Observations

A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

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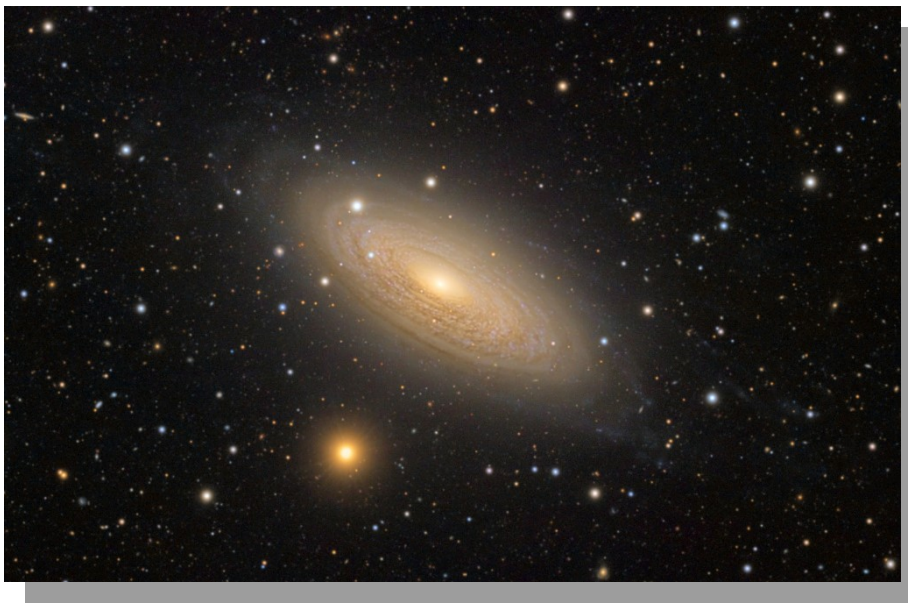
In This Issue

Membership Renewals Due

03/2022	Angelini DellaPenna Fulton Sterrett Zander Zibinski
04/2022	Chisholm & Odell Hepler Imburgia Miller Richter Rossomando Sah Smaglik
05/2022	Aylam & Martin-Aylam Bentley Bogusch Cunningham Fletcher Malkan O'Hara Ostanek Rosenstein Toth

Spiral Galaxy NGC 2841



Spiral galaxy NGC 2841 can be found in the northern constellation of Ursa Major. This view was captured during 32 clear nights in November, December 2021 and January 2022. NGC 2841 has a diameter of over 150,000 light-years, even larger than our own Milky Way. X-ray images suggest that resulting winds and stellar explosions create plumes of hot gas extending into a halo around NGC 2841.
Image Credit & Copyright: Vitali Pelenjow

March 2022 Dates

2nd • New Moon, 12:34 p.m. EST

10th • First Quarter Moon and the Lunar X is visible, 5:45 a.m. EST

12th • The Lunar Straight Wall is visible

15th • The Moon eclipses Eta Leonis around 7:45 p.m. EDT

18th • Full Moon, the Full Worm Moon or the Full Maple Sugar Moon, 3:17 a.m. EDT

18th-31st • The Zodiacal Light is visible from a dark sky site after evening twilight

25th • Last Quarter Moon, 1:37 a.m. EDT

CCAS Upcoming Nights Out

Because of the recent increase in Covid -19 infections, CCAS has curtailed its outreach to local communities with group and organizational observing sessions.

In addition, our monthly observing sessions at Myrick Conservancy Center, BVA, are limited to vaccinated CCAS members only.

✹ Friday, March 25, 2022, Myrick Conservancy Center, BVA (Tentative)

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

Winter / Spring Society Events

March 2022

8th • Monthly CCAS Meeting online via Zoom. The meeting starts at 7:30 p.m. Guest Speaker: Dr. Benjamin Hockman, Robotics Division, NASA's Jet Propulsion Laboratory (JPL): "Frontiers of Robotic Exploration of the Solar System: From Asteroid Hoppers to Europan Deep Drills."

13th • Daylight Saving Time starts, 2:00 a.m. ET. Adjust clocks one hour ahead.

17th • The von Kármán Lecture Series: Moon Dance: Dynamics of the Moons of the Outer Solar System, starting at 10:00 pm EDT. Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

20th • Vernal Equinox, 11:33 a.m. EDT. First day of spring.

20th • Open call for articles and photographs for the April 2022 edition of Observations.

26th • Deadline for newsletter submissions for the April 2022 edition of Observations.

April 2022

8th • Monthly CCAS Meeting online via Zoom. The meeting starts at 7:30 p.m. Guest Speaker: (tentative) Dr. Peter K. Hand, NASA's Jet Propulsion Laboratory (JPL), "Alien Oceans - Exploration and Studies of Europa and Enceladus."

20th • Open call for articles and photographs for the May 2022 edition of Observations.

26th • Deadline for newsletter submissions for the May 2022 edition of Observations.

February 2022 Monthly Meeting Minutes

by Bea Mazziotta, CCAS Secretary

- Dave Hockenberry welcomed members and guests to the meeting on February 8, 2022, which was held via Zoom and YouTube only. 40 members and guests attended on these platforms.
- Dave announced that CCAS would continue to follow the guidance of WCU re: in person meetings. The club hopes to return to in person meetings if current Covid trends continue in a positive direction.
- Don Knabb announced that the club has started to schedule some public star gazing events for spring and summer. Look for a list of those upcoming events in the newsletter or the CCAS website. http://www.ccas.us/
- Don also recommended that members look into the upcoming Green Bank Star Quest event. Link http://greenbankstarquest.org/
- Don took us on a tour of the February night sky. The cold temperatures may not be very conducive to setting up a scope but, as he pointed out, there are many amazing objects that are perfect for binocular viewing. Here are some you can find with binoculars on a reasonably clear February night: The Coal Car cluster (NGC 1981); the great Orion Nebula; the Casper the Friendly Ghost nebula (M78); NGC 2169 or the "37 cluster"; the Little Beehive (M41); the Beehive (M44); M46, M47, M48.
- Bruce Ruggeri introduced the evening's speaker, Dr. Morgan Cable.
- Dr. Cable is a research scientist and group supervisor in Astrobiology and Ocean Worlds at NASA JPL in Pasadena. She worked on the Cassini Mission as a Project Science Systems Engineer, and is currently working on the Europa Clipper Mission.
- Her presentation was titled Exploring Ocean Worlds of the Outer Solar System. When exploring other potential habitable worlds sci-

(Continued on page 8)

March 2022 CCAS Meeting Agenda

by Bruce Ruggeri, CCAS Program Chair

Our next meeting will be held on March 8, 2022, online via Zoom. The meeting starts at 7:30 p.m. Guest Speaker: Dr. Benjamin Hockman, Robotics Division, NASA's Jet Propulsion Laboratory (JPL): "Frontiers of Robotic Exploration of the Solar System: From Asteroid Hoppers to Europan Deep Drills."

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 2022 -2023 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 2022 Guest Speaker Bio & Presentation Synopsis

by Bruce Ruggeri

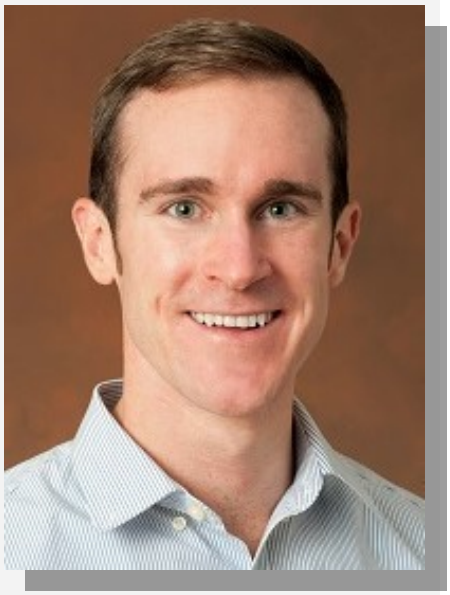
At our next monthly meeting on March 8, 2022, Dr. Benjamin Hockman from NASA's JPL will share with us his research on robotics and their use in exploring the solar system. Join us online starting at 7:30 p.m.

Title: Frontiers of Robotic Exploration of the Solar System: From Asteroid Hoppers to Europan Deep Drills

Abstract: Our solar system is teeming with mysteries, from the ancient history of rocky planets encoded in their scarred surfaces, to the tantalizing potential of extant life hidden within the subsurface oceans of icy moons. While these distant worlds remain largely unreachable for our fragile terrestrial bodies, we can pool our collective ingenuity to fashion instrumented robotic probes to undertake these dangerous journeys on our behalf---extensions of humanity's consciousness into the deep unknown.

However, to visit these alien destinations, our robotic emissaries must contend with a variety of foreign challenges, including volatile temperatures, harsh radiation, microgravity, and highly varied planetary terrains. To do so, our probes take many forms that are highly specialized for the task and environment at hand, ranging from orbiting spacecraft, to wheeled rovers, to aerial rotorcraft and balloons. Moreover, as these probes venture deeper into the solar system, they must be increasingly intelligent and autonomous to reason about their environment and execute tasks with limited human interaction.

In this presentation, I will discuss some of the recent research and development activities at JPL to meet these challenges of future robotic exploration in new and challenging planetary environments. I will share a broad portfolio of ongoing technology and mission concept developments, and then focus on three concepts I am currently working on: (1) hopping probes for the exploration of asteroids and comets, (2) an "aerobot" and towbody imager for peering beneath Venus' thick atmosphere, and (3) a nuclear-powered ice-melting "drill" for penetrating Europa's icy crust and accessing its global subsurface ocean.



Benjamin Hockman, Ph.D.

Biosketch: Dr. Benjamin Hockman is a robotics technologist at NASA's Jet Propulsion Laboratory. He received his PhD from Stanford University, where his graduate work focused on autonomous robotic mobility on small Solar System Bodies. Ben's research interests include design, control, modeling, estimation,

(Continued on page 13)

Astronomers Discover a Third Planet Orbiting Our Galactic Neighbor Proxima Centauri

by Tom Metcalfe, courtesy MSN.com

Astronomers have found evidence of a third planet around the closest star to the sun, reinforcing the idea that planets are common around the stars of the galaxy, even some of its smallest. And while the newly found planet is less than half the size of Earth and probably too hot to be inhabited, there's still a chance there could be life around Proxima Centauri, Earth's nearest galactic neighbor.

"The planet is not within the star's habitable zone — it's orbiting too close," said astronomer João Faria, the lead author of a study published this month in the journal *Astronomy & Astrophysics* that details the discovery. "So it's unlikely that water can be in a liquid state and that the conditions are right for life."

In fact, the new planet is so close — about a tenth of the distance between the sun and Mercury — that it takes just five days to complete an orbit around its star. It's also likely to be "tidally locked," as the moon is to Earth, with one face always pointing toward Proxima Centauri. That could cause extremes of temperature and limits the likelihood that the planet has a stable atmosphere, Faria said.

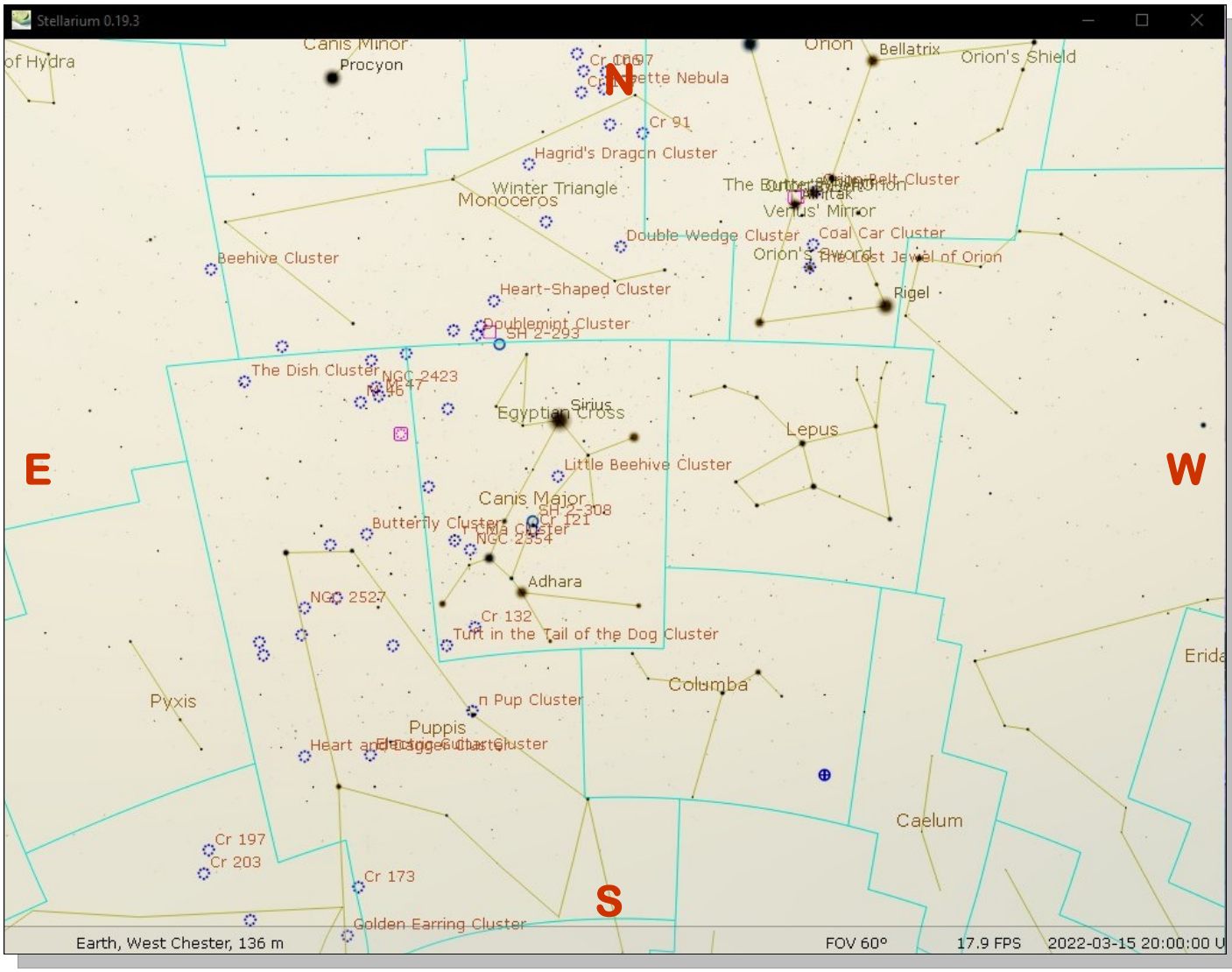
But astronomers are excited by the discovery, despite the hostile conditions that could exist on the new planet. Faria, a researcher at the Institute of Astrophysics and Space Sciences at the University of Porto in Portugal, said it suggests the Proxima system could

(Continued on page 6)

The Sky Over Chester County

March 15, 2022 at 8:00 p.m. ET

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



Date	Civil Twilight Begins	Sunrise	Sunset	Civil Twilight Ends	Length of Day
03/01/2022	6:08 a.m. EST	6:36 a.m. EST	6:21 p.m. EST	5:50 p.m. EST	11h 18m 41s
03/15/2022	6:46 a.m. EDT	7:13 a.m. EDT	7:09 p.m. EDT	7:36 p.m. EDT	11h 55m 28s
03/31/2022	6:20 a.m. EDT	6:48 a.m. EDT	7:25 p.m. EDT	7:53 p.m. EDT	12h 37m 42s

Moon Phases					
			New Moon	03/02/2022	12:34 a.m. EST
First Quarter	03/10/2022	5:45 a.m. EST	Full Moon	03/18/2022	3:17 a.m. EDT
Last Quarter	03/25/2022	1:37 a.m. EDT			

March 2022 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

2	**New Moon, 12:34 p.m. EST**
5	**Jupiter passes behind the Sun, emerging in the morning sky in April**
8	**The waxing crescent Moon is between the Pleiades and Aldebaran**
10	**First Quarter Moon and Lunar X visible, 5:45 a.m. EST**
12	**The Lunar Straight Wall is visible**
13	**Daylight Saving Time begins at 2:00 a.m. ET, and Neptune passes behind the Sun**
15	**The Moon eclipses Eta Leonis around 7:45 p.m. EDT**
18	**Full Moon, the Full Worm Moon or the Full Maple Sugar Moon, 3:17 a.m. EDT**
18-31	**The Zodiacal Light is visible from a dark sky site after evening twilight**
20	**Spring equinox, 11:33 a.m. EDT**
25	**Last Quarter Moon, 1:37 a.m. EDT**

The best sights this month: The only planet visible during the evening hours in March is the distant ice giant Uranus. A set of binoculars mounted on a tripod and an astronomy app will allow you to find this dim green planet by star hopping. The best evening to seek out Uranus is March 6th when it will be above the Moon just as the sky darkens. A fun lunar event to watch is on March 15th around 7:45 p.m. when the Moon eclipses the star Eta Leonis, the "chest star" of Leo the Lion.

Mercury: Mercury is visible in the dawn sky early in the month. On the 2nd it passes less than a degree from Saturn.

Venus: Our sister planet is first up in the morning planet parade when it rises two hours before the Sun. It shines at a dazzling magnitude -4.7!

Mars: The red planet rises about a half hour after Venus but shines at a much dimmer magnitude 1.3.

Jupiter: The king of the planets passes behind the Sun on March 5th, emerging in the pre-dawn sky at month's end.

Saturn: The ringed planet inhabits the pre-dawn sky for the next few months.

Uranus and Neptune: Neptune passes behind the Sun on March 13th so it cannot be viewed during March. Uranus is the only planet visible during the evening hours. You should be able to find this green/blue ice giant with an astronomy app and binoculars, which are best used mounted on a tripod for easy star hopping. Try looking for Uranus on March 6th when it will be almost directly above the crescent Moon.

The Moon: The Moon is full on March 18th. 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.

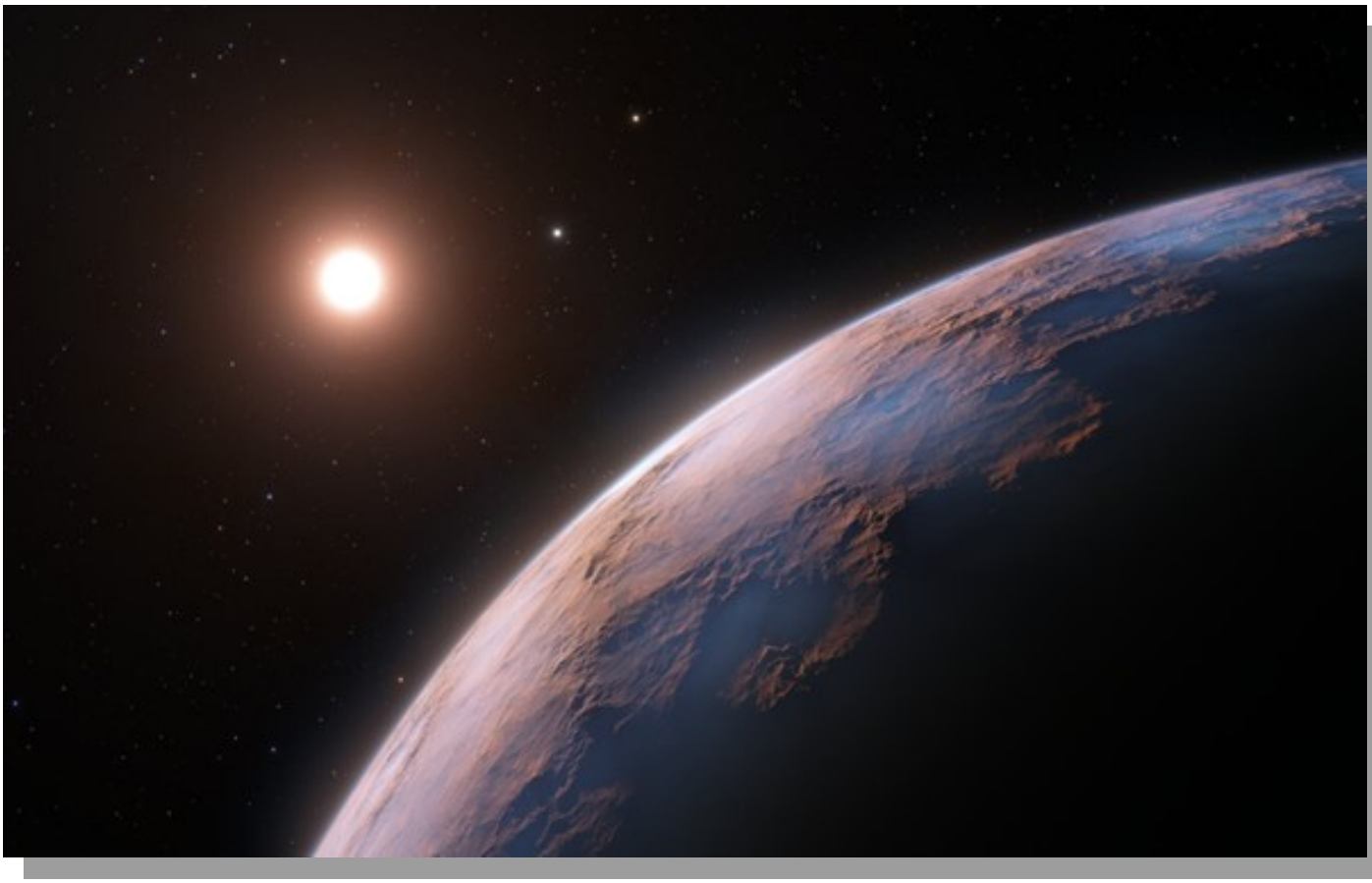
The Lunar Straight Wall is visible on March 12th and on the evening of March 15th the Moon will eclipse Eta Leonis, a 3.5 magnitude star in the constellation Leo the Lion. The exact time depends on your location, but it will happen sometime around 7:45 p.m.

Constellations: Early in the evening the "big guy" Orion dominates the sky in the southwest. Bright Capella in Auriga is nearly overhead. Leo the Lion is in the southeast and as the night progresses you can see some spring constellations rising such as Boötes, Corona Borealis and Hercules.

Messier/deep sky: Take a few more gazes at the Orion Nebula before it settles into the west as spring marches on. The Big Dipper is high in the sky so take this opportunity to look for galaxies

(Continued on page 7)

Proxima Centauri (Cont'd)



An artist's impression shows the small world Proxima d - a new planet recently discovered around the Sun's nearest neighbor. Image Credit: ESO/L. Calçada

(Continued from page 3)

be "packed with planets."

It's also a breakthrough in the way astronomers search for planets around distant stars, which could soon lead to the discovery of even more, he said in an email. The new planet will have to be verified by other observations, but Faria and his co-authors say they detected it in tiny variations in Proxima's starlight — "wobbles" caused by the planet's gravity.

Similar techniques were used to detect the first planet found around Proxima in 2016, and a second planet in 2019. But the latest search used light gathered by a new spectrograph at the Very Large Telescope on a mountaintop in the Atacama Desert of northern Chile — a more sensitive instrument than used before.

"We are now able, in terms of instrumental precision, to detect such small signals, which opens the possibility of finding planets like the Earth around stars like the sun in the not-so-distant future," Faria said.

Proxima Centauri is the third star of the Alpha Centauri system, which looks like a single bright star from Earth. It's just over four light-years away, or about 25 trillion miles — but despite that vast distance, it's the closest star system.

Only the light from its two brightest stars, Alpha Centauri A and Alpha Centauri B, can be seen with the naked eye. They orbit each other, but far enough apart that they're thought not to interfere with each other's planets. And because Alpha Centauri A and B are both remarkably like the sun, it's possible life could have evolved on their planets or moons — so scientists plan to look for them with a dedicated space telescope.

Proxima Centauri, on the other hand, is a small and very dim red dwarf star discovered by telescope in 1915, far away from the system's two main stars. Technically, Proxima is the closest star to the sun — about a trillion miles closer than the others — until its orbit takes it further away in about 25,000 years (its name comes from the

(Continued on page 9)

Observing (Cont'd)

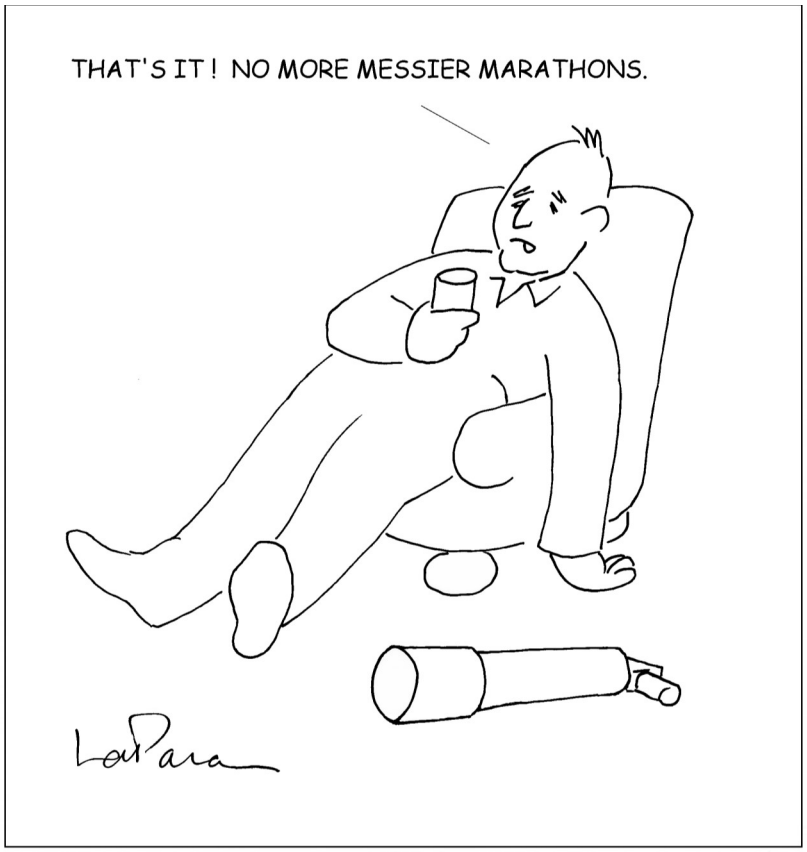
(Continued from page 5)

M81 and M82. With a low power eyepiece in your telescope they might be in the same field of view depending on your equipment. For more of a challenge, look for the 10th magnitude galaxies M65 and M66 in Leo.

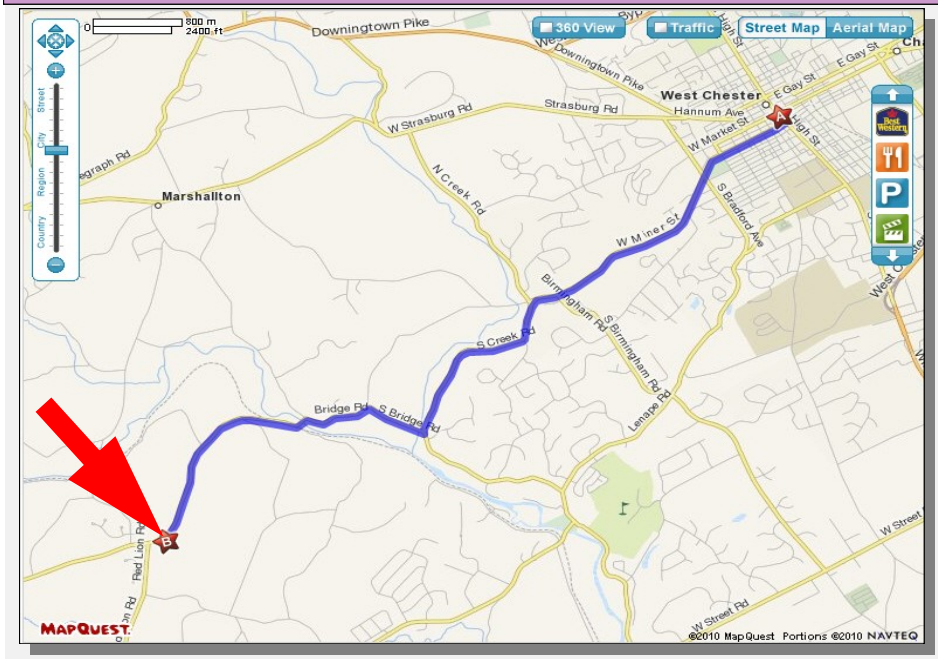
Comets: There are no bright comets visible during March.

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

Classic La Para
by Nicholas La Para



CCAS Directions



Brandywine Red Clay Alliance
1760 Unionville Wawaset Rd
West Chester, PA 19382
(610) 793-1090
http://brandywinewatershed.org/

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

Brandywine Red Clay Alliance

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

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

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

Minutes (Cont'd)

(Continued from page 2)

entists 'follow the water for life'. Earth is an ocean world with surface water, but other potential habitable worlds in our solar system have only sub surface water. The three she discussed in tonight's presentation were Enceladus and Titan (moons of Saturn) and Europa (a moon of Jupiter)

- Dr. Cable spoke of the Europa Clipper Mission, scheduled to launch in 2024 It will do more than 50 flybys of Europa capturing gases plumes which emanate from the surface. This Water World moon has a huge subsurface ocean.
- Dr. Cable also gave us some details about NASA's Dragonfly. That mission will explore the abundant chemical activity in Titan's dense atmosphere to determine whether organic molecules are forming and falling to the surface. Dragonfly will launch in 2026 and arrive at Titan in 2034.
- The moon Enceladus, Dr. Cable explained, actually sits within its own ring in Saturn. The Cassini Mission, which launched in 1997 and spent 13 years orbiting Saturn, began making multiple close flybys of the icy moon Enceladus in 2005. The mission discovered water-rich plumes and ice particles venting from the subsurface ocean in its southern polar region. The plumes could indicate hydrothermal vents that might be hospitable to the kind of microorganisms found in earth's hydrothermal vents. Though these areas on earth

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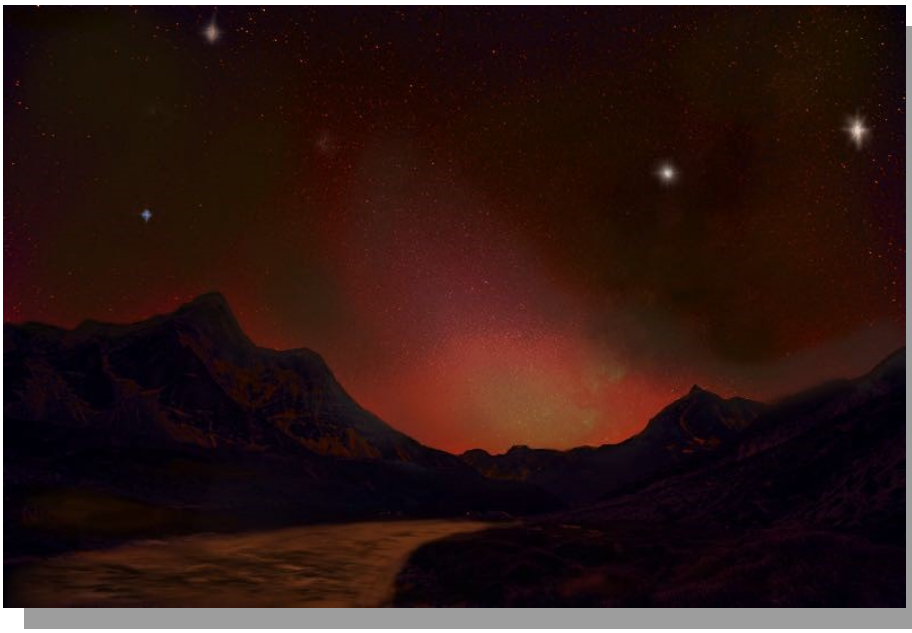
Astronomers Find Evidence of Zodiacal Light on Other Worlds

by Christopher Cokinos, courtesy Astronomy.com



Kepler-1229b is a planet 2.7 times the mass of Earth in the habitable zone of a red star. Studies indicate that zodiacal light might be visible from its surface, creating a red, almost lava-like glow in the night sky. Image Credit: SHAO/Yue Xu

One of the most coveted sights for sky gazers is the zodiacal light, a tall cone of whitish light that climbs the mid-latitude sky before dawn in autumn and at twilight in the spring. The light comes from the Sun glinting off dust particles in the solar system and the dust, it seems, originates from comets and possibly even from Mars.

It turns out that anyone looking up on some exoplanets could see their own zodiacal light as well. In research presented at the virtual 239th Meeting of the American Astronomical Society last week, Jian Ge of Shanghai Astronomical Observatory and Chinese Academy of Sciences — whose team included three high school students — described other solar systems where data suggest there exist debris disks that could give rise to otherworldly zodiacal light.

Ge worked with Chinese and American colleagues, including high schoolers Larry Ge, Amanda Hao, and Justin Hou. They gathered information from a number of sources, including the Kepler space telescope, the former Wide-field Infrared Survey Explorer space telescope, the Gaia mission. The team looked at three worlds: the super-Earths Kepler-69c, Kepler-1229b, and Kepler-395c, all of which may be habitable. They sleuthed a variety of infrared data, searching for "extra" emission in the infrared portion of the spectrum. This excess is indicative of solar system dust and debris absorbing light and re-radiating it at longer wavelengths.

What's more, they found dust as hot as 260 degrees Fahrenheit (127 degrees Celsius). Based on the similar temperature of our solar system's own zodiacal dust, this suggests dust lurking close to at least two of the planets.

(Continued on page 9)

Zodiacal Light (Cont'd)

On Kepler-69c, a super-Earth 2.1 times the mass of our planet with a Venus-like atmosphere, the zodiacal light might appear as a narrow, bright band of white light. Image Credit: SHAO/Yue Xu

(Continued from page 8)

The team's illustrations portray a poetic sense of the possible views. On both Kepler-1229b and Kepler-395c, red host stars would render an almost volcanic-looking zodiacal light. On Kepler-69c, the planet's Venusian environment might turn its zodiacal light into a white searchlight in a dark muted sky.

These results are not just aesthetic. The presence of dust suggests there could be — especially in the two younger systems — active formation of small objects like moons and minor planets. The prospect can help foster future research into how such smaller objects can both collide into and stabilize exoplanets.

"Younger planet systems experience more activities (such as comet activities and asteroid collisions)," Ge told Astronomy. But "we cannot rule out that some old systems experience occasional activities." For example, the oldest system, Kepler-69, might have been experiencing increased activity — such as collisions or cometary activity — close to the star while Kepler was observing it, Ge says.

As to anyone — or anything — actually looking up from those planets to see the zodiacal light, well, theoretically it's possible.

Although Ge says astronomers have previously found debris disks around other systems, none of them were considered habitable. "Our work is the first-ever on zodiacal light and debris disks around habitable planet systems," Ge says.

So, the next time you're hunting for the zodiacal light here on Earth, perhaps you can stretch your imagination to some other worlds where eyes are also looking.

Proxima Centauri (Cont'd)

(Continued from page 6)

Latin word for "nearest").

Unlike Alpha Centauri A and B, where no verified planets have been found, three planets have now been detected around Proxima. None of them are thought to be very similar to Earth, however, because Proxima is an active "flare star" that regularly doses its planets with bursts of intense radiation.

But it's still possible that life could have evolved on at least one of its planets, said Guillem Anglada-Escudé, an astronomer at the Institute of Space Sciences in Barcelona, Spain. He led the team that announced Proxima's first planet in 2016. That planet was found to be about the size of Earth and within Proxima's narrow habitable or "Goldilocks" zone, where it's neither too hot nor too cold — "just right" — for oceans of water on its surface.

Observations now suggest there may actually be oceans there; and if that's the case, they could replenish atmospheric gases stripped away by Proxima's frequent flares, he said. Oceans could also act as a barrier to the flares, and so it's possible that marine life may have evolved.

Anglada-Escudé expects more planets will be found around Proxima Centauri and other stars as astronomical instruments and techniques improve. "Within a decade, we should be able to detect these planets directly," he said. "The idea will be to search for life, to see from the spectrum of a planet if there are chemicals that cannot be explained by other natural processes."

Through the Eyepiece: Messier 67 – the King Cobra Open Star Cluster
by Don Knabb, CCAS Observing Chair & Treasurer

Photo credit: Jim Mazur - http://www.skyledge.net/Messier67.htm

Open clusters are great objects to view in the night sky of Chester County. They stand out in binoculars or a telescope even in light polluted skies when other fainter objects such as nebulas and galaxies cannot be seen. One of the nicest, but often overlooked open clusters in the spring sky is Messier 67.

Messier 67 is a fairly bright open cluster of some 200 stars. It is estimated to be about 4 billion years old, making it one of the oldest known open clusters. Messier 67 is not as well-known as the nearby Beehive Cluster, Messier 44, but it is quite an attractive object when viewed with a small telescope at low power.

Messier 67 is nicknamed the King Cobra Cluster or the Golden Eye Cluster and is located in the northern constellation Cancer, the Crab. The cluster has an apparent magnitude of 6.1. It has the designation NGC 2682 in the New General Catalogue.

According to Johann Elert Bode, M 67 was originally discovered by Johann Gottfried Koehler before the year 1779, but his telescope was so primitive that little more than the light could be made out. According to historical records he listed it as his object nineteen, describing it as, "A rather conspicuous nebula in elongated figure, near Alpha of Cancer."

French astronomer Charles Messier kept noting the presence of fixed, diffuse objects he initially mistook for comets. In time, he would come to compile a list of approximately 100 of these objects, hoping to prevent

(Continued on page 11)

Eyepiece (Cont'd)

M 67 sky map produced with Stellarium planetarium software

(Continued from page 10)

other astronomers from making the same mistake. This list – known as the Messier Catalog – would go on to become one of the most influential catalogs of Deep Sky Objects

Charles Messier independently rediscovered M 67, resolved it into stars, and cataloged it on April 6, 1780 as Messier 67. He described it as a "Cluster of small stars with nebulosity, below the southern claw of Cancer." It was observed again by Caroline Herschel, and many times by Sir William Herschel. After seeing it in his 20-foot telescope in 1784, Herschel described it as a "most beautiful cluster of stars; not less than 200 in view." Of all the folks in history who described it, John Dreyer, the Danish astronomer who compiled the New General Catalogue (NGC) and the Index Catalogue (IC), said it best when he said it was a "remarkable; cluster; very bright; very large; extremely rich."

Messier 67 is one of the oldest known open clusters and the single oldest open cluster listed by Messier in his catalogue. The few open clusters that are known to be older are not as close to Earth as M 67

The average age of the stars in M 67 is around 4 billion years, which means that they are roughly the same age as the Sun and have similar elemental abundancies. Open clusters are typically younger and the stars tend to disperse over time, usually before they reach this age. For example, the Beehive Cluster (M 44), another Messier cluster in the Cancer constellation, is only 600 million years old. The stars of M 67, however, are expected to stay together for another 5 billion years before dissociating.

M 67 has more than 100 stars similar to the Sun, and numerous red giants. The total star count has been estimated at well over 500. The ages and prevalence of Sun-like stars had led some astronomers to theorize it as the possible parent cluster of the Sun. However, computer simulations have suggested that this is highly unlikely.

Messier 67 can be found roughly halfway and slightly above the imaginary line connecting the bright stars Regulus in Leo and Procyon in Canis Minor. With an apparent diameter of 30 arc minutes, M 67 appears roughly the same size as the full Moon.

Small binoculars show the cluster as an elongated patch of light that appears almost galaxy-like, while small telescopes reveal its brightest stars. 6-inch and 8-inch instruments resolve dozens of stars, while 12-inch telescopes reveal about 100 individual stars in the cluster. M 67 is well suited to urban skies and moderate moonlit conditions. The best time of year to observe M 67 from northern latitudes is during the late winter and early spring.

I observed M 67 in late February from a reasonably dark location on a cold and windy night using 20x80 binoculars mounted on a parallelogram mount. If I did not know that M 67 was an

(Continued on page 14)

NASA Night Sky Notes: Embracing the Equinox

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.

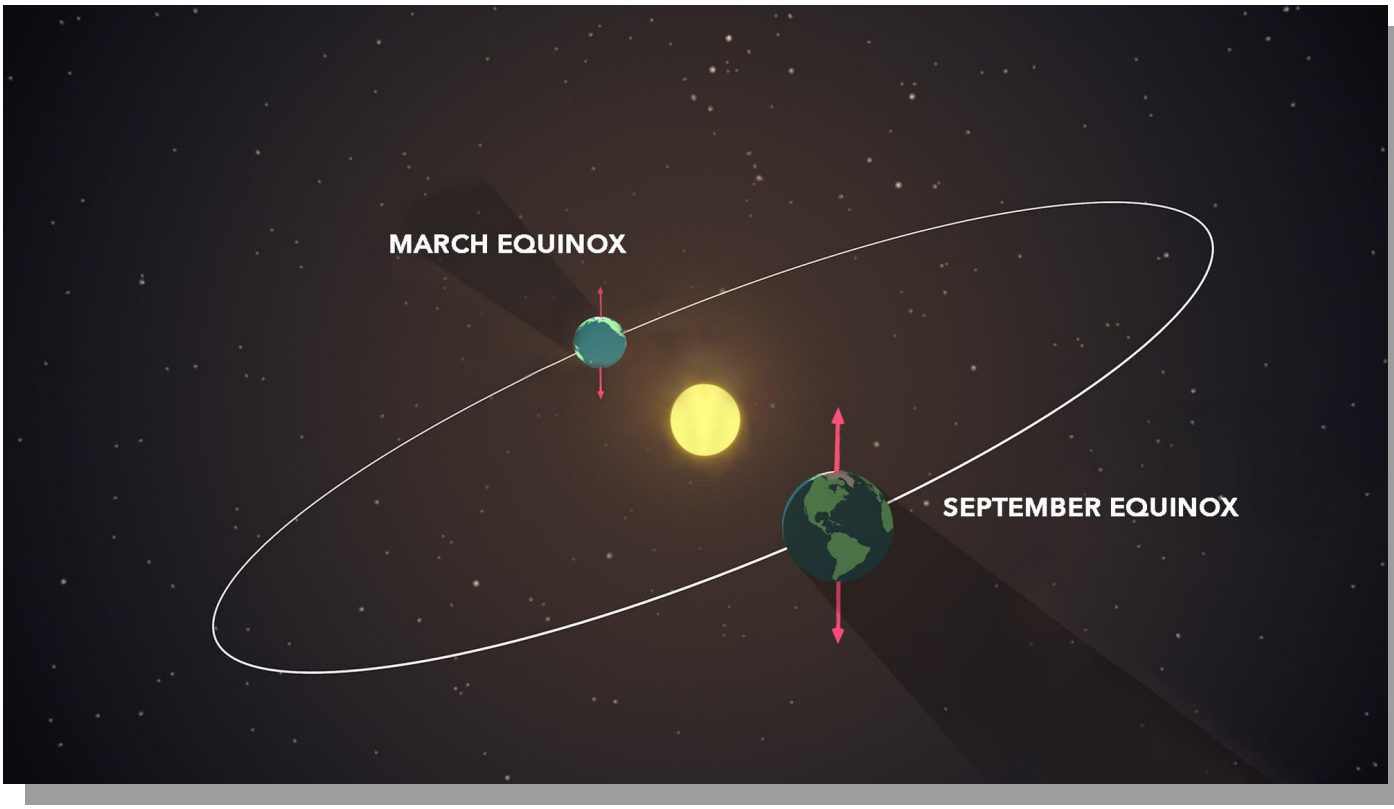
Depending on your locale, equinoxes can be seen as harbingers of longer nights and gloomy weather, or promising beacons of nicer temperatures and more sunlight. Observing and predicting equinoxes is one of the earliest skills in humanity's astronomical toolkit. Many ancient observatories around the world observed equinoxes along with the more pronounced solstices. These days, you don't need your own observatory to know when an equinox occurs, since you'll see it marked on your calendar twice a year! The word "equinox" originates from Latin, and translates to **equal** (equi-) **night** (-nox). But what exactly *is*

an equinox?

An **equinox** occurs twice every year, in March and September. In 2022, the equinoxes will occur on March 20, at exactly 15:33 UTC (*or 11:33 am EDT*), and again on September 23, at 01:04 UTC *(or September 22 at 9:04 pm EDT)*. The equinox marks the exact moment when the center of the Sun crosses the plane of our planet's equator. The day of an equinox, observers at the equator will see the Sun directly overhead at noon. After the March equinox, observers anywhere on Earth will see the Sun's path in the sky continue its movement further north every day until the June solstice, after which it begins traveling south. The Sun crosses the equatorial plane again during the September equinox, and continues traveling south until the December solstice, when it heads back north once again. This movement is why some refer to the March equinox as the **northward equinox**, and the September equinox as the **southward equinox**.

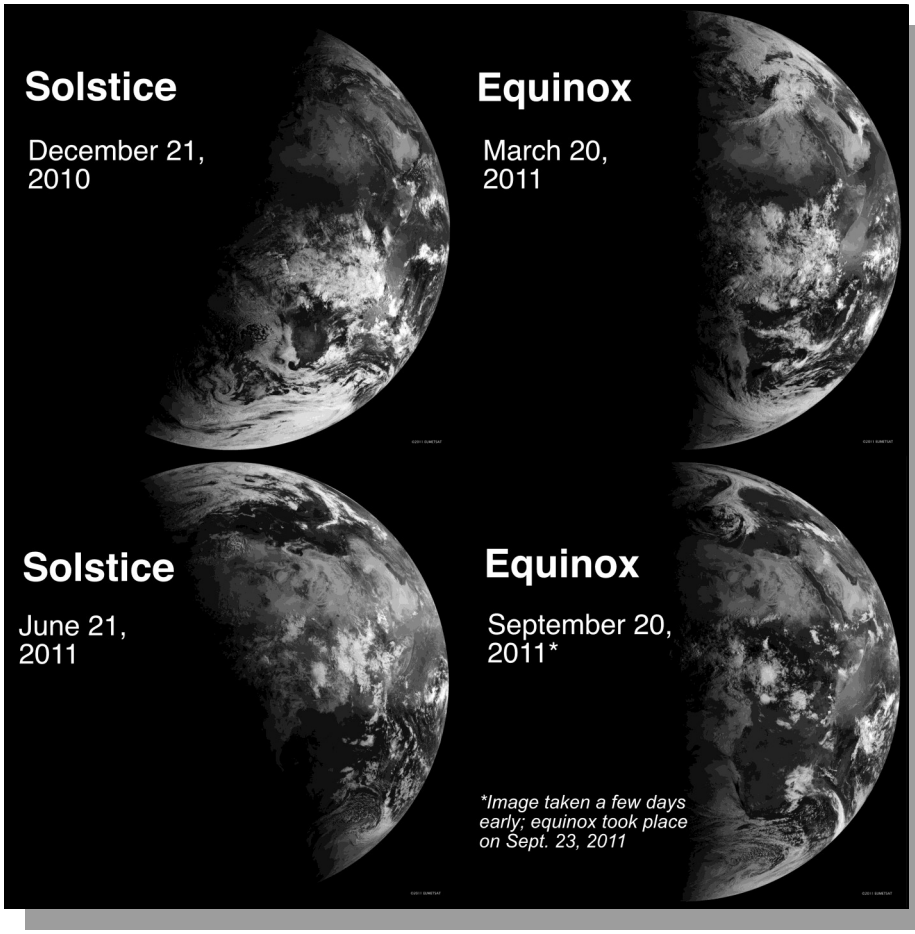
Our Sun shines equally on both the Northern and Southern Hemispheres during equinoxes,

(Continued on page 13)



This (not to scale) image shows how our planet receives equal amounts of sunlight during equinoxes.
Credit: NASA/GSFC/Genna Duberstein

Night Sky Notes (Cont'd)



Scenes of Earth from orbit from season to season, as viewed by EUMETSAT. Notice how the terminator - the line between day and night - touches both the North and South Poles in the equinox images. See how the shadow is lopsided for each solstice, too: sunlight pours over the Northern Hemisphere for the June solstice, while the sunlight dramatically favors the Southern Hemisphere for the December solstice. Source: bit.ly/earthequinox Images: NASA/Robert Simmon

(Continued from page 12)

which is why they are the only times of the year when the Earth's North and South Poles are simultaneously lit by sunlight. Notably, the lengths of day and night on the equinox aren't precisely equal; the date for that split depends on your latitude, and may occur a few days earlier or later than the equinox itself. The complicating factors? Our Sun and atmosphere! The Sun itself is a sphere and not a point light source, so its edge is refracted by our atmosphere as it rises and sets, which adds several minutes of light to every day. The Sun doesn't neatly wink on and off at sunrise and sunset like a light bulb, and so there isn't a *perfect* split of day and night on the equinox - but it's very close.

Equinoxes are associated with the changing seasons. In March, Northern Hemisphere observers welcome the longer, warmer days heralded by their **vernal**, or spring, equinox, but Southern Hemisphere observers note the shorter days – and longer, cooler nights - signaled by their **autumnal**, or fall, equinox. Come September, the reverse is true.

Discover the reasons for the seasons, and much more, with NASA at nasa.gov

Minutes (Cont'd)

(Continued from page 8)

seem so extreme as to be incapable of supporting life, robotic exploration has shown that life does exist in these vents. Scientists are eager to see if Enceladus also harbor life forms in these hostile environments.

- She explained how some exciting tools are being developed to help new missions maximize their capabilities. Robotics are playing and will play a critical role in space exploration. They enable scientists to gather raw materials and data from otherwise inaccessible and / or invisible places, such as the suspected hydrothermal vents in the subsurface ocean on Enceladus. Dr. Cable provided some links for those interested in finding out what new tools are in development now.

Speaker Bio (Cont'd)

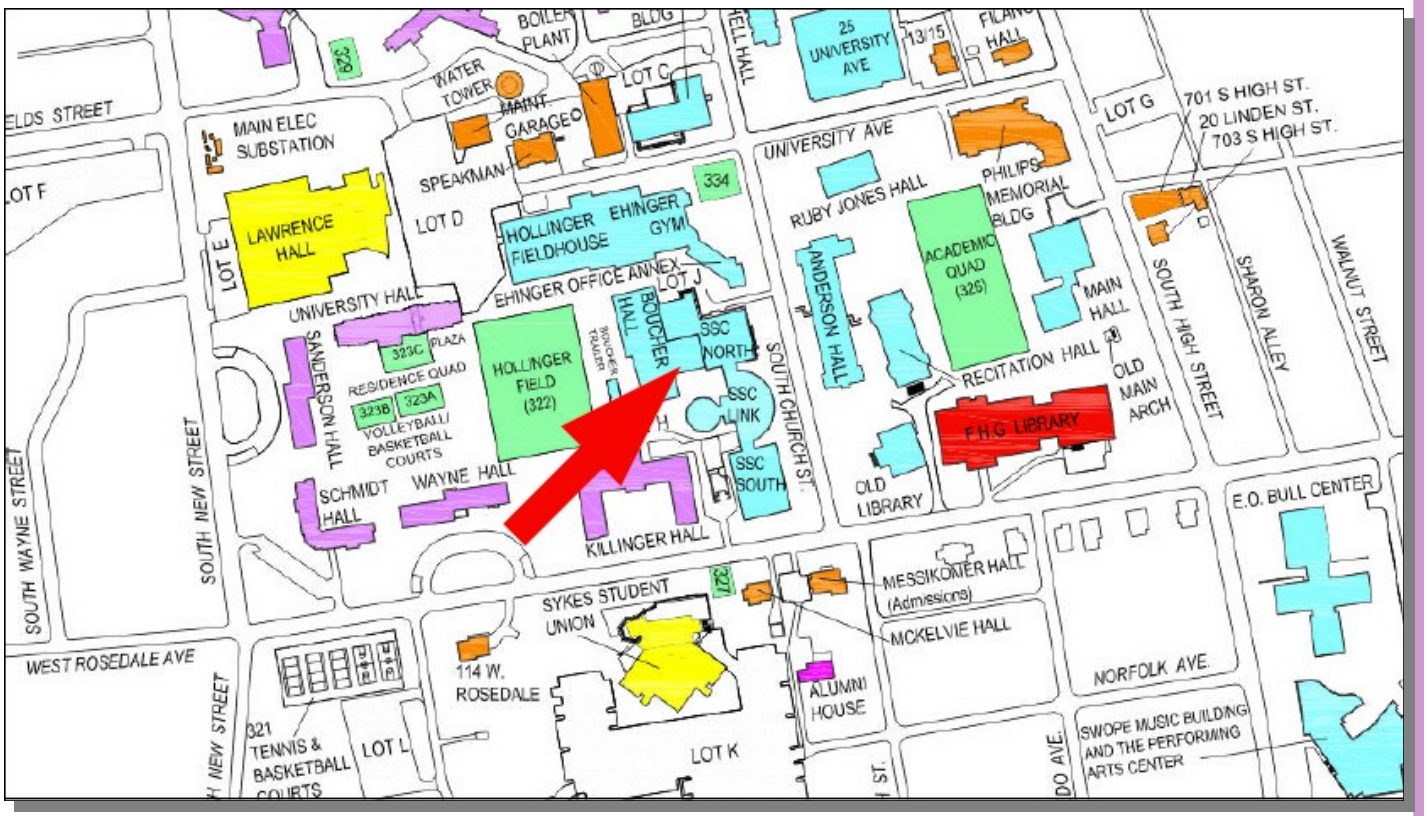
(Continued from page 3)

and decision making for space robotic systems. Ben has worked on extreme-terrain tethered rovers for exploring Lunar pits, internally-actuated hopping robots for asteroids and comets, melt probes for accessing the oceans of icy moons, and algorithms for spacecraft and rover autonomy. Ben is a NIAC fellow and regularly participates in JPL's "A-team" mission formulation concept studies.

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).



Eyepiece (Cont'd)

(Continued from page 11)

open cluster, I would have said it was a nebula or a galaxy. At 20X I could not discern any individual stars. I am looking forward to observing M 67 with a telescope under warmer conditions.

So dust off your binoculars or telescope and when the weather warms take a look at M 67, The King Cobra Cluster!

Information credits:

- https://en.wikipedia.org/wiki/Messier_67
- https://www.universetoday.com/37706/messier-67-1/
- http://www.skyledge.net/Messier67.htm
- https://www.messier-objects.com/messier-67-king-cobra-cluster/

CCAS Membership Information and Society Financials

Treasurer's Report
by Don Knabb

Feb. 2022 Financial Summary

Beginning Balance	$1,311
Deposits	$345
Disbursements	-$183
Ending Balance	$1,473

New Member Welcome!

Welcome to our new CCAS members Randy Rainville from Glen Mills, PA, and Frank Colosimo from New Ringgold, PA, and Sadhu Kataria from Malvern, PA.

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

Membership Renewals

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

Don Knabb
988 Meadowview Lane
West Chester PA 19382

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

CCAS Information Directory

Join the Fight for Dark Skies!

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

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

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

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

http://www.darksky.org

Dark-Sky Website for PA

PENNSYLVANIA OUTDOOR LIGHTING COUNCIL

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!

Starry Night Lights

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

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

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

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Spectrum Scientifics
Quality Science Products for All Ages

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 & Tel*escope Magazine

The club membership subscription cost for *Sky and Telescope* magazine has increased to **$43.95**. This is still a good saving from the regular rate of **$56.05**.

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

https://skyandtelescope.org/subscribe/

If you have **any** questions call Don Knabb at 610-436-5702.

Astronomy Magazine Group Rates

Subscriptions to this excellent periodical are available through the CCAS at a reduced price of **$34.00** which is much less than the individual subscription price of **$42.95** (or $60.00 for two years).

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