. "Skyglow affects both diurnal and nocturnal animals and also destroys an important part of our

New Ring System (Cont'd)

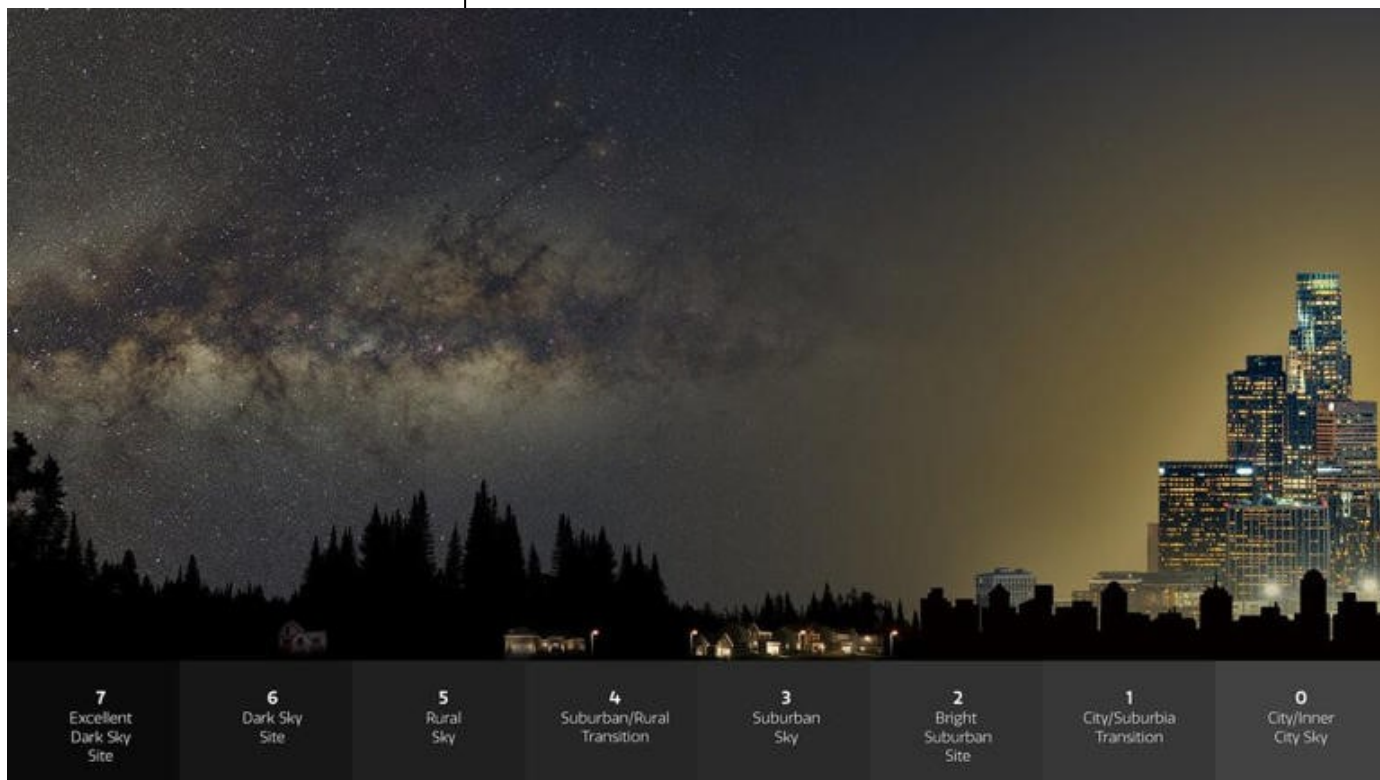
(Continued from page 9)

spot these dwarf planet rings would be to send a robotic probe to visit them.

"This discovery shows you the amazing diversity of things that are in our own cosmic backyard," Dhillon said. "You don't have to look light-years away into the distant universe to find the unexpected. Surprises are still aplenty in our own solar system."

The team's findings were published Feb. 8, 2023 in the journal [Nature](#).

cultural heritage," Walker says. "The increase in skyglow over the past decade underscores the importance of redoubling our efforts and developing new strategies to protect dark skies.



*This graphic illustrates that the greater the amount of light pollution, and therefore skyglow, the fewer the stars that are visible.
NOIRLab/NSF/AURA, P. Marenfeld © Provided by CNET*

Night Sky Notes (Cont'd)

(Continued from page 11)

of active volcanism, plate tectonics, and any possible signs of life. In order to do so, NASA is sending two new missions to Venus by the end of this decade: the orbiter **VERITAS**, which will map the surface in high detail and study the chemistry of its rocks and volcanoes, and **DAVINCI+**, which will study its atmosphere and possible tectonic surface features via a "descent sphere" that will plunge into Venus's clouds.

Follow their development and discover more about Venus at solarsystem.nasa.gov/venus, and of course, continue your exploration of the universe at nasa.gov.

Speaker Bio (Cont'd)

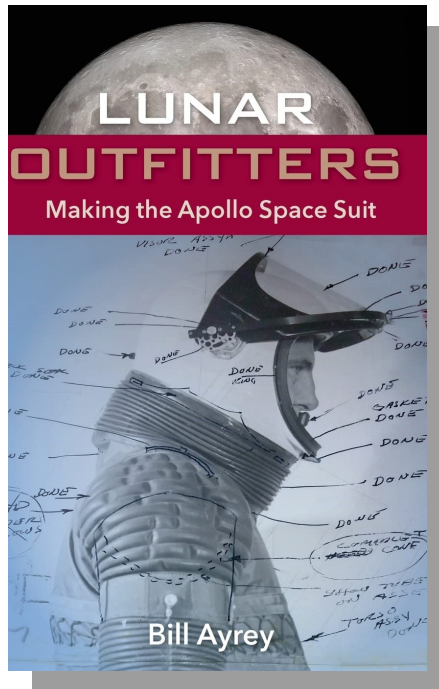
(Continued from page 3)

leader in the discovery and statistical characterization of extra-solar planets using a variety of methods, including transits and gravitational microlensing. In 2008, he and his collaborators announced the discovery of the first Jupiter/Saturn analog.

Dr. Gaudi is deeply involved in analytic and numerical techniques for assessing the yield, biases, and discovery potential of current and next-generation surveys to determine the demographics of exoplanets.

Dr. Gaudi is a member of the Science Definition Team for NASA's Wide-Field Infrared Survey Telescope (WFIRST) and is the chair-elect for the NASA Exoplanet Exploration Analysis Group. He was the 2009 recipient of the Helen B.

Book Review (Cont'd)



Outfitters: Making the Apollo Space Suit is available online in hardcover and e-book formats.

(Continued from page 7)

also in the Appendices at the rear of the book.

Ayrey recounts the difficulties that ILC had in winning the spacesuit contract from NASA. ILC was a small-time player in aerospace industry. It was their ability to come-up with a radically different design and follow through with the expertise to fabricate the suit within very tight time constraints that gave them the edge over the other competitors.

Ayrey also mentions an interesting tidbit that the boots, along with the suit backpacks, were intentionally left on the lunar surface as a weight-saving measure in exchange for the added load of the rocks and samples that were returned to Earth. Only two pairs of used boots were returned, those of Gene Cernan and Harrison Schmitt from the final lunar mission. Those boots along with the spacesuits are preserved at the Smithsonian's Air & Space Museum.

A short interview with Ayrey about the book and his time at ILC is at <https://www.youtube.com/watch?v=jBLfBXDwUdE>

A longer, more detailed video with Ayrey and other panelists by the Smithsonian is available at: <https://www.youtube.com/watch?v=uNkV-C9qfG4>

I highly recommend *Lunar Outfitters* to any aficionados of the Apollo program and those looking forward to what we may see in the future as we continue manned exploration of the moon and eventually to Mars.

(Continued on page 14)

Warner Prize of the American Astronomical Society, received NSF CAREER and PECASE awards, was named a University Distinguished Scholar in 2016.

In 2017, he was awarded the NASA Outstanding Public Leadership Medal in recognition of his "outstanding leadership as the ExoPlanet Program Analysis Group Chairperson having significant impact on NASA's search for exoplanets and life in the universe." His research has resulted in the discovery and characterization of over 100 exoplanets.

Dr. Gaudi self-identifies as an autistic, gay man and is strongly committed to diversity, equity, and inclusion.

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)

31st is a good time to look for the Zodiacal Light, a cone-shaped glow of light that is created when sunlight reflects off dusty debris in the inner solar system.

Book Review (Cont'd)

(Continued from page 13)

Lunar Outfitters was published in 2020 by University Press of Florida. It is available in hard-back and contains ten chapters, numerous illustrations and diagrams, five detailed appendices and a very comprehensive index – a veritable lunar spacesuit encyclopedia!

CCAS Membership Information and Society Financials

Treasurer's Report by Don Knabb

Feb. 2023 Financial Summary

Beginning Balance	\$2054
Deposits	\$150
Disbursements	-\$164
Ending Balance	\$2040

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

New Member Welcome!

Welcome to our new CCAS members Lyssa and Alaric Han from Paoli, PA, and Regan Steiner from WCU, West Chester, PA.

We're glad you decided to join us under the stars! Clear skies to you!

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
 5049 E Broadway Blvd, #105
 Tucson, AZ 85711

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.lymebasics.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 Phoenix, Arizona.

Phone: 520-280-3846

<http://www.starrynightlights.com>



LIGHTHOUSE
 OUTDOOR LIGHTING

Lighthouse Outdoor Lighting is a dedicated lifetime corporate member of the [International Dark-Sky Association](http://www.darksky.org). 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.

211 North Walnut St.
1st Floor
West Chester, PA 19380

Phone: 484-291-1084 or 800-737-4068

<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
 Email: info@skiesunlimited.com

<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: 267-297-0423
 Fax: 215-965-1524

Hours:
 Monday thru Friday: 9AM 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 & 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 **\$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.