Observations

A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 28, No. 10 ***Three-Time*** *Winner of the Astronomical League's Mabel Sterns Award ☼ 2006, 2009 & 2016* *October 2020*

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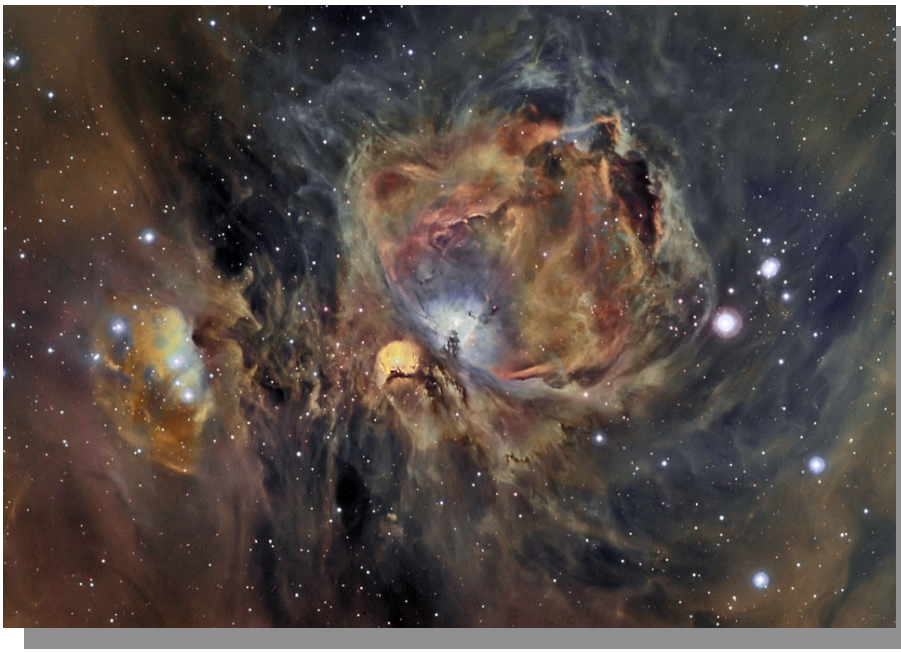
Membership Renewals Due

10/2020	Conrad Lane Rosenblatt Wirth
11/2020	Baker Bentley Buczynski Holenstein Kerkel Leiden Taylor
12/2020	Bogusch Damerau DellaPenna Moynihan O'Leary Sigler-Quick

Orion Nebula in Oxygen, Hydrogen, and Sulfur



The image shows the nebula in three colors specifically emitted by hydrogen, oxygen, and sulfur gas. The whole Orion Nebula cloud complex, which includes the Horsehead Nebula, will slowly disperse over the next 100,000 years. Image Credit & Copyright: César Blanco González

October 2020 Dates

1st • Full Moon, the Full Harvest Moon or the Full Turns Leaves White Moon, 5:05 p.m. EDT

9th • Last Quarter Moon, 8:39 p.m. EDT

13th • Mars is at opposition, 7:00 p.m. EDT

16th • New Moon, 3:31 p.m. EDT

21st • The Orionid meteors peak in the predawn hours

23rd • First Quarter Moon, 9:22 a.m. EDT

31st • Full the Full Hunter's Moon and Uranus is at opposition, 10:49 a.m. EDT

CCAS Upcoming Nights Out

In addition to our monthly observing sessions at the Myrick Conservancy Center, BRC, CCAS has several special "nights out" scheduled over the next few months. Members are encouraged to help out during these events any way they can. See below for more information.

☼ **Saturday, October 10, 2020** - CCAS Special Observing Session, French Creek State Park, Elverson, PA. The observing session is scheduled to start at 7:30 PM. This is a CCAS members-only event. We must observe all social distancing requirements and wear masks when near other members. We should not share eyepieces or equipment. For more information, contact our Observing Chair, Don Knabb. Rain date set for Friday, October 16th.

Autumn Society Events

October 2020

10th • Saturday, October 10, 2020—CCAS Special Observing Session, French Creek State Park, Elverson, PA. The observing session is scheduled to start at 7:30 PM. This is a CCAS members-only event. We must observe all social distancing requirements and wear masks when near other members. We should not share eyepieces or equipment. For more information, contact our Observing Chair, Don Knabb. Rain date set for Friday, October 16th.

13th • CCAS Monthly Meeting, ONLINE via Zoom. Meet & Greet online for members from 7:00 to 7:30 p.m. The meeting starts immediately after at 7:30 p.m. CCAS Member Speaker: John Conrad, NASA Solar System Ambassador, will present "Global Climate Change – The View from Space: A 2020 Update."

15th • The von Kármán Lecture Series: Galaxy of Horrors: Terrifying Real Planets, Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

20th • Open call for articles and photographs for the November 2020 edition of Observations.

26th • Deadline for newsletter submissions for the November 2020 edition of Observations.

November 2020

1st • Daylight Saving Time ends, 2:00 a.m. EST. Turn clocks back one hour.

10th • CCAS Monthly Meeting, ONLINE via Zoom. Meet & Greet online for members from 7:00 to 7:30 p.m. The meeting starts immediately after at 7:30 p.m. Guest Speaker: Dr. Giovanna Tinnetti, Professor of Planetary Science, University College London and Program Leader for ESA ARIEL Mission. Her presentation is entitled, "ARIEL and Brave New Worlds: The Planets in Our Galaxy."

12th • The von Kármán Lecture Series: Failure *is* an Option: The Agony & Inspiration of Defeat. Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

20th • Open call for articles and photographs for the December 2020 edition of Observations.

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

Minutes from the September 8, 2020, CCAS Monthly Meeting

by Bea Mazziotti, CCAS Secretary

- Dave Hockenberry welcomed 52 members and guests to the September 2020 CCAS meeting. Zoom was again the platform. Dave confirmed that the upcoming meetings will continue to be via Zoom for the foreseeable future.
- Don Knabb reported on the recent successful camping trip to Cherry Springs. A dozen or so members made the trip. Even though smoke from the California fires had arrived there were observing opportunities and a good time was had by all.
- Don then took us on a virtual tour of some of his favorite objects in the September night sky. Among them are M-6 and M-7 (the Butterfly and Ptolemy clusters), M-22, a globular cluster in the Teapot, the Swan nebula and the Wild Duck. Two more outstanding objects are the Cygnus Star Chain and the Andromeda.
- Pete Kellerman alerted members to an upcoming Antares rocket launch from Wallops Island scheduled for Tuesday 9/29. For more info, go to https://www.nasa.gov/wallops/2020/press-release/watch-the-september-29-antares-launch-from-wallops
- Bruce Ruggeri, program chair, introduced the evening's speaker Dr. Sara Seager, a renowned astrophysicist and planetary scientist. She is currently the 'Class of 1941' Professor of Planetary Science, Professor of Physics, and Professor of Aeronautics and Astronautics at MIT.
  - Her past research is credited with laying the foundation for the field of exoplanet atmospheres, while her current research focuses on exoplanet atmospheres and the future search for signs of life by way of atmospheric biosignature gases.
  - She is the Deputy Science Director for the MIT-led NASA mission TESS (Transiting Exoplanet Survey Satellite) and also a lead for the Starshade Rendezvous Mission (a space-based mission concept under technology development for direct imaging discovery and characterization of Earth analogs).

October 2020 CCAS Meeting Agenda

by Bruce Ruggeri, CCAS Program Chair

John Conrad

Our next meeting will be held on October 13, 2020, starting at 7:30 p.m. The meeting will be held ONLINE via Zoom.us. CCAS Member Speaker: John Conrad, NASA Solar System Ambassador, will present "Global Climate Change – The View from Space: A 2020 Update." See page 13 for more details about our member speaker and his achievements.

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 2020-2021 season and beyond. If you are interested in presenting, or know someone who would like to participate, please contact me at programs@ccas.us.

Nobel Prize in Physics Awarded to Three Scientists for Work on Black Holes

by Dennis Overbye and Derrick Bryson Taylor, The New York Times

Roger Penrose, Reinhard Genzel and Andrea Ghez are the recipients of the Nobel Prize in Physics for 2020.Credit...Pool photo by Fredrik Sandberg

The Nobel Prize in Physics was awarded to three astrophysicists Tuesday for work that was literally out of the world, and indeed the universe. They are Roger Penrose, an Englishman, Reinhard Genzel, a German, and Andrea Ghez, an American. They were recognized for their work on the gateways to eternity known as black holes, massive objects that swallow light and everything else forever that falls in their unsparing maws.

Dr. Penrose, a mathematician at Oxford University, was awarded half of the approximately $1.1 million prize for proving that black holes must exist if Albert Einstein's theory of gravity, known as general relativity, is right.

The second half was split between Dr. Genzel and Dr. Ghez for their relentless and decades long investigation of the dark monster here in the center of our own galaxy, gathering evidence to convict it of being a supermassive black hole.

Dr. Ghez is only the fourth woman to win the Nobel Prize in Physics, following Marie Curie in 1903, Maria Goeppert Mayer in 1963 and Donna Strickland in 2018.

"I'm so thrilled" she said in an email.

The Nobel Assembly announced the prize at the Royal Swedish Academy of Sciences in Stockholm.

More Einstein, Less Math

Black holes were one of the first and most extreme predictions of Einstein's General Theory of Relativity, first announced in November 1915. The theory explains the force we call gravity, as objects try to follow a straight line through a universe whose geometry is warped by matter and energy. As a result, planets as well as light beams follow curving paths, like balls going around a roulette wheel.

Einstein was taken aback a few months later when Karl Schwarzschild, a German astronomer, pointed out that the equations contained an apocalyptic prediction: In effect, cramming too much matter and energy inside too small a space would cause space-time to collapse into a point of infinite density called a singularity. In that place — if you could call it a place — neither Einstein's equations nor any other physical law made sense.

Einstein could not fault the math, but he figured that in real life, nature would find a way to avoid such a calamity.

In 1965, however, a decade after Einstein's death, Dr. Penrose slammed the door on Einstein's hopes.

Born in 1931 into an intellectual family, Dr. Penrose is a professor at the University of Oxford. Dr. Penrose recalled in an interview recently that when he was young and the family took walks in the country, they would play chess in their heads, keeping track of various moves without a physical board.

"My job was the runner," he said, "I would take the moves from one brother and race up to my father. And I just got exercise by running back and forth."

A talented mathematician, he invented a new way of portraying space-time, called a Penrose diagram, which bypassed most of the mathematical complexities of general relativity.

His diagrams are now the lingua franca of cosmology. He

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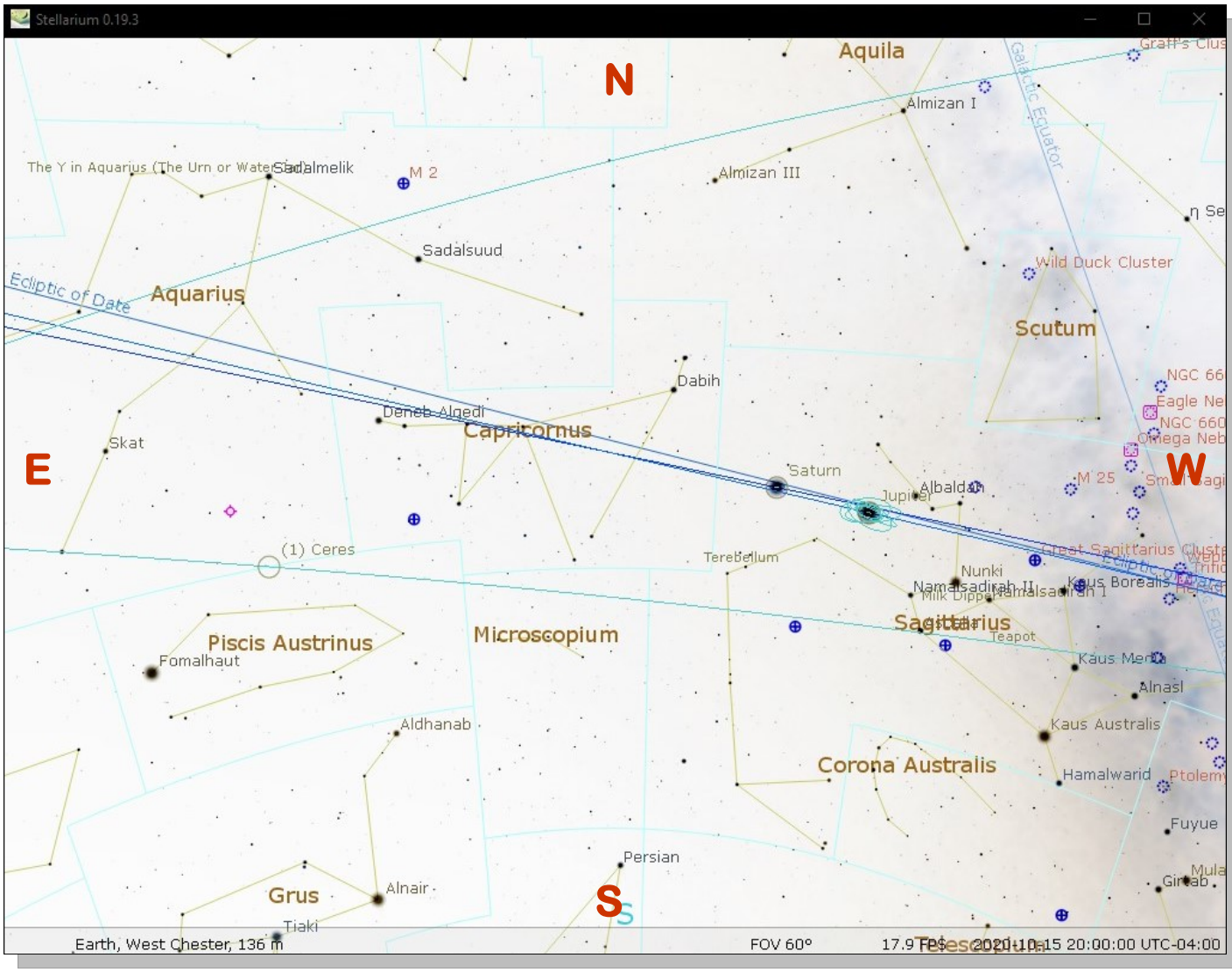
The Sky Over Chester County

October 15, 2020 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
10/01/2020	6:32 a.m. EDT	6:59 a.m. EDT	6:43 p.m. EDT	7:10 p.m. EDT	11h 44m 40s
10/15/2020	6:46 a.m. EDT	7:13 a.m. EDT	6:22 p.m. EDT	6:49 p.m. EDT	11h 08m 41s
10/31/2020	7:02 a.m. EDT	7:30 a.m. EDT	6:00 p.m. EDT	6:28 p.m. EDT	10h 29m 42s

Moon Phases					
			Full Moon	10/01/2020	5:05 p.m. EDT
Last Quarter	10/09/2020	8:39 p.m. EDT	New Moon	10/16/2020	3:31 p.m. EDT
First Quarter	10/23/2020	9:22 a.m. EDT	Full Moon	10/31/2020	10:49 a.m. EDT

October 2020 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

1	**Full Moon, the Full Harvest Moon or the Full Turns Leaves White Moon, 5:05 p.m. EDT**
2	**The Moon is near Mars**
6	**Mars closest approach, 10:00 a.m. EDT**
9	**Last Quarter Moon, 8:39 p.m. EDT**
13	**Mars is at opposition, 7:00 p.m. EDT**
16	**New Moon, 3:31 p.m. EDT**
21	**The Orionid meteors peak in the predawn hours**
22	**The Moon, Jupiter and Saturn form a triangle in the south after sunset**
23	**First Quarter Moon, 9:22 a.m. EDT, and the Lunar X is visible around 7 p.m.**
24	**The Lunar Straight Wall is visible**
31	**Full the Full Hunter's Moon and Uranus is at opposition, 10:49 a.m. EDT**

The best sights this month: October is all about Mars! On October 6th the red planet is at its nearest to Earth until 2035. View Mars late at night when it is high in the sky and you are looking through the least amount of atmosphere. With almost any telescope you will see a polar ice cap and surface markings! Then the Moon takes center stage on October 23rd when the elusive Lunar X is visible around 7 p.m.

Mercury: To see Mercury you need to look low in the west just after sunset at the beginning of October.

Venus: Our sister planet made the news in September with the discovery of compounds possibly related to life in its atmosphere. Venus rises around 3 hours before the Sun through most of October.

Mars: Mars is the highlight of October as it shines high and bright in the sky. With closest approach on October 6th you will be able to see surface features with almost any telescope. Since Mars is so close it outshines mighty Jupiter through most of the month. Do not miss this opportunity to see our next-door neighbor at its best!

Jupiter: The king of the planets is best viewed as soon as darkness falls when it is highest in the sky. On October 13th the shadows of two planets are visible just before 8:00 p.m.

Saturn: The ringed planet follows Jupiter across the sky and the distance between them decreases through the month.

Uranus and Neptune: Uranus reaches opposition on October 31st so it will be visible all night. If you have not seen Uranus in a telescope this is a great time to add this distant gas giant to your "life list". Neptune rises three hours ahead of Uranus and is much dimmer, but you can still find it with a sky map app on your device or a go-to telescope. Look for a dim blue "star".

The Moon: We have two full moons during October. The first occurs on October 1st. This full Moon is the Harvest Moon because it is the full Moon that occurs closest to the autumn equinox. In two years out of three, the Harvest Moon comes in September, but in some years it occurs in October. At the peak of harvest, farmers can work late into the night by the light of this Moon.

The second Full Moon, a "Blue Moon", occurs on October 31st, Halloween night! This full Moon is called the Hunter's 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.

Constellations: High up in the sky we see the Summer Triangle overhead. Look to the left of the large triangle and you will find another geometric shape in the sky, the Great Square of Pegasus. And a bit toward the east and nearly overhead is the constellation Cassiopeia in the shape of a large "W". According to Greek myths, Cassiopeia was the Queen of Ethiopia. Her husband, Cepheus the King is hon-

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Nobel Prize (Cont'd)

The Monster of the Milky Way: An image from the Chandra X-ray Observatory of the center of our galaxy, which astrophysicists believe is home to a supermassive black hole. Credit...Chadra X-ray Observatory/NASA

(Continued from page 3)

proved that if too much mass accumulated in too small a place, collapse into a black hole was inevitable. At the boundary of a black hole, called the event horizon, you would have to go faster than the speed of light — the acknowledged cosmic speed limit — to get away. So you could never escape. Inside the boundary, time and space would switch roles and so all directions would lead downward, to the center, where the density became infinite and the laws of physics, as we knew them, would break down.

He showed that the black hole would become a gateway to the end of time, the end of the universe.

He is also famous for discovering Penrose tiles, a way of tiling an infinite floor without ever repeating the pattern. He has also published iconoclastic views of artificial intelligence and the origins of consciousness in books like *The Emperor's New Mind: Concerning Computers, Minds and the Laws of Physics.*

As they hailed the news, some astronomers and physicists lamented the absence of Stephen Hawking, the Cambridge University cosmologist who was arguably the world's leading black hole theorist until he died in 2018, making him ineligible for the Nobel.

Shortly after Dr. Penrose made his breakthrough calculations, Dr. Hawking and Dr. Penrose collaborated using the same methods to prove that if general relativity was right, the universe must also have had a beginning — a fairly big discovery.

John Preskill, a Caltech physicist, celebrated the accomplishment of Dr. Ghez and the other scientists in a tweet. But he added that the moment was poignant.

"I'm thinking of how much

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Nobel Prize (Cont'd)

(Continued from page 6)

Stephen Hawking would have enjoyed sharing a Prize for advances in General Relativity," he said.

Today, astronomers agree that the universe is speckled with such dark monsters, including beasts lurking in the hearts of most galaxies that are millions and billions of times as massive as the sun. They've even taken a picture of one in a galaxy some 55 million light-years away.

But closer to home, at the center of our Milky Way galaxy, 26,000 light-years from here, there is a faint source of radio noise called Sagittarius A*. In 1971 Martin Rees and Donald Lynden-Bell suggested that it was a supermassive black hole.

Working independently, Dr. Genzel and Dr. Ghez, and their teams, have spent the last decades tracking stars and dust clouds whizzing around the center of our galaxy with telescopes in Chile and Hawaii, trying to see if that dark dusty realm does indeed harbor a black hole.

Dr. Ghez was born in New York on June 16, 1965. She is a professor at the University of California, Los Angeles and one of the authors of the children's book "You Can Be a Woman Astronomer." Noting on Tuesday that she was only the fourth woman to win the physics prize, she said that she hoped to inspire young women.

"It's a field that has so many pleasures, and if you're passionate about the science, there is so much that can be done," she said.

Dr. Genzel is a director at the Max Planck Institute for Extraterrestrial Physics in Garching, Germany, and a professor at the University of California, Berkeley.

He grew up in Freiburg, Germany, a small city in the Black Forest. As a young man, he was one of the best javelin throwers in Germany, even training with the national team for the 1972 Munich Olympics.

Dr. Genzel and Dr. Ghez have shared other honors for their work, including the Crafoord Prize in 2012, often referred to as the astronomy Nobel.

Over the years, their observations have crept closer to the conclusion that whatever is at the galactic center is dark and must have a mass equivalent to four million suns, in order to exert enough gravitational pull to keep the stars and gas that circle it in check.

One of the stars, which Dr. Genzel calls S2 and Dr. Ghez calls S0-2, is a young blue star that follows a very elongated orbit and passes within just 11 billion miles, or 17 light-hours, of the mouth of the putative black hole every 16 years.

During these fraught passages, the star, yanked around an egg-shaped orbit at speeds of up to 5,000 miles per second, should experience the full strangeness of the universe, according to Einstein. That last happened in the summer of 2018, with both teams watching for deviation or surprise from the star.

To conduct that experiment, astronomers needed to know the star's orbit to a high precision, which in turn required decades of observations with the most powerful telescopes on Earth.

"You need 20 years of data just to get a seat at this table," said Dr. Ghez, who joined the fray in 1995.

In fall 2018, Dr. Genzel announced that they had detected the gas clouds circling the center of the galaxy every 45 minutes or so at 30 percent the speed of light. Those clouds are so close to the suspected black hole that if they were any closer, they would fall in, according to classical Einsteinian physics, Dr. Genzel said.

The results provide "strong support" that the dark thing in Sagittarius "is indeed a massive black hole," Dr. Genzel's group wrote in the journal Astronomy & Astrophysics in 2018.

"Their pioneering work has given us the most convincing evidence yet of a supermassive black hole at the centre of the Milky Way," the Swedish Academy of Sciences said in its announcement.

Einstein might grumble, but he would also be proud.

Knowing that black holes exist, physicists say, only reminds us that we don't understand what goes on inside them and that we don't really understand gravity.

The black hole "teaches us that space can be crumpled like a piece of paper into an infinitesimal dot, that time can be extinguished like a blown-out flame, and that the laws of physics that

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Through the Eyepiece: The Pleiades, Jewels of the Night!

by Don Knabb, CCAS Treasurer & Observing Chair

Picture credit: NASA, ESA, AURA/Caltech, Palomar Observatory, public domain image

As the leaves start to turn color, I look forward to crisp, clear nights that are not too cold for a good observing session. One of the many sights I look forward to is M45, the Pleiades.

The Pleiades is an open cluster in the constellation of Taurus, but I think of them as an object of their own. It is among the nearest to Earth of all open clusters and has been observed since ancient times.

The name of the Pleiades comes from Ancient Greek. It probably derives from plein ("to sail") because of the cluster's importance in delimiting the sailing season in the Mediterranean Sea. However, in mythology the name was used for the Pleiades, the seven divine sisters, the name supposedly deriving from that of their mother Pleione and effectively meaning "daughters of Pleione".

In Japan, the constellation is mentioned under the name Mutsuraboshi ("six stars") in the 8th-century. The constellation is now known in Japan as *Subaru*. It was chosen as the brand name of Subaru automobiles to reflect the origins of the firm as the joining of five companies and is depicted in the firm's six-star logo.

The Pleiades are mentioned three times in the Bible, in Homer's Iliad and Odyssey and were known to Australian Aborigines and the Sioux of North America.

The Pleiades are a true cluster, not a chance alignment of stars near and distant. But you had better hurry and study these gems since astronomers estimate that after about 250 million years the cluster will have dispersed due to gravitational interactions with the spiral arms of the galaxy and giant molecular clouds.

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Eyepiece (Cont'd)

Star map created using Stellarium planetarium software

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Galileo Galilei was the first astronomer to view the Pleiades through a telescope. He discovered that the cluster contains many stars too dim to be seen with the naked eye. He published his observations, including a sketch of the Pleiades showing 36 stars, in his treatise *Sidereus Nuncius* in March 1610.

Charles Messier measured the position of the cluster and included it as M45 in his catalogue of comet-like objects, published in 1771. Along with the Orion Nebula and the Praesepe cluster, Messier's inclusion of the Pleiades has been noted as curious, as most of Messier's objects were much fainter and more easily confused with comets—something that seems scarcely possible for the Pleiades. One possibility is that Messier simply wanted to have a larger catalogue than his scientific rival Lacaille, whose 1755 catalogue contained 42 objects, and so he added some bright, well-known objects to boost his list.

Although the Pleiades carries the name "The Seven Sisters", only 6 stars stand out under Chester County skies if you have good vision. I immediately grab my binoculars for the best view of this cluster. The total star count in the cluster is estimated at 500 mostly faint stars that spread out over a piece of sky four times the diameter of the Moon.

The Pleiades are easy to find in the late-night October sky. Look for Aldebaran, the eye of Taurus the Bull, then look up and to the

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Nobel Prize (Cont'd)

(Continued from page 7)

we regard as 'sacred,' as immutable, are anything but," said John Wheeler, one of the leaders of general relativity as a professor at Princeton and the University of Texas at Austin, in his 1998 autobiography.

Most physicists believe that Einstein's theory of general relativity will need to be modified to cope with extreme situations such as the Big Bang or whatever does happen in black holes.

"We already know Einstein's theory of gravity is fraying around the edges," Dr. Ghez said in an interview a couple of years ago. "What better places to look for discrepancies in it than a supermassive black hole?"

Tuesday's award extends a recent streak of prizes for astrophysics.

Last year, the cosmologist James Peebles split the prize with two astronomers, Michel Mayor and Didier Queloz, for work the Nobel judges said "transformed our ideas about the cosmos."

And in 2017 the committee honored Rainer Weiss, Kip Thorne and Barry Barish for the discovery of gravitational waves from black holes.

"Astrophysics seems to own the Nobel Physics Prize these days," said Michael Turner, a cosmologist now at the Kavli Foundation, adding "and rightly so with all that we are learning about the Universe."

NASA, Space Force Partnership Aims to Make Space Exploration Safe

by Sarah Scoles, Science Magazine

NASA Administrator Jim Bridenstine sometimes gets mistaken for the leader of a different agency. "A lot of people ask me about the Space Force," he said today at an event called the Space Power Forum. "They say, 'So how's the Space Force coming along?' and, 'Congratulations on the Space Force.'" Bridenstine wants them to understand the big difference between his civil space agency and the military space branch led by Gen. John Raymond, who appeared virtually next to Bridenstine at the forum. But despite the different missions, Bridenstine continued, "We share a very similar—in fact, we share the same—domain." Orbit, and beyond.

That shared focus is deepening with the announcement at the forum of a new partnership between NASA and the Space Force, an independent branch within the U.S. Air Force. The memorandum of understanding commits the two organizations to "broad collaboration in areas including human spaceflight, U.S. space policy, space transportation, standards and best practices for safe operations in space, scientific research, and planetary defense," according to a NASA statement.

As NASA moves forward with programs like Artemis, its plan to send humans back to the Moon, it wants space to remain safe, even as the region becomes increasingly congested, contested, and competitive—the "three Cs." This new memorandum aims to add another C to the mix: calm. "We share the desire for security in space," Raymond said.

NASA is deepening its ties to the military as it seeks international partners for Artemis, its plan to return humans to the Moon. Image courtesy NASA

The agreement replaces one put in place 14 years ago by NASA and the Air Force Space Command. But blurred boundaries between the U.S. civil and military space enterprises stretch much further into the past. "The history of collaboration between NASA and the Air Force, as the predecessor service that had space capabilities, is very long and extensive and goes back basically to the beginning," says Robin Dickey, a space policy and strategy analyst at the Aerospace Corporation, a federally funded R&D center.

The first astronauts, for instance, were all military pilots. Many today still come from the service. The Space Shuttle sometimes landed not at Kennedy Space Center but at Edwards Air Force Base. NASA has launched classified payloads. "The U.S. space program, from the very beginning, has been inherently military in nature," says Victoria Samson, Washington, D.C., office director of the Secure World Foundation, a space sustainability think tank.

Samson says a deeper or more apparent marriage between the organizations could present challenges for NASA as it pursues joint missions with other nations, if they see the space agency as too attached to the military. "The question is, does that affect others' perceptions of NASA?" Samson says, although she notes that because the agreement builds on an existing one, "it's not as big of a change as it might seem."

The question is particularly relevant as NASA seeks international partners for Artemis. In fact, at today's event, Bridenstine cited Artemis's appeal as a diplomatic tool, a way to establish norms of good behavior in space. He noted that a recent Artemis meeting to foster collaboration drew representatives from 26 countries.

At the same time, programs like Artemis—plus increased commercial activity in space—could need an expanded military presence for protection and peacekeeping. As major stake-

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Eyepiece (Cont'd)

(Continued from page 9)

right. The cluster is a great object in binoculars or a telescope with your lowest power eyepiece to give you a wide field of view. You should be able to see more than 100 stars.

A sure way to get a "WOW" from a friend new to studying the night sky is to mount your binoculars on a tripod and put the Pleiades in the field of view. Share this wonderful sight with your friends and family!

Information credits:

- Pasachoff, Jay M. 2000. *A field guide to the stars and planets.* New York, NY. Houghton Mifflin.
- https://en.wikipedia.org/wiki/Pleiades
- Dickinson, Terence 2006. *Nightwatch: A practical guide to viewing the universe.* Buffalo, NY. Firefly Books

Observing (Cont'd)

(Continued from page 5)

ored by the constellation just to the west of Cassiopeia that is in the shape of a house. In the east we see the Pleiades rising like a "mini-dipper" of jewels.

Messier/deep sky: October is a great month to study the Andromeda galaxy, M31. This is the most distant object you can ever see without binoculars or a telescope to help, although you will need to go to a dark sky site to pick out its soft glow. It is many times further away than any star in the sky. It is so far away that the light you see as that fuzzy spot in the sky left Andromeda 2.5 million years ago! In Chester County skies we need to use binoculars or a telescope, but the view is still wonderful. In addition to M31, you won'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: 9th magnitude Comet 88P/Howell continues to be visible in the southern sky early in October. Discovered by Ellen Howell from Palomar Mountain in 1981, this comet should cast a green glow in long exposure photos. The October issue of Astronomy magazine has a sky map to guide you to this faint visitor to our late summer skies.

Meteor showers: The Orionid meteor shower peaks in the early morning hours of October 21st. You could see up to 15

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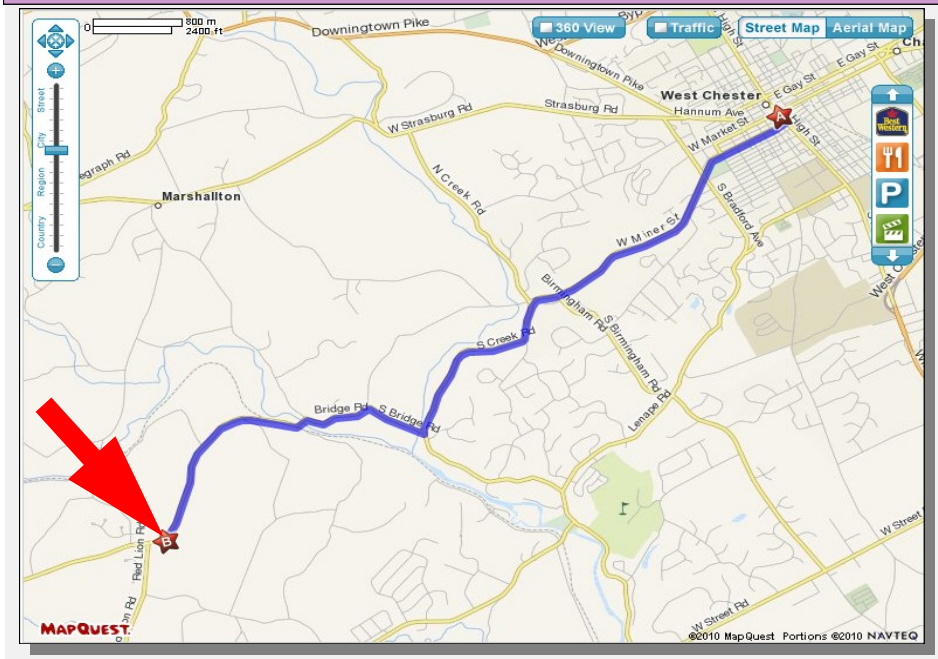
CCAS Directions



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

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

Brandywine Red Clay Alliance

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

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

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

NASA Night Sky Notes: Observe the Skies Near Mars

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.

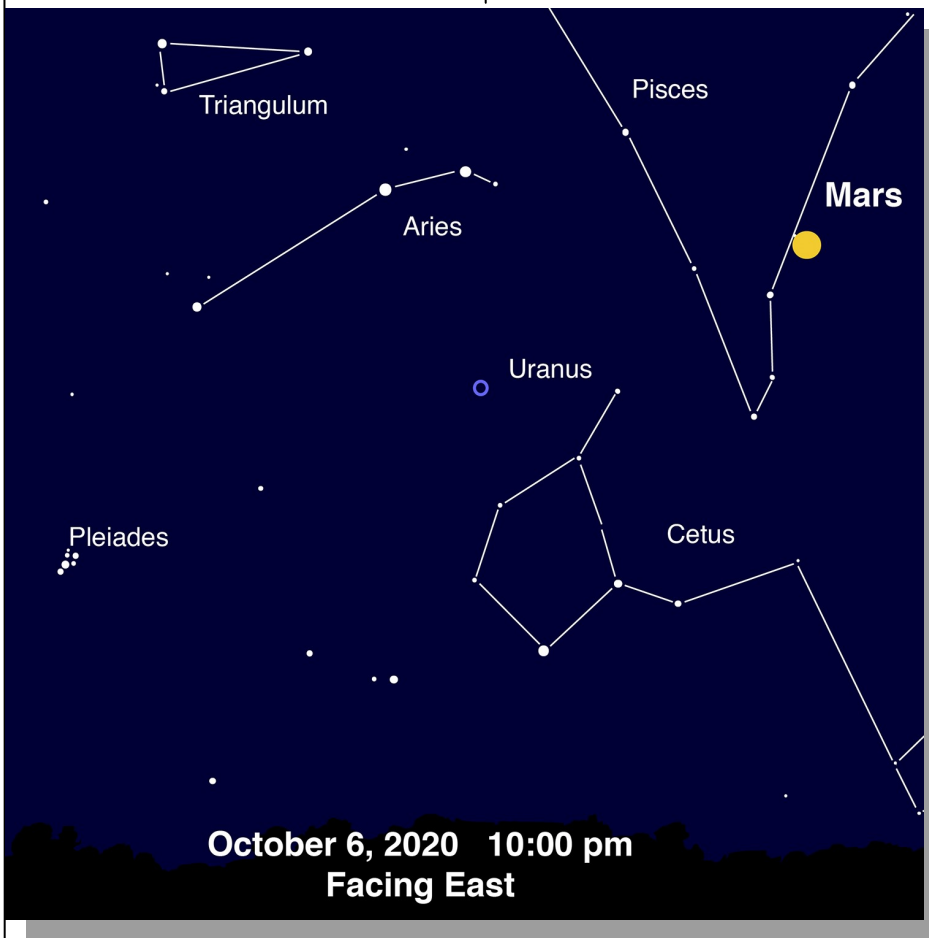
Visit nightsky.jpl.nasa.gov to find local clubs, events, stargazing info and more.

October is a banner month for Mars observers! October 6 marks the day Mars and Earth are at closest approach, a once-every-26-months event. A week later, on October 13, Mars is at opposition and up all night. Mars is very bright this month, and astronomers are eager to image and directly observe details on its disc; however, don't forget to look at the space around the planet, too! By doing so, you can observe the remarkable retrograde motion of Mars and find a few nearby objects that you may otherwise overlook.

Since ancient times, Mars stood out to observers for its dramatic behavior. Usually a noticeable but not overly bright object, its wandering path along the stars showed it to be a planet instead of a fixed star. Every couple of years, this red planet would considerably flare up in brightness, for brief times becoming the brightest planet in the sky before dimming back down. At these times, Mars would also appear to slow down its eastward motion, stop, then reverse and head westward against the stars for a few weeks, before again stopping and resuming its normal eastward movement. This change in the planet's movement is called "apparent retrograde motion." While all of the planets will appear to undergo retrograde motion when observed from Earth, Mars's retrograde appearances may be most dramatic. Mars retrograde motion in 2020 begins on September 10, and ends on November 16. You can observe its motion with your eyes, and it makes for a fun observing project! You can sketch the background stars and plot Mars as you observe it night after night, or set up a photographic series to track this motion. Does the planet move at the same rate night after night, or is it variable? As you observe its motion, note how Mars's brightness changes over time. When does Mars appear at its most brilliant?

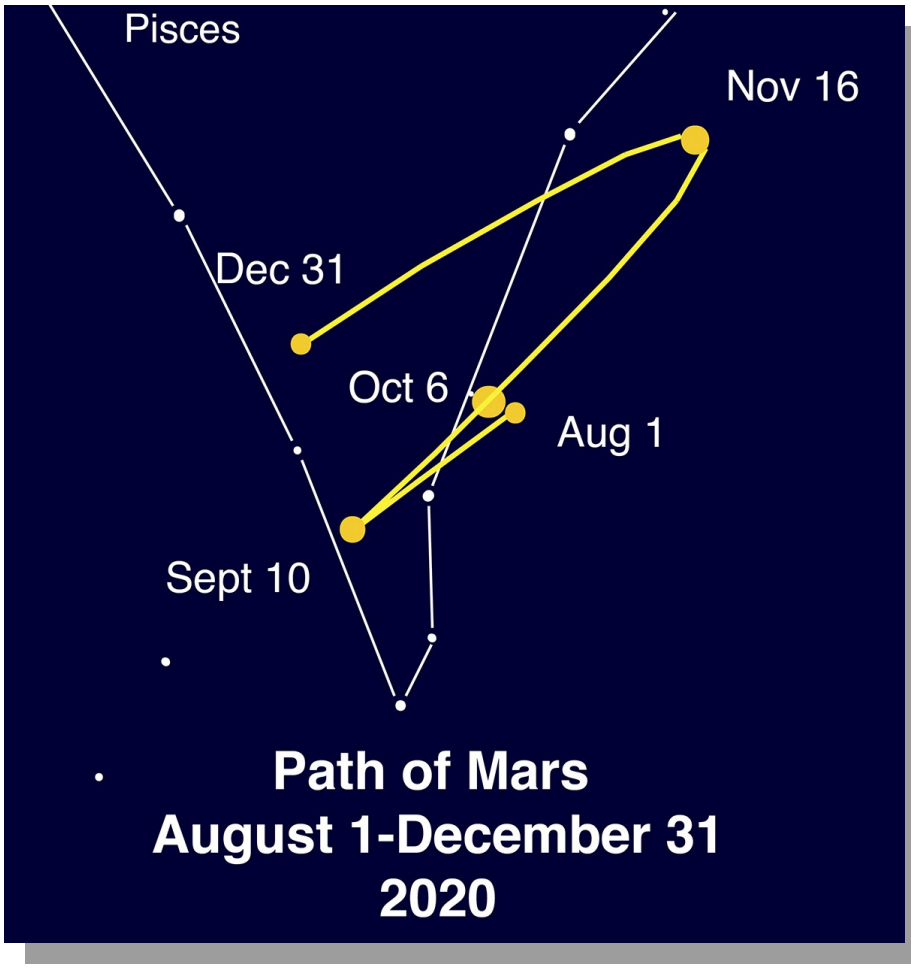
NASA has tons of great Mars-related resources! Want to know more about apparent retrograde

(Continued on page 13)



If you are paying this much attention to Mars, you're likely curious about the skies surrounding it! Find Mars in the constellation Pisces, with constellations Aries, Triangulum, and Cetus nearby. Aries may be the only one of these dimmer patterns readily visible from light-polluted areas. The Pleiades rises shortly after Mars. Dim Uranus is found close by, in Aries. If you are observing Mars up close, use the same eyepiece to check out Uranus's tiny blue-green disc. If you are uncertain whether you spotted Uranus, you didn't see it! Unlike stars, Uranus doesn't resolve to a point at high magnifications.

Night Sky Notes (Cont'd)



The path of Mars during the last five months of 2020. Notice the retrograde motion from September 10 to November 16, with prime Mars observing time found in between. October 6 is the day of closest approach of Earth and Mars, "just" 38.6 million miles apart.
Images created with help from Stellarium: stellarium.org

(Continued from page 12)

motion? NASA has an explainer at: bit.ly/marsretromotion. Find great observing tips in JPl's "What's Up?" videos: bit.ly/jplwhatsup. Check out detailed views with NASA's HiRISE satellite, returning stunning close-ups of the Martian surface since 2006: hirise.lpl.arizona.edu. NASA's Curiosity Rover will be joined in a few months by the Perseverance Rover, launched in late July to take advantage of the close approach of Mars and Earth, a launch window that opens two years: nasa.gov/perseverance. Calculate the ideal launch window yourself with this handy guide: bit.ly/marslaunchwindow. The Night Sky Network's Exploring Our Solar System handout invites you to chart the positions of the planets in the Solar System, and NSN coordinator Jerelyn Ramirez recently contributed an update featuring Mars opposition! You can download both versions at bit.ly/exploresolarsystem. Young astronomers can find many Mars resources and activities on NASA's Space Place: bit.ly/spaceplacemars. Here's to clear skies and good seeing for Mars's best appearance until 2033!

Partnership (Cont'd)

(Continued from page 10)

holders working in the same space, Samson says, they are both invested in establishing and reinforcing good behavior. "There's obviously interest in keeping that space stable and predictable," she says. "It makes sense you'd have a whole-government approach."

Although NASA is a civil and scientific organization, it still can play a political role for the nation, Bridenstine said at the forum. "We are an instrument of national power," he said. "It is soft power. It is diplomatic power. It is information power. It is economic power. But … we can't do any of those things if space is not secure. And that's why it was important to create the Space Force. That's why it's important for NASA to partner with the Space Force."

About Our October 2020 Speaker

Our October 2020 speaker, John Conrad, is a familiar face to many CCAS members, engaging and entertaining us at a number of monthly meetings.

John Conrad followed his childhood interest in space and spaceflight – at the dawn of the Space Age – through Astronautical Engineering degrees from the U.S. Air Force Academy and Purdue University, then straight into leadership roles in space programs for the Air Force, NASA, DOE, and industry.

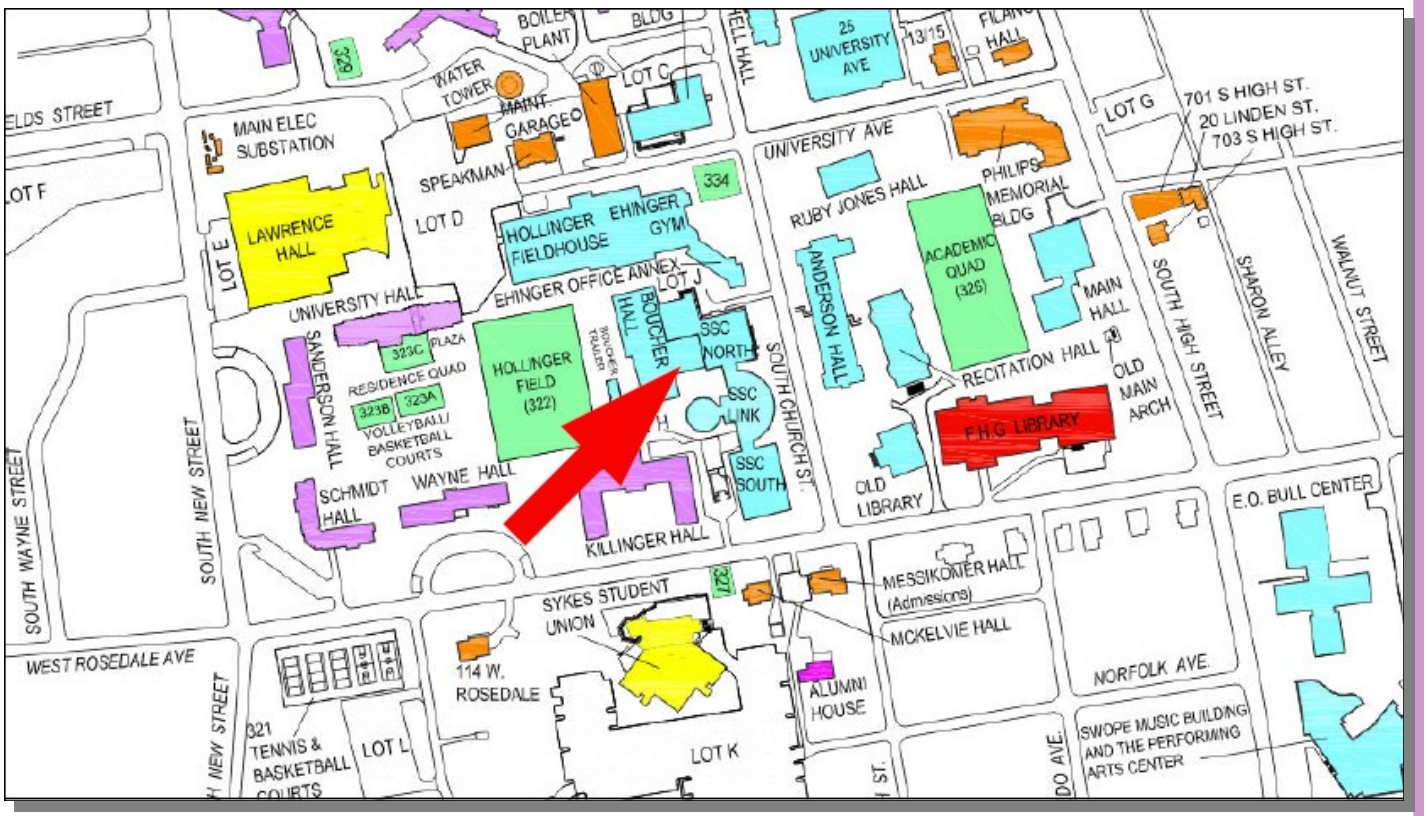
Upon retirement, he was selected by NASA/JPL as a NASA Solar System Ambassador. In that role, he gives frequent talks to schools, astronomy clubs, mu-

(Continued on page 14)

CCAS Directions

West Chester University Campus

The monthly meetings (September through May) are held in Room 112 in Merion Science Center (formerly the Boucher Building), attached to the Schmucker Science Center. The Schmucker Science Center is located at the corner of S. Church St & W. Rosedale Ave. Parking is generally available across Rosedale in the Sykes Student Union parking lot (Lot K).



Observing (Cont'd)

(Continued from page 11)

"shooting stars" per hour. This shower is made up of dust particles from Comet Halley. The peak of this shower is broad, so look for shooting stars a few days before and after the peak.

Speaker (Cont'd)

(Continued from page 13)

seums, libraries, and other learning venues that draw on his extensive experiences, including: managing satellite rocket launches; designing and operating military and civil spacecraft; data applications in areas such as Earth science and intelligence; and astrodynamics and astronomy.

CCAS Membership Information and Society Financials

Treasurer's Report
by Don Knabb

Sept. 2020 Financial Summary

Beginning Balance	$678
Deposits	$150
Disbursements	-$0
Ending Balance	$828

New Member Welcome!

Welcome new CCAS member Dan Kraynik from West Chester, PA, joining his father, longtime member Steve Kraynik. We're glad you decided to join us under the stars! Clear skies to you!

Membership Renewals

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

Don Knabb
988 Meadowview Lane
West Chester PA 19382

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

CCAS Information Directory

Join the Fight for Dark Skies!

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

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

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

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

http://www.darksky.org

Dark-Sky Website for PA

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

http://www.POLCouncil.org

Find out about Lyme Disease!

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

http://www.LymePA.org

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

Good Outdoor Lighting Websites

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

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

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

http://www.starrynightlights.com

★ ★ ★ ★ ★

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

Phone: **484-291-1084**

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

Local Astronomy-Related Stores

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

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

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

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

http://www.skiesunlimited.net

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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
21103 Striper Run
Rock Hall, MD 21661

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 410-639-4329
Public Relations:	Ann Miller 610-558-4248

CCAS Membership Information

The present membership rates are as follows:

REGULAR MEMBER……$25/year
SENIOR MEMBER…….$10/year
STUDENT MEMBER……..$ 5/year
JUNIOR MEMBER……..$ 5/year
FAMILY MEMBER…….$35/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 & Tele*scope Magazine Group Rates

Subscriptions to this excellent periodical are available through the CCAS at a reduced price of **$32.95,** much less than the newsstand price of $66.00, and also cheaper than individual subscriptions ($42.95)! Buying a subscription this way also gets you a 10% discount on other Sky Publishing merchandise.

To **start** a **new** subscription, make **sure** you make out the check to the **Chester County Astronomical Society**, note that it's for *Sky & Telescope*, and mail it to Don Knabb.

To **renew** your "club subscription" contact Sky Publishing directly. Their phone number and address are in the magazine and on their renewal reminders. If you have **any** questions call Don first 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). If you want to participate in this special Society discount offer, **contact our Treasurer Don Knabb.**