



Observations

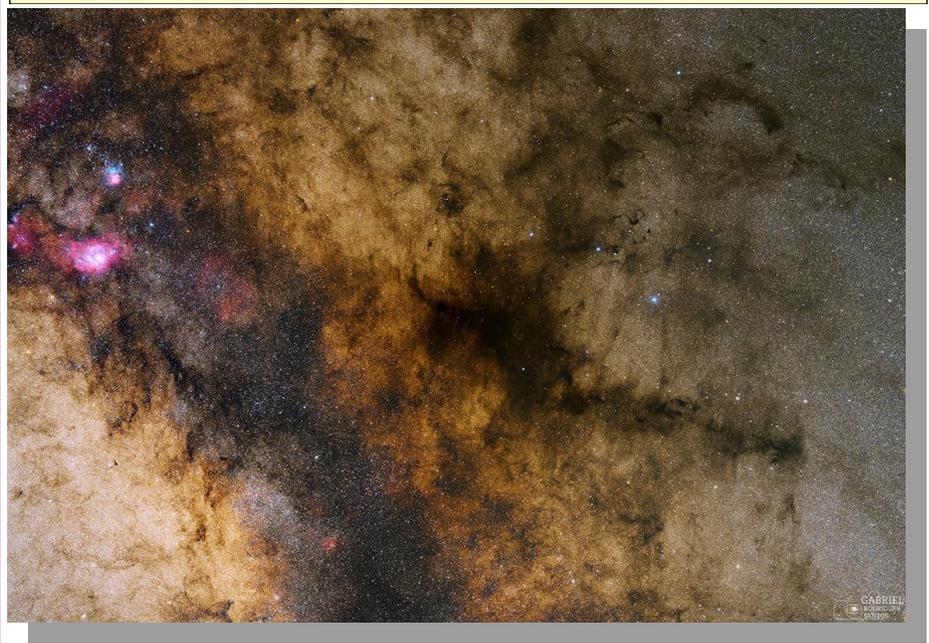
A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 29, No. 10 **Three-Time Winner of the Astronomical League's Mabel Sterns Award** ☼ 2006, 2009 & 2016 October 2021

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The Central Milky Way from Lagoon to Pipe



Cataloged in the early 20th century by astronomer E. E. Barnard, the obscuring interstellar dust clouds seen toward the right include B59, B72, B77 and B78, part of the Ophiuchus molecular cloud complex a mere 450 light-years away. To the eye their combined shape suggests a pipe stem and bowl, and so the dark nebula's popular name is the Pipe Nebula. Three bright nebulae gathered on the left are stellar nurseries M8 (the Lagoon Nebula), M20 (The Trifid), and NGC 6559.
Image Credit & Copyright: Gabriel Rodrigues Santos

Membership Renewals Due

10/2021	Kraynik Lane Lester Rosenblatt Wirth
11/2021	Buczynski DiGiovanni Holenstein Kerkel Romer Scovill Smith Taylor
12/2021	Damerau DeAngelo DellaPenna Etherington Moynihan O'Leary Orso Watson & Metts

October 2021 Dates

- 6th** • New Moon, 7:05 a.m. EDT
- 9th** • A thin crescent Moon is near Venus
- 12th** • First Quarter Moon, 11:25 p.m. EDT
- 13th** • Antares is near Venus in the evening sky
- 20th** • Full Moon, the Full Hunter's Moon or the Turns Leaves White Full Moon
- 21st** • The Orionid meteors peak
- 28th** • Last Quarter Moon, 4:05 p.m. EDT
- 29th** • Venus is at greatest elongation this evening



CCAS Upcoming Nights Out

Until further notice, monthly observing sessions at Myrick Conservancy Center, BVA, are limited to vaccinated CCAS members only in response to the current increase in Covid-19 infections.

Upcoming dates (weather dependent):

- ☼ **Friday, Sept. 3rd**
- ☼ **Friday, Oct. 1st**
- ☼ **Friday, Nov. 5th**

For more information about future observing opportunities, contact our [Observing Chair](#), Don Knabb.

Autumn Society Events

October 2021

1st • CCAS Monthly Observing Session, BRC. Due to increase in Covid-19 infections, session is limited to vaccinated CCAS members only.

6th-12th • [York County Star Party](#), Susquehannock State Park, 1880 Park Dr, Drumore, PA 17518.

12th • CCAS Monthly Meeting, in Room 113, Merion Science Center, WCU. The meeting starts at 7:30 p.m. Member Speaker: John Conrad, who will present "Lucy, the upcoming NASA mission to the Jupiter 'Trojans'."

14th • The von Kármán Lecture Series: [The Warm Glow of our Cool Universe](#), 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 November 2021 edition of [Observations](#).

26th • Deadline for newsletter submissions for the November 2021 edition of [Observations](#).

November 2021

5th • CCAS Monthly Observing Session, BRC. Due to increase in Covid-19 infections, session is limited to vaccinated CCAS members only.

7th • Daylight Saving Time ends, turn clocks back one hour, 2:00 a.m.. ET.

11th • The von Kármán Lecture Series: [Rising Tides: First Year in Space for NASA's Earth Flagship](#), 10:00 pm EDT. Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

14th • Monthly CCAS Meeting (virtual only meeting – note different meeting date). The meeting starts at 7:30 p.m. Guest Speaker: Dr. Steven Levin, NASA's Jet Propulsion Laboratory (JPL); "Highlights and Updates on the Juno Mission to Explore the Jovian System."

20th • Open call for articles and photographs for the December 2021 edition of [Observations](#).

26th • Deadline for newsletter submissions for the December 2021 edition of [Observations](#).

September 2021 Monthly Meeting Minutes

by Bea Mazziotta, CCAS Secretary

- Dave Hockenberry welcomed members and guests to the September 2021 CCAS meeting. The meeting was held at West Chester University. Members followed the WCU COVID protocols for this first in person meeting in over a year. Zoom and YouTube were also available for members and guests unable to attend in person. A shout out to Dave Hockenberry, Don Knabb and all those involved for providing the technical expertise needed to host the multiplatform meeting.
- Bruce Ruggeri, Program Chair, announced the scheduled speakers for the upcoming year. The roster will include 2 CCAS members, JPL associates and Astronomy Professors. Topics will include various NASA missions, robotics, oceans of other worlds and Planet Nine. It promises to be a very interesting year.
- Don Knabb took the floor and, in lieu of taking us on a tour of the current night sky, informed members and guests about the US Astronomical League (<https://www.astroleague.org/>) and their Constellation Hunter Program, which is a great way for novices to learn the night sky and for long-time observers to hone their observing skills. Log sheets are available from the League. Monthly downloadable sky charts are available from <http://www.skymaps.com/>
- Dennis O'Leary, CCAS member and NASA Solar System Ambassador, gave the evening's presentation - NASA's Missions to Mars: Our Quest for Signs of Life. Dennis traced the history of our Mars explorations, discussing the Missions' goals to look for traces of water, determine potential habitability, prepare for future exploration and search for signs of life. He described the Mars Rovers, the invaluable information they have provided and continue to provide as we continue to enhance their capabilities for determining whether humans can someday be Martians as well as Earthlings.

October 2021 CCAS Meeting Agenda

by Bruce Ruggeri, CCAS Program Chair

Our next meeting will be held on October 12, 2021, in Room 113, Merion Science Center, WCU. The meeting starts at 7:30 p.m. CCAS member John Conrad will present on Lucy, the upcoming NASA mission to the Jupiter "Trojans".

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.

John Conrad, CCAS Member & NASA Solar System Ambassador
by Bruce Ruggeri, CCAS Program Chair

Our speaker on October 12th, John Conrad, NASA Ambassador and CCAS member, has been a long-time contributor to our meeting programs addressing a variety of topics. John's presentation will commence at approximately 7:50-8:00PM ET. The synopsis of the presentation, **The Lucy Mission: An Epic Journey to the Fossils of our Solar System**, along with John's biographical sketch are below.

Synopsis: Boldly going where no man (nor robot) has gone before, NASA will launch the Lucy spacecraft this October. The destination of this 12-year visit is the last unexplored Solar System "fossils" – the Trojan asteroids – trapped in Jupiter's orbit since the formation of the Solar System. Animations will aid in understanding the special – and changing orbits – designed by NASA's astrodynamacists, and how they will maximize the number and diversity of targets to be studied.

This single mission will rendezvous with 7 asteroids, almost as many as have been studied up close by all previous missions to the main asteroid belt (8). Kepler, Newton, and LaGrange would be proud to see this powerful application of their mathematical formulations and laws! Finally, Lucy's instruments will be described in order to see how the mission payoff will be achieved, namely, unlocking the mysteries of these ancient, pristine 'fossils' and furthering our understanding of the evolution of all bodies within our Solar System.



John Conrad

About the speaker: John Conrad followed his childhood interest in space and spaceflight – just before the dawn of the Space Age – earning his Astronautical Engineering degrees from the US Air Force Academy and Purdue University and assuming leadership roles in space programs for the Air Force, NASA, and the aerospace industry. Upon retirement, he was selected by NASA/JPL as a NASA Solar System Ambassador.

In this role, he reaches a broad range of audiences with the latest and greatest in NASA's programs and achievements. John has been an active member of CCAS and The Planetary Society and speaker for events in both organizations, addressing a number of topics drawing considerable interest from diverse audiences, including *Global Climate Change: The View from Space*, *A Hitchhiker's Guide to the Solar System – Celebrating the 60th Anniversary of NASA*, and *The Cassini/Huygens Mission to Saturn and its Moons*.

Astronomers Discover Mysterious 500-Light-Year-Wide Void in Space

by Robert Lea, Newsweek.com

Astronomers have discovered a gigantic cavity in space while studying 3D maps of nearby star-forming clouds of gas and dust. The bubble-shaped void in the Milky Way is around 500 light-years wide and is located between the star-forming clusters of gas, or molecular clouds, in the Perseus and Taurus constellations.

The research team that discovered the void believes that it may have been created when a star went supernova in the vicinity around 10 million years ago. The tremendous stellar explosion pushed gas out from the region, forming the void and the "Perseus-Taurus Supershell" of stars that surround it.

"Hundreds of stars are forming or exist already at the surface of this giant bubble," a postdoctoral researcher at the Institute for Theory and Computation (ITC) at the Center for Astrophysics (CfA), Shmuel Bialy, said in a press release.

Bialy, the lead author of a study detailing the discovery published in the *Astrophysical Journal Letters*, added the team has an alternative theory of how the void could have been created, also involving supernovas. "We have two theories—either one supernova went off at the core of this bubble and pushed gas outward forming what we now call the 'Perseus-Taurus Supershell,' or a series of supernovae occurring over millions of years created it over time."

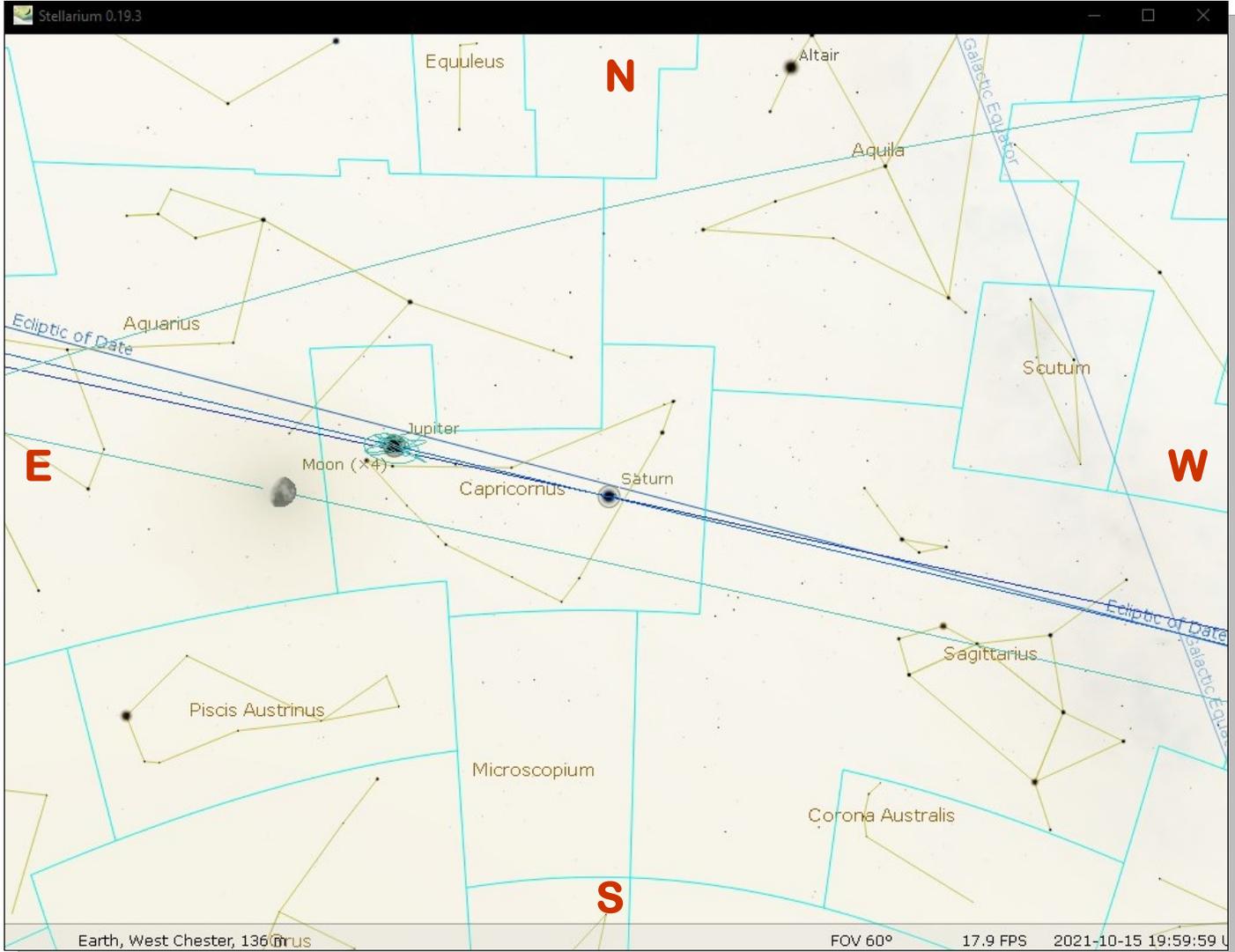
This is the first time the Perseus and Taurus molecular

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The Sky Over Chester County

October 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.



Date	Civil Twilight Begins	Sunrise	Sunset	Civil Twilight Ends	Length of Day
10/01/2021	6:31 a.m. EDT	6:58 a.m. EDT	6:44 p.m. EDT	7:11 p.m. EDT	11h 45m 18s
10/15/2021	6:16 a.m. EDT	7:13 a.m. EDT	6:22 p.m. EDT	7:37 p.m. EDT	11h 09m 17s
10/31/2021	7:02 a.m. EDT	7:30 a.m. EDT	6:00 p.m. EDT	6:28 p.m. EDT	10h 30m 16s

Moon Phases					
			New Moon	10/06/2021	7:05 a.m. EDT
First Quarter	10/12/2021	11:25 p.m. EDT	Full Moon	10/20/2021	10:56 a.m. EDT
Last Quarter	10/28/2021	4:05 p.m. EDT			

October 2021 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

6	New Moon, 7:05 a.m. EDT
9	A thin crescent Moon is near Venus
12	First Quarter, 11:25 p.m. EDT
13	Antares is near Venus in the evening sky
14	The Lunar Straight Wall is visible
20	Full Moon, the Full Hunter's Moon or the Turns Leaves White Full Moon
21	The Orionid meteors peak
28	Last Quarter Moon, 4:05 p.m. EDT
29	Venus is at greatest elongation this evening

The best sights this month: The planetary parade continues during October, starting with Venus just after the Sun sets, then Jupiter and Saturn appear in the south. Later, Neptune followed by Uranus rise in the east. So grab a warm drink and your telescope and make a date with the planets on a clear and crisp October evening. It is a better show than Netflix.

Mercury: Late in the month Mercury is in excellent viewing position. The only problem is the viewing opportunity occurs in the hour before dawn.

Venus: Venus is amazingly bright in the glow of the fading sunset, shining at magnitude -4.5 by month's end. At the York County Star Party, we viewed the gibbous phase of Venus. On October 9th Venus is near the thin crescent Moon.

Mars: Mars passes behind the Sun during October so viewing the red planet is not possible this month.

Jupiter: Jupiter is shining brightly in the southeast every evening at magnitude -2.5. Look for the Great Red Spot on an evening with clear and steady skies.

Saturn: Saturn is in excellent position for evening viewing for all of October. Don't miss seeing this incredible sight in the eyepiece of your telescope! And share the view with family and friends!

Uranus and Neptune: We saw Uranus and Neptune at the York County Star Party as they rose in the east. Uranus is a distinct greenish disk, while Neptune has just a hint of blue color but with no visible disk it looks like a star.

The Moon: Full Moon is on October 20th. This full Moon is the Hunter's Moon, Blood Moon, or Sanguine Moon. Many moons ago, Native Americans named this bright moon for obvious reasons. The leaves are falling from trees, the deer are fattened, and it is time to begin storing up meat for the long winter ahead. Because the fields were traditionally reaped in late September or early October, hunters could easily see fox and other animals that come out to glean from the fallen grains. Probably because of the threat of winter looming close, the Hunter's Moon is generally accorded with special honor, historically serving as an important feast day in both Western Europe and among many Native American tribes. Native Canadians called this the Animal Fattening Moon or the Turns Leaves White Moon.

Constellations: During October the Summer Triangle and all the delights it holds sinks toward the west late in the evening, but here come the fall and winter treasures! The dim but huge Great Square of Pegasus dominates the southern sky and by 9:00 we can find the jewels of the night – the Pleiades - rising in the east. Stay up late and Taurus the Bull leads Orion the Hunter up from the eastern horizon.

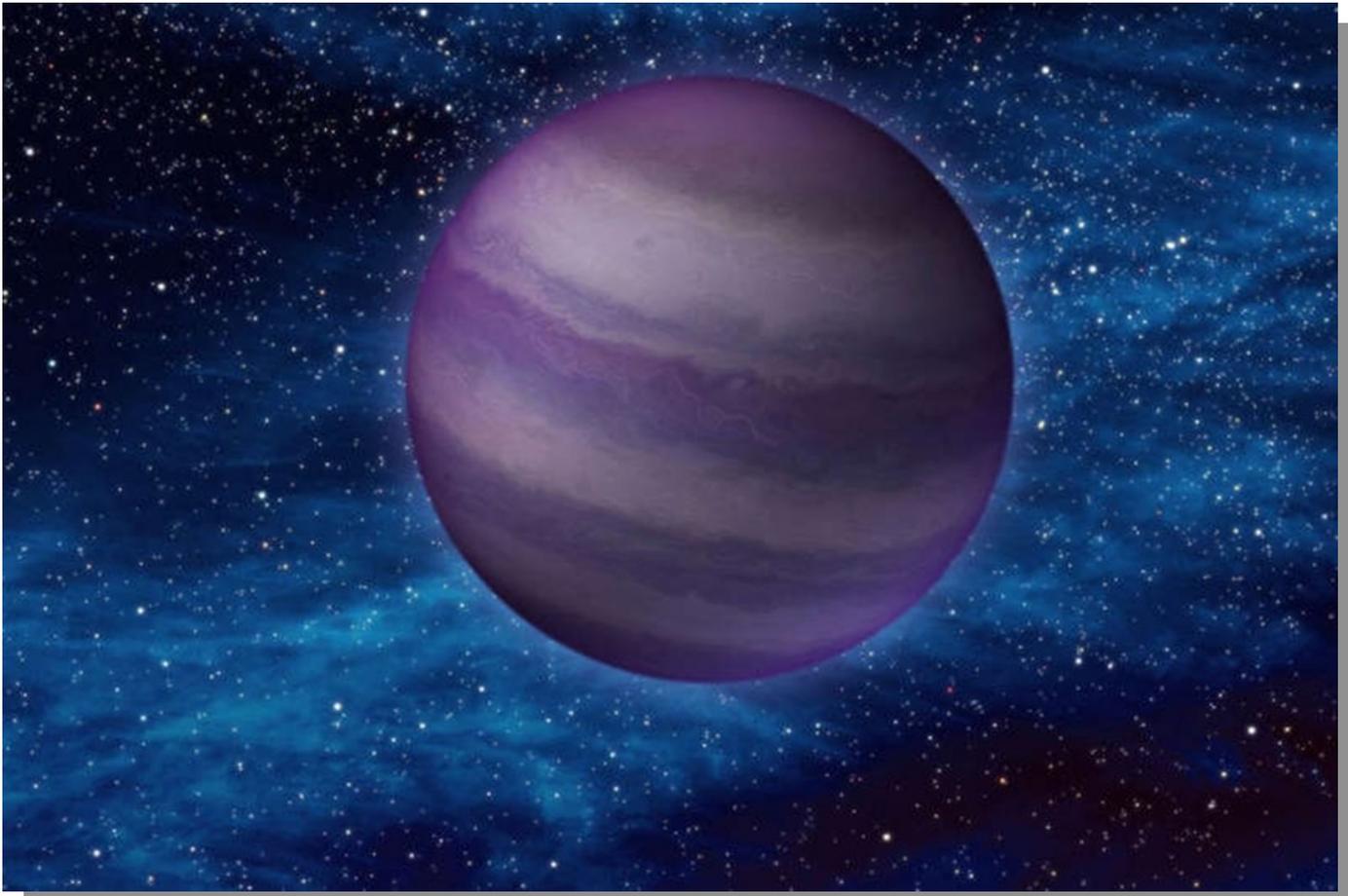
Messier/deep sky: The deep sky highlight this time of year for me is the Andromeda Galaxy, M31. That fuzzy spot in the eyepiece is amazing to gaze into, knowing it is 2.5 million miles distant. You don't need to be up late to catch the wonderful Double Cluster in Perseus and the compact star cluster M34 is just a bit to the south, also in Perseus. Stay up until 10:00 and you can see the star clusters in Auriga rising: M36, M37 and M38.

Comets: There are no bright comets visible during October

Meteor showers: The Orionid meteor shower peaks in the early morning hours of October 21st. Normally you could see up to 15 "shooting stars" per hour, but with Full Moon occurring the previous evening we won't see many meteors this year. This shower is made up of dust particles from Comet Halley.

Unique Failed Star Is Like Nothing Else in the Milky Way

by Aristos Georgiou, Newsweek.com



This artist's illustration shows a dim, cold brown dwarf in space. Image Credit: IPAC/Caltech

Astronomers have uncovered fascinating new details about a bizarre "failed star" that has a set of "unusual" properties and "unique" traits that distinguish it from every other known object like it in our galaxy.

In the study, which was published in *The Astrophysical Journal Letters*, astronomers analyzed data regarding a peculiar object known as WISEA J153429.75-104303.3, which has been dubbed "The Accident" due to the fortuitous manner of its recent discovery.

The Accident is a type of brown dwarf—a class of astronomical objects with a mass between that of a planet and a star. In fact, these objects are often

referred to as "failed stars" because while they form in much the same way, they do not have the required mass to kickstart the crucial process of nuclear fusion that gives birth to true stars.

The findings of the latest paper suggest that there may be many more brown dwarfs in the universe than previously thought, given that The Accident does not appear to resemble any of the roughly 2,000 brown dwarfs that have been found in the Milky Way to date.

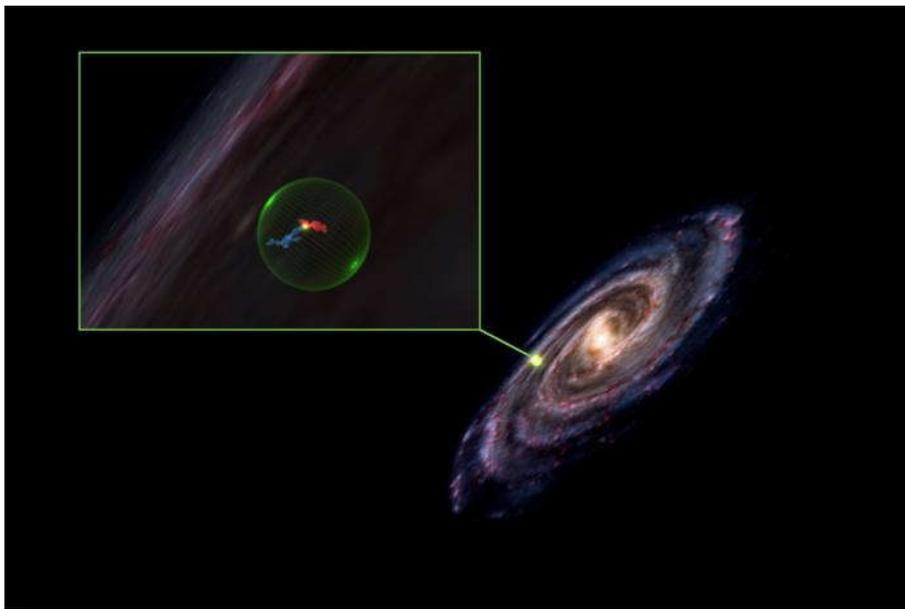
Some brown dwarfs appear to defy characterization but until the latest discovery, astronomers had a relatively good understanding of their general characteristics.

The Accident, however, appears to be an outlier that "defied all our expectations," Davy Kirkpatrick, an author of the study from Caltech, said in a statement. As brown dwarfs age, they become cooler and their brightness in different wavelengths of light changes. Brown dwarfs tend to be cooler and dimmer compared to most stars, emitting mainly infrared light.

But when the authors analyzed data on The Accident, the findings caused confusion, because it appeared to have seemingly contradictory properties. In some wavelengths of light, the object appeared to be very

(Continued on page 7)

Void (Cont'd)



An image of a giant space cavity within the Milky Way. Astronomers discovered the 500 light year wide void whilst 3D modelling star forming regions. Image © Alyssa Goodman/ Nadia Whitehead/Center for Astrophysics/Harvard & Smithsonian

(Continued from page 3)

clouds have been mapped in 3D, with previous 2D maps missing the titanic void. The findings suggest that these molecular clouds, which have previously been considered to be separate structures, actually formed as a result of the same supernova shockwave. The 3D maps were

created with data collected by the Gaia space-based observatory by a team at CfA led by post-doctoral researcher Catherine Zucker.

"We've been able to see these clouds for decades, but we never knew their true shape, depth, or thickness," Zucker, the lead au-

thor on a separate study that detailed the work set to be published in the *Astrophysical Journal*, said in the press release. "We also were unsure how far away the clouds were. Now we know where they lie with only 1 percent uncertainty, allowing us to discern this void between them."

Zucker said that she and her team created the maps to better understand how **gas and dust** arrange in molecular clouds as they **collapse to form stars**. The 3D molecular cloud maps were created using data visualization software called "Glue," founded by CfA astronomer Alyssa Goodman who is a co-author on both studies.

"When I was a graduate student, in the 1980s, I never, ever, dreamed that I would see real, 3D, maps of star-forming clouds. Even the closest clouds are hundreds of light-years away, so, absent Star Trek warp speed, we would never have a

(Continued on page 9)

The Accident (Cont'd)

(Continued from page 6)

faint, suggesting it was very cold—and therefore old. But in others, it seemed to glow more brightly indicating a much higher temperature.

To understand more about these unusual properties, the scientists conducted further investigations revealing that The Accident, which is located around 50 light-years from Earth, was indeed very cold and that the object was moving at around half a million miles per hour—much faster than all the other known

brown dwarfs at this distance from Earth.

Taking all of this evidence into account, the authors concluded that the brown dwarf's strange properties could be explained by the fact that it was somewhere between 10 and 13 billion years old, at least double the median age of other known brown dwarfs. This means that the object likely formed early in the history of the galaxy when the Milky Way contained very little carbon, and was composed almost entirely of hydrogen and

helium.

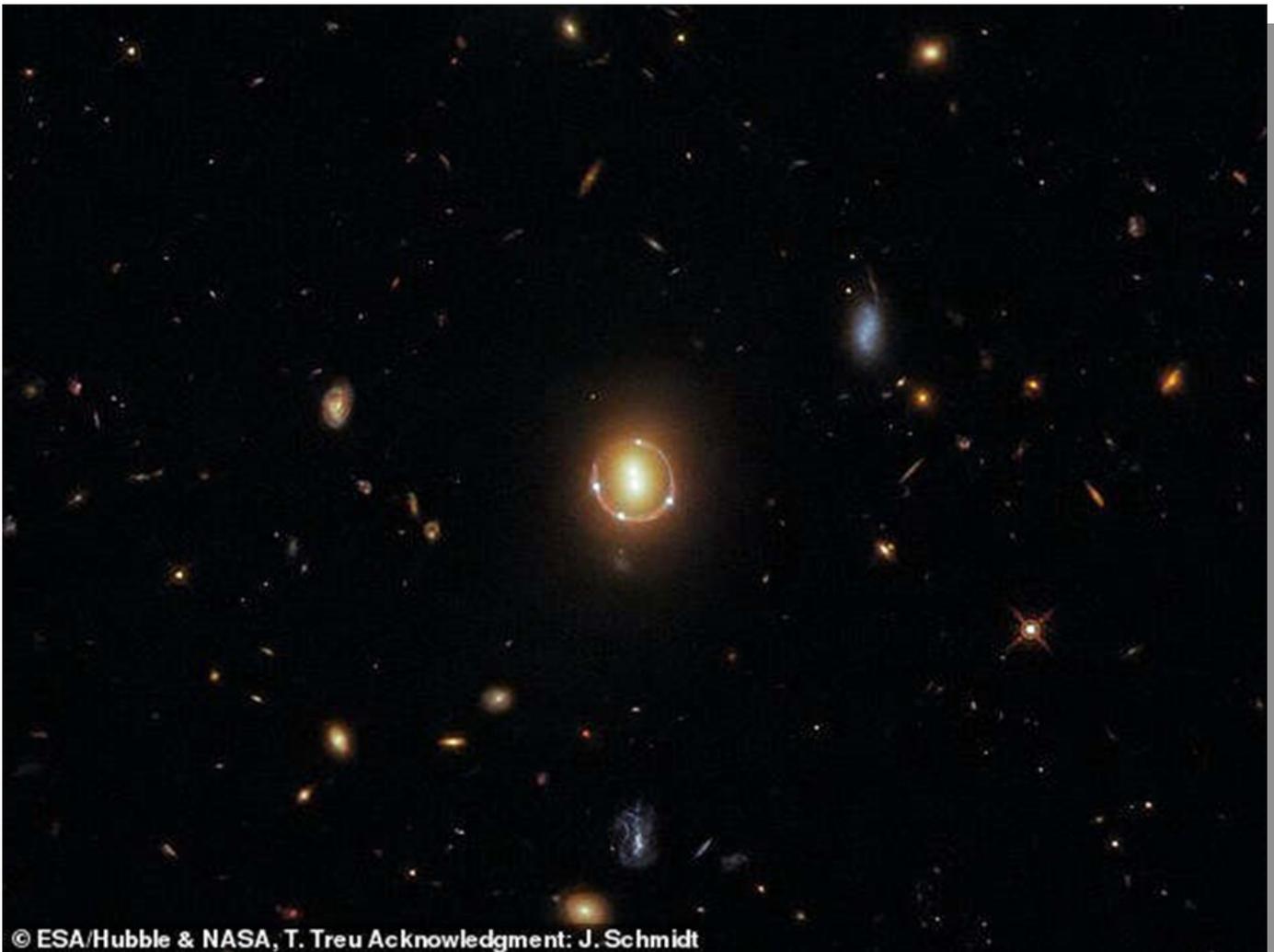
Most brown dwarfs that have a similar temperature to The Accident are rich in methane, a gas which consists of hydrogen and carbon. But the light properties of The Accident indicate that it contains very little methane today, suggesting that it is very old.

The latest findings indicate that there are many more ancient brown dwarfs in the galaxy than previously thought because as-

(Continued on page 11)

Einstein Ring spotted by Hubble 3.4 billion light-years from Earth

by Stacy Liberatore, Dailymail.com



© ESA/Hubble & NASA, T. Treu Acknowledgment: J. Schmidt

Image Provided by Daily Mail

The Hubble Space Telescope captured a stunning “Einstein Ring” 3.4 billion light-years from Earth. This cosmic display, formally known as gravitational lensing, occurs when the gravitational field from a massive object in space warps space and deflects light from a distant object behind it.

It then results in a bull’s-eye pattern, or “Einstein Ring.” It was predicted by the famed physicist, Albert Einstein, in 1915. The image shows six luminous spots of light clustered at the center, four of which are

forming a circle around a central pair. The formation, however, only consists of two galaxies and a single distant quasar that is magnified as it passes through the gravitational field of the galaxies.

The quasar, known as 2M1310-1714, sits farther away from Earth than the pair of galaxies. A quasar is the extremely bright nucleus of an active galaxy and its powerful glow is created by the incredible amounts of energy released by gas falling toward the supermassive black hole at its center.

“The light from the quasar has been bent around the galaxy pair because of their enormous mass, giving the incredible appearance that the galaxy pair are surrounded by four quasars — whereas in reality, a single quasar lies far beyond them,” the European Space Agency (ESA) shared in a [statement](#).

In 1915, the German-born Einstein claimed that gravity is the result of massive objects warping the very fabric of the universe, what he called *spacetime*.

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Void (Cont'd)

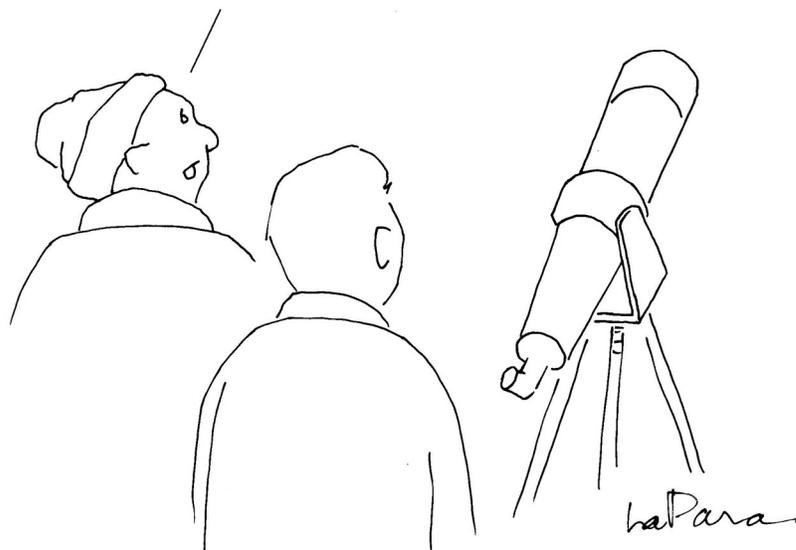
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chance of 'flying around them' and mapping them in 3D," Goodman told Newsweek. "Instead, computers and telescopes have gotten so good that we can image these clouds with, essentially mathematic. Absolutely shocking, as are the insights we've gained from these 3D dust maps."

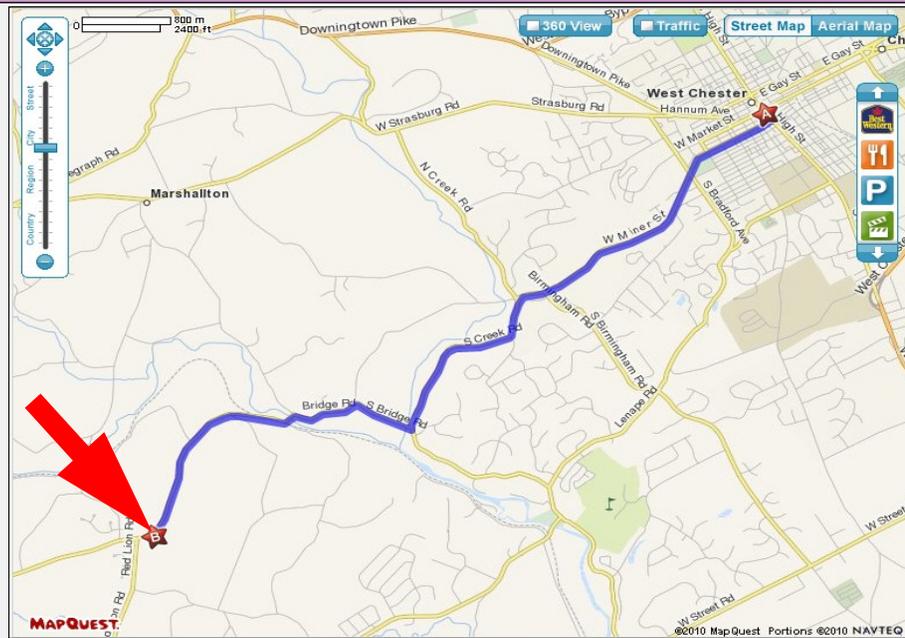
Goodman foresees a future in which programs like "Glue" will help modernize studies providing interactive and replicable results in what she calls a "paper of the future." She said in the press release: "It's 3D visualizations like these that can help both scientists and the public understand what's happening in space and the powerful effects of supernovae."

Classic La Para by Nicholas La Para

CAN THE DARK-SKY
ASSOCIATION DO
ANYTHING ABOUT THAT?



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

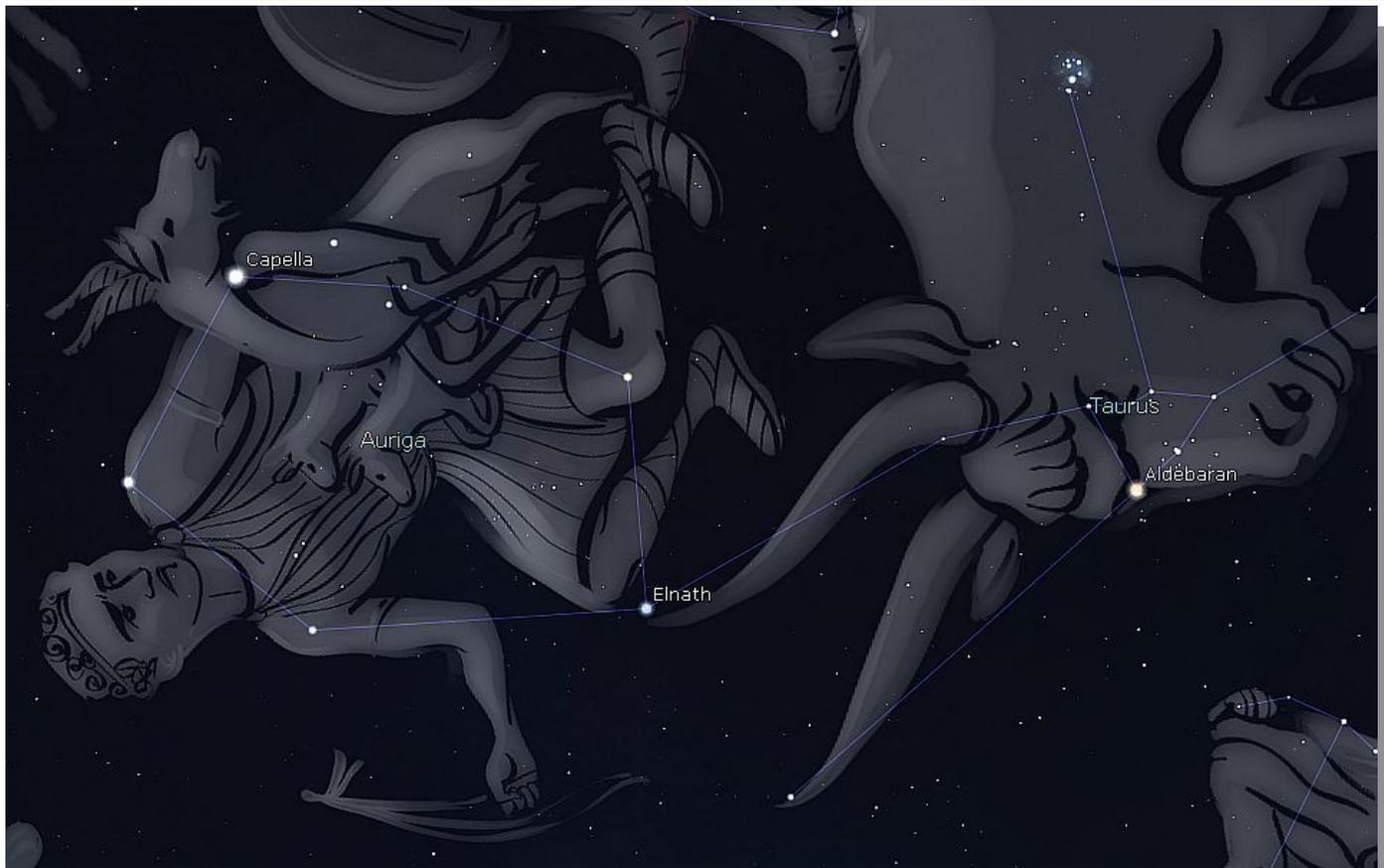
1760 Unionville Wawaset Rd
West Chester, PA 19382
(610) 793-1090

<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.

Through the Eyepiece: Elnath, the Star with a Dual Identity

by Don Knabb, CCAS Observing Chair & Treasurer



Star chart created with Stellarium planetarium software by the author

Like Superman and Clark Kent, Elnath has a dual identity. It is the second brightest star in the constellation Taurus the Bull, so it is officially Beta Tauri. But Elnath also “connects the dots” of the ring of stars that make up the constellation Auriga.

The name Elnath, also written as El Nath or Alanth, means “the butting”, as in with a bull’s horns. And as you can see on the star chart Elnath is at the tip of one of the horns of Taurus.

When constellations were first drawn thousands of years ago, there was no official body to rule what stars belonged to which constellation, so a star could do double duty as Elnath

did for centuries. Ptolemy considered the star to be shared by Auriga, and Johann Bayer the celestial cartographer assigned it a designation in both constellations.

But in the early 1900’s astronomers sought order in the chaos of the night sky, so 88 official constellations were named and boundaries established for those constellations. Elnath was officially assigned to Taurus but still remains in location as part of the ring of stars that form Auriga.

Elnath is easy to find, if you learn to recognize the “face of the bull” in the constellation Taurus. The “face of the bull” in Taurus is shaped like the letter V. You can actually see that V-

shape on the sky’s dome. If you extend one end of the V, you come to the star Elnath. Elnath represents the northern horn of Taurus the Bull.

Elnath isn’t quite as bright as Aldebaran, the “eye of the bull” in Taurus. But it’s also part of a noticeable pattern, and its blue-white color contrasts nicely to Aldebaran’s orange color.

In the Northern Hemisphere, we see Taurus and its stars on fall and winter evenings. Elnath stands opposite the sun around mid-December, at which time this star rises around sunset and sets around sunrise. In January and February, Elnath is already up in the southeast at sunset. By

(Continued on page 11)

Eye-piece (Cont'd)

(Continued from page 10)

June, Elnath will be lost to the sun's glare and won't be seen at all. Excepting June, however, Elnath can be seen for at least part of the night throughout the year.

Elnath is in an interesting position in the night sky. In August we look toward the center of our Milky Way galaxy. During the fall and winter, we do the opposite. We look opposite the galaxy's center, toward the galactic anticenter and the galaxy's nearest outer edge. Elnath is the closest bright star on our sky's dome to the galactic anticenter.

Elnath stands a bit north of the ecliptic – the annual pathway of the sun in front of the background stars. Because the moon's path is always near the ecliptic, the moon swings close to Elnath every month. Generally, the moon swings to the south of Elnath. On occasion, the moon swings far enough north so that it occults – covers over – Elnath. This won't happen again

until September 7, 2023, the occultation marking the first of a series of monthly occultations that will last until April 11, 2027.

Elnath sparkles white, and is tinged in blue. This star's color indicates that it has a hot surface temperature of about 24,000 degrees F. Contrast this to the surface temperature of our yellowed-colored sun, which is 10,000 degrees F. According to the star expert Jim Kaler, Elnath has 4.5 times the sun's mass, and shines with the firepower of 700 suns.

References:

- Dickinson, Terence 2006. *Nightwatch: A practical guide to viewing the universe*. Buffalo, NY. Firefly Books
- <https://earthsky.org/brightest-stars/el-nath-aurus-the-bulls-second-brightest-star/>
- https://en.wikipedia.org/wiki/Beta_Tauri

The Accident (Cont'd)

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tronomers have not been looking for objects with the unusual mix of characteristics displayed by The Accident.

The characteristics of The Accident are so different to any other known brown dwarf that it took a stroke of pure luck to discover the object, hence the name. It was not picked up by typical searches for brown dwarfs. In fact, the object was discovered accidentally by citizen scientist Dan Caselden who was observing another, more ordinary, brown dwarf in data from the NEOWISE project, which maps the entire sky roughly once every six months.

"This discovery is telling us that there's more variety in brown dwarf compositions than we've seen so far," Kirkpatrick said. "There are likely more weird ones out there, and we need to think about how to look for them."

The latest discovery suggests

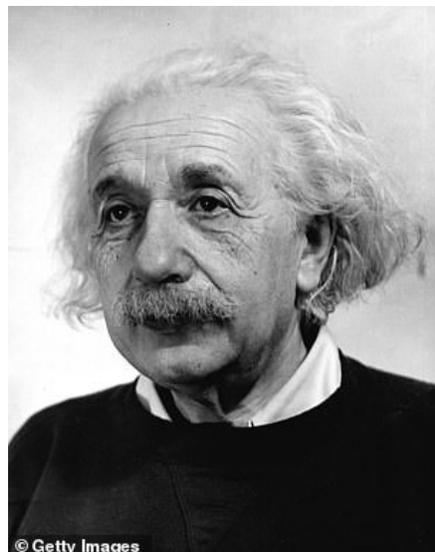
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Einstein Ring (Cont'd)

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Experts have since been able to test his theory of General Relativity within the solar system and prove his groundbreaking work holds up to scrutiny, which has been with hundreds of Einstein Rings.

Thomas Collett, of the Institute of cosmology and gravitation at the University of Portsmouth, who discovered another Einstein Ring in 2018, said in a statement: "General Relativity predicts that massive objects de-



© Getty Images

form space-time.

"This means that when light passes near another galaxy the light's path is deflected. If two galaxies are aligned along our line of sight this can give rise to a phenomenon, called strong gravitational lensing, where we see multiple images of the background galaxy.

"If we know the mass of the foreground galaxy, then the amount of separation between

(Continued on page 14)

NASA Night Sky Notes: Weird Ways to Observe the Moon

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.

International Observe the Moon Night is on October 16 this year—but you can observe the Moon whenever it's up, day

or night! While binoculars and telescopes certainly reveal incredible details of our neighbor's surface, bringing out dark seas, bright craters, and numerous odd fissures and cracks, these tools are not the only way to observe details about our Moon. There are more ways to observe the Moon than you might expect,



just using common household materials.

Put on a pair of sunglasses, especially **polarized sunglasses!** You may think this is a joke, but the point of polarized sunglasses is to dramatically reduce glare, and so they allow your eyes to pick out some lunar details! Surprisingly, wearing sunglasses even helps during daytime observations of the Moon.

One unlikely tool is the humble **plastic bottle cap!** John Goss from the Roanoke Valley Astronomical Society shared these directions on how to make your own bottle cap lunar viewer, which was also suggested to him by Fred Schaaf many years ago as a way to also view the thin crescent of Venus when close to the Sun:

“The full Moon is very bright, so much that details are overwhelmed by the glare. Here is an easy way to see more! Start by drilling a 1/16-inch (1.5 mm) diameter hole in a plastic soft drink bottle cap. Make sure it is an unobstructed, round hole. Now look through the hole at the bright Moon. The image brightness will be much dimmer than

(Continued on page 13)



Sun Funnels in action! Starting clockwise from the bottom left, a standalone Sun Funnel; attached to a small refractor to observe the transit of Mercury in 2019; attached to a large telescope in preparation for evening lunar observing; projection of the Moon onto a funnel from a medium-size scope (5 inches).

Safety tip: NEVER use a large telescope with a Sun Funnel to observe the Sun, as they are designed to project the Sun using small telescopes only. Some eager astronomers have melted their Sun Funnels, and parts of their own telescopes, by pointing them at the Sun - large telescopes create far too much heat, sometimes within seconds! However, large instruments are safe and ideal for projecting the much dimmer Moon. Small telescopes can't gather enough light to decently project the Moon, but larger scopes will work.

Night Sky Notes (Cont'd)



International OBSERVE
THE MOON NIGHT 2021 SATURDAY
OCTOBER 16TH



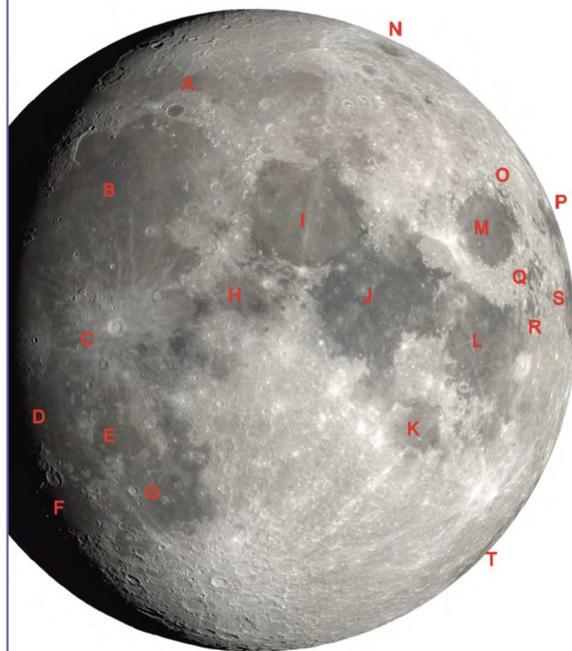
NORTHERN HEMISPHERE MOON MAP WITH LUNAR MARIA (SEAS OF BASALT)

Moon Map

This map was created for International Observe the Moon Night 2021. It depicts the Moon as it will appear from the northern hemisphere at approximately 11:00 PM EDT on October 16, 2021 (3:00 AM UTC on October 17).

Lunar Maria (Seas of Basalt)

You can see a number of maria tonight. Once thought to be seas of water, these are actually large, flat plains of solidified basaltic lava. They can be viewed in binoculars or even with the unaided eye. Tonight, you may be able to identify 18 maria on the Moon. This includes four seas along the eastern edge that are often hard to see. Because of libration, a slight apparent wobble by the Moon in its orbit around Earth, tonight we get to peek slightly around the northeast edge of the Moon, glimpsing a sliver of terrain normally on the Moon's far side.



Map generated with NASA's Dial-A-Moon
(<https://svs.gsfc.nasa.gov/4874>)

- | | | |
|--|--|---------------------------------|
| A. Mare Frigoris (Sea of Cold) | H. Mare Vaporum (Sea of Vapors) | O. Mare Anguis (Serpent Sea) |
| B. Mare Imbrium (Sea of Rains) | I. Mare Serenitatis (Sea of Serenity) | P. Mare Marginis (Border Sea) |
| C. Mare Insularum (Sea of Isles) | J. Mare Tranquillitatis (Sea of Tranquility) | Q. Mare Undarum (Sea of Waves) |
| D. Oceanus Procellarum (Ocean of Storms) | K. Mare Nectaris (Sea of Nectar) | R. Mare Spumans (Sea of Foam) |
| E. Mare Cognitum (Known Sea) | L. Mare Fecunditatis (Sea of Fertility) | S. Mare Smythii (Smyth's Sea) |
| F. Mare Humorum (Sea of Moisture) | M. Mare Crisium (Sea of Crises) | T. Mare Australe (Southern Sea) |
| G. Mare Nubium (Sea of Clouds) | N. Mare Humboldtianum (Humboldt's Sea) | |



[MOON.NASA.GOV/OBSERVE](https://moon.nasa.gov/observe)

#ObserveTheMoon

You can download and print NASA's observer's map of the Moon for International Observe the Moon Night! This map shows the view from the Northern Hemisphere on October 16 with the seas labeled, but you can download both this map and one of for Southern Hemisphere observers, at: bit.ly/moonmap2021 The maps contain multiple pages of observing tips, not just this one.

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normal – over 90% dimmer – reducing or eliminating any lunar glare. The image should also be much sharper because the bottle cap blocks light from entering the outer portion of your pupil, where imperfections of the eye's curving optical path likely lie." Many report seeing a startling amount of lunar detail!

You can project the Moon!

Have you heard of a "Sun Funnel"? It's a way to safely view the Sun by projecting the image from an eyepiece to fabric stretched across a funnel mounted on top. It's easy to make at home, too – directions are here: bit.ly/sunfunnel. Depending on your equipment, a Sun Funnel can view the Moon as well as

the Sun– a full Moon gives off more than enough light to project from even relatively small telescopes. Large telescopes will project the full Moon and its phases, with varying levels of detail; while not as crisp as direct eyepiece viewing, it's still an impressive sight! You can also mount your smartphone or tablet to your eyepiece for a similar Moon-viewing experience, but the funnel doesn't need batteries.

Of course, you can join folks in person or online for a celebration of our Moon on October 16, with International Observe the Moon Night – find details at moon.nasa.gov/observe. NASA has big plans for a return to the Moon with the Artemis program, and you can find the latest news on their upcoming lunar explorations at nasa.gov.

The Accident (Cont'd)

(Continued from page 11)

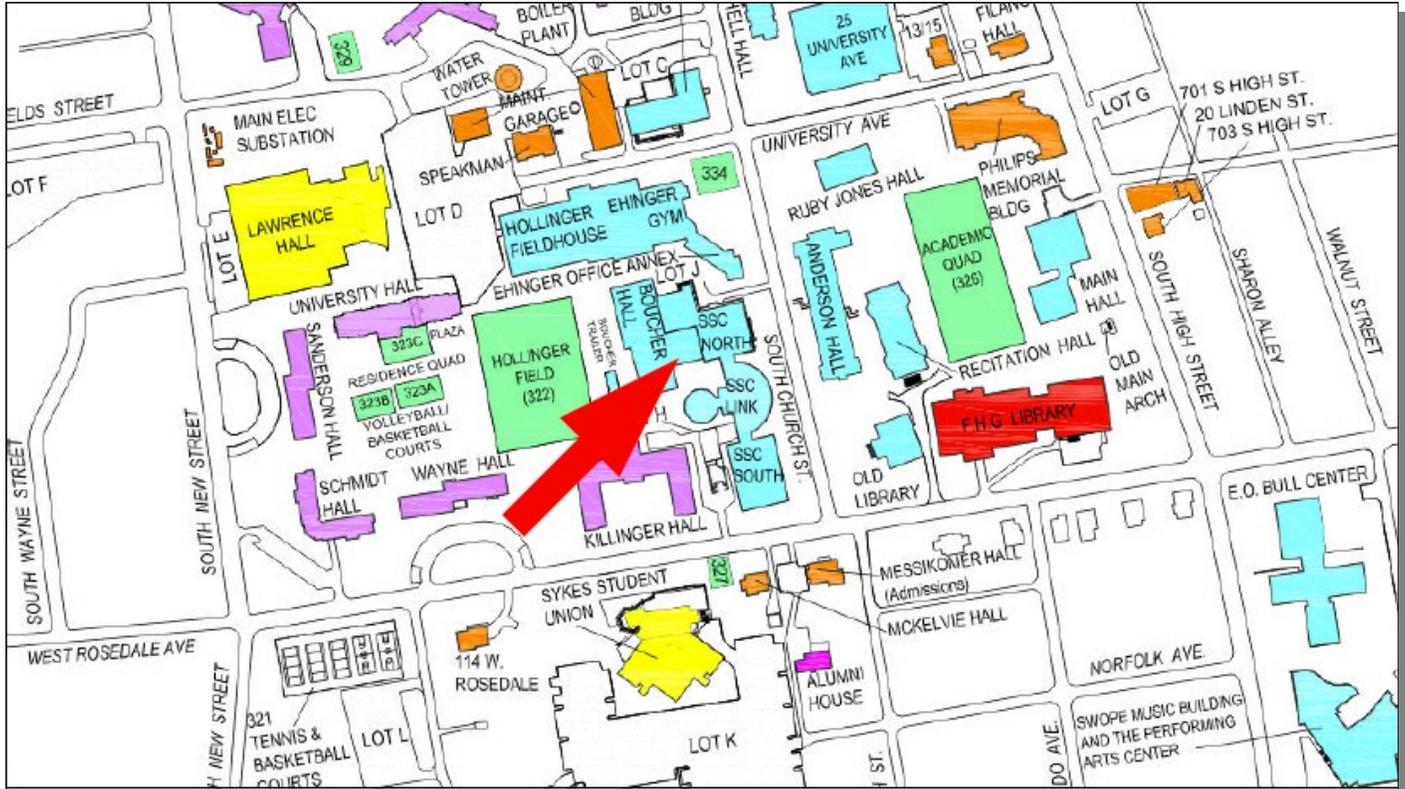
that if astronomers change how they look for brown dwarfs, we may discover many more than we could have previously predicted in future.

"It's not a surprise to find a brown dwarf this old, but it is a surprise to find one in our backyard," Federico Marocco, an astrophysicist at Caltech who was also involved in the study, said in the statement. "We expected that brown dwarfs this old exist, but we also expected them to be incredibly rare. The chance of finding one so close to the solar system could be a lucky coincidence, or it tells us that they're more common than we thought."

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).



Einstein Ring (Cont'd)

(Continued from page 11)

the multiple images tells us if General Relativity is the correct theory of gravity on galactic scales.”

Data from the Hubble telescope identified a seventh spot of light in the very center, which is a rare fifth image of the distant quasar.

A few hundred strong gravitational lenses are known, but most are too distant to precisely measure their mass. This rare phenomenon is caused by the presence of two galaxies in the center that act as a lens.

CCAS Membership Information and Society Financials

Treasurer's Report by Don Knabb

Sept. 2021 Financial Summary

Beginning Balance	\$520
Deposits	\$223
Disbursements	-\$382
Ending Balance	\$361

New Member Welcome!

Welcome new CCAS members Lex Klusovsky, Agostino Nigro, Marissa Mowrer, Robert Sopin, Sara Gallagher, Ella Simmons, Gabriella Lerario Aranda dos Santos, Erin Shaughnessy, Evan Brooks, and Ethan Stein, all from West Chester University.

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

Membership Renewals

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

Don Knabb
988 Meadowview Lane
West Chester PA 19382

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

Join the Fight for Dark Skies!



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

International Dark-Sky Association
 3225 North First Avenue
 Tucson, AZ 85719
 Phone: 520-293-3198
 Fax: 520-293-3192
 E-mail: ida@darksky.org

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

<http://www.darksky.org>

Dark-Sky Website for PA



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

<http://www.POLCouncil.org>

Find out about Lyme Disease!

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

<http://www.LymePA.org>

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

Good Outdoor Lighting Websites

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



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

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

<http://www.starrynightlights.com>



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

Phone: 484-291-1084

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

Local Astronomy-Related Stores

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



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

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

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

<http://www.skiesunlimited.net>



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

4403 Main Street
Philadelphia, PA 19127

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

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

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

CCAS Information Directory

CCAS Lending Telescopes

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

CCAS Lending Library

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

Contributing to *Observations*

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

Or mail the contribution, typed or handwritten, to:

Dr. John C. Hepler
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 (410) 639-4329 or e-mail to webmaster@ccas.us

CCAS Purpose

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

CCAS Executive Committee

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

President: Dave Hockenberry
610-558-4248

Vice President: Pete Kellerman
610-873-0162

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

Secretary: Beatrice Mazziotta
610-933-2128

Librarian: Barb Knabb
610-436-5702

Program: Bruce Ruggeri
484-883-5092

Education: Don Knabb
610-436-5702

Dennis O'Leary
610-701-8042

Webmaster & Newsletter: John Hepler
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 **\$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.