Observations

A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 26, No. 12 ***Three-Time*** *Winner of the Astronomical League's Mabel Sterns Award ☼ 2006, 2009 & 2016* *December 2018*

In This Issue

CCAS Original Astrophotography

Seven Sisters or Pleiades (M45) Image Credit : CCAS Member Pete LaFrance

Membership Renewals Due

12/2018	Damerau Kozik Marshall Moynihan O'Leary
01/2019	Kellerman Kovacs Linskens McElwee
02/2019	Ruggeri

December 2018 Dates

7th • New Moon, 2:20 a.m. EST

14th • Geminid meteors peak

15th • First Quarter Moon, 6:49 a.m. EST

16th • Comet 46P/Wirtanen is at closest approach

21st • Winter solstice, 5:22 p.m. EST

22nd • Full Moon, the Full Long Night Moon or the Chief Moon, 12:48 p.m. EST

29th • Last Quarter Moon, 4:34 a.m. EST

CCAS Annual Holiday Party

Ann Miller and Dave Hockenberry invite CCAS members to their home in Glen Mills on Saturday, December 15th starting at 6 PM. Hoagies from Primos will be provided, along with wine and beer. Anyone who wishes to bring appetizers or desert snacks, please feel free to contribute.

Their address is 1477 Valley Road, Glen Mills, PA, 19342. Should anyone have trouble finding their home, call them at (610) 558-4248 and they'll get you here. There is NO street parking on Valley Road, but they do have a long

(Continued on page 14)

Autumn/Winter Society Events

December 2018

15th • CCAS Holiday Party, hosted by Dave Hockenberry & Ann Miller at their home in Glen Mills, PA. The party starts at 6:00 p.m. EST. They will provide sandwiches and drinks. They invite others to bring party foods and drinks to share. More details and directions will appear in the December 2018 edition of *Observations*.

14th • Live public presentation, *Walking on the Moon*, at the West Chester University Mather Planetarium. Doors open at 6:30 p.m. with presentation starting at 7:00 p.m. Cost is $6.00.

20th • Open call for articles and photographs for the January 2019 edition of Observations.

21st • Winter Solstice, 5:23 p.m. First astronomical day of winter in northern hemisphere.

26th • Deadline for newsletter submissions for the January 2019 edition of Observations.

January 2019

8th • CCAS Monthly Meeting, Room 113, Merion Science Center (former Boucher Building), West Chester University. The meeting starts immediately after at 7:30 p.m. Program Theme: TBA.

10th-11th • The von Kármán Lecture Series: Red Planet Rovers and Insites, Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

20th • Open call for articles and photographs for the February 2019 edition of Observations.

25th • Live public presentation, *The Expanding, Accelerating Universe,* at the West Chester University Mather Planetarium. Doors open at 6:30 p.m. with presentation starting at 7:00 p.m. Cost is $6.00.

26th • Deadline for newsletter submissions for the February 2019 edition of Observations.

Minutes from the November 13, 2018, CCAS Meeting

by Ann Miller, CCAS Secretary

- David Hockenberry welcomed 20 members and guests to the November 13, 2018 meeting of the Chester County Astronomical Society.
- David reminded members that the December meeting will be held at the home of Ann and David Hockenberry on Saturday, December 15, 2018, instead of the usual meeting time. More details to follow in the newsletter.
- David also reminded the membership that Roger Taylor will be retiring as President of our club in January and anyone interested in serving as an officer or committee chairperson should contact Ann Miller or Don Knabb.
- Don Knabb shared a list of upcoming club events:
  - Friday, November 16-Girl Scout troop star Party at East Goshen Township Park. David Hockenberry will be leading that event. Please contact him if you can assist.
  - Sunday, December 9-BRC club observing to see Comet 46P Wirtane
  - Saturday, December 15-CCAS Holiday Party at the Hockenberry's
- Don, our observing chair then shared the upcoming night sky using Sky Safari Pro.
  - The highlight of the month will be Comet 46P/Wirtanen which should be at its brightest on December 16.
  - Comet 38P Stephan-Oterma will come to perihelion on November 10th, 2018.
- John Conrad, one of our NASA Solar System Ambassadors, presented "Rocket Science 102". John presented Rocket Science 101 at a prior meeting. The mission of Rocket Science is to place (rocket) a payload (spacecraft) where you want it (orbit). John discussed orbital mechanics and spacecraft tonight.

January 2019 CCAS Meeting Agenda

by Dave Hockenberry, CCAS Program Chair

Our next meeting will be held on January 8, 2019, starting at 7:30 p.m. The meeting will be held in Room 113, Merion Science Center (former Boucher Building), West Chester University. Program Theme: TBA.

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 2019 spring season. If you are interested in presenting, or know someone who would like to participate, please contact me at programs@ccas.us.

Real-Time Insights from WALL-E and EVE

by John Conrad, CCAS Member & NASA/JPL Ambassador

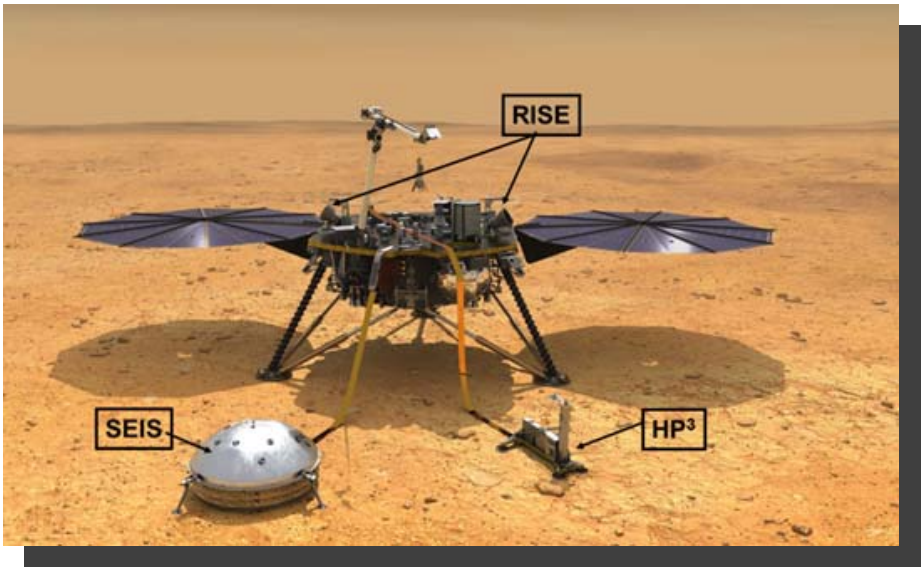


Image courtesy NASA/JPL

NewsFlash – NASA TV – Nov. 26, 2018 – 3 pm EST

Success! The NASA/JPL team is leaping and hugging (and finally breathing) after the perfect 7-minute entry, descent and touchdown of NASA's latest Mars' lander: InSight.

Many of you may have witnessed this in near real time (not quite real time because right now signals take 8 minutes to get to Earth from Mars). We didn't see the spacecraft or the landing or the surface right away, but we did see the entire JPL mission team, filling the control room in their maroon shirts. All maroon except for a couple key mission people in black shirts. We'll get to the 'black shirts' in a minute.

So here are highlights of this quite unique new Mars lander – going boldly not only to Mars but, if all goes well, deep into Mars. InSight is, of course, an acronym – because all Project Managers feel at their most 'immortal' when they get to make up the name for their project (in the case of NASA, their spacecraft). So, while technically InSight stands for Interior Exploration Using Seismic Investigations, Geodesy and Heat Transport – the name really means that this lander will give us insight into Mars interior.

Three instruments will give us these insights over a planned two-year mission (two Earth years is one Mars year). This figure illustrates the fully deployed operational configuration, which will take a few months to achieve.

Two packages will be deployed onto/into the Martian surface by a robotic arm, while one remains on the InSight platform. Their acronyms suggest their scientific objectives:

Rotation and Interior Structure Experiment (RISE) is a JPL radio science package, providing precise measurements of planetary rotation to better understand the interior of Mars. Determination of the spin axis direction, precession, and nutation amplitudes of Mars should make it possible to calculate the size and density of Mars core.

Seismic Experiment for Interior Structure (SEIS) is a French Space Agency package that will take precise measurements of **marsquakes** and other internal activity. The seismometer is sensitive to vibrations on a scale of half the radius of a hydrogen atom!

Heat Flow and Physical Properties Package (HP^3) is a German Aerospace Center package that features a self-penetrating heat flow probe (a "self-hammering nail") designed to burrow as deep as 5 m (16 ft) below the Martian surface to measure how efficiently heat flows through Mars' core, revealing unique information about the planet's interior and how it has evolved over time.

I'll leave it to the reader to take advantage of the many NASA and YouTube videos and animations to delve as deeply into (or, what the heck, gain *insights* into) this mission.

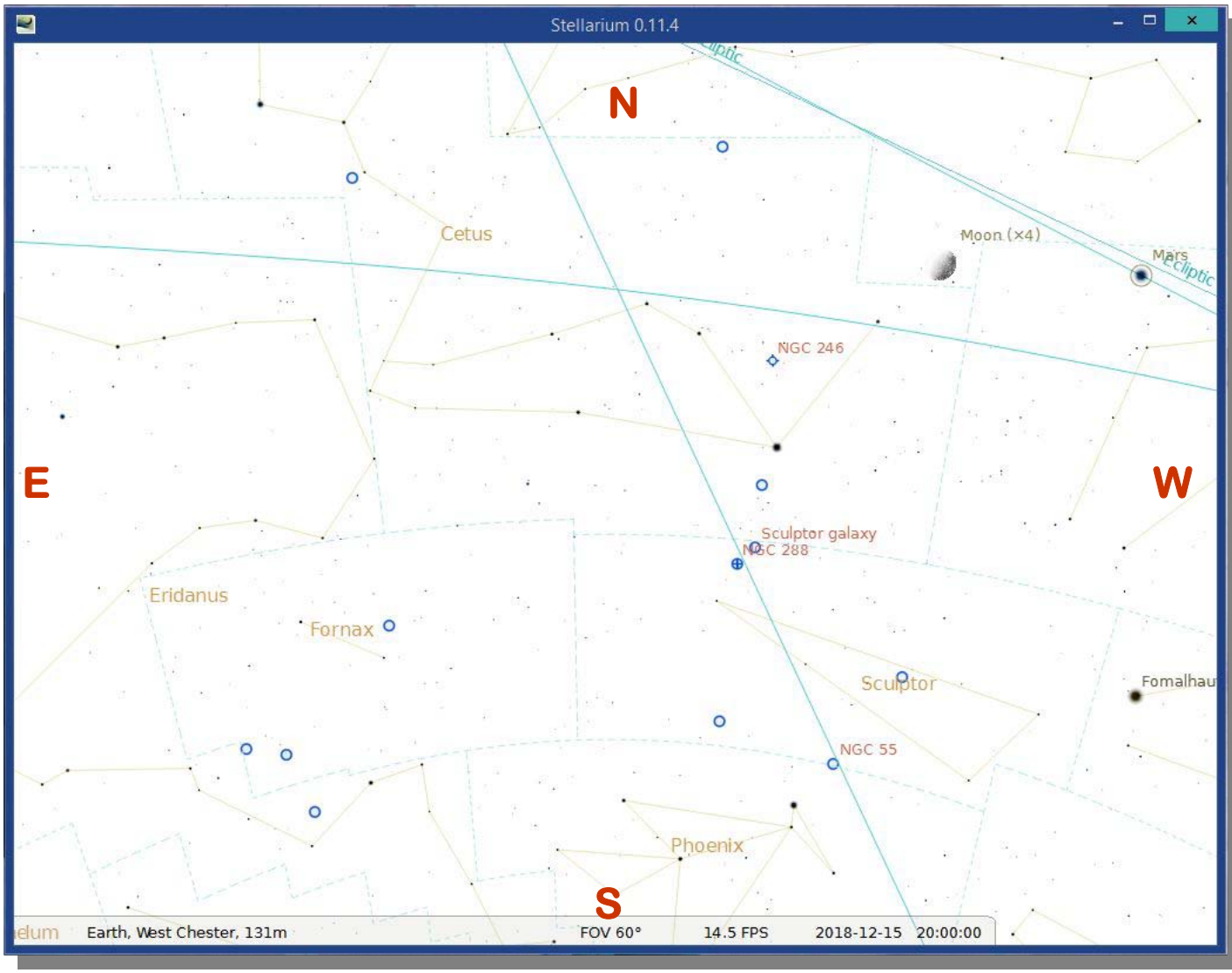
Now back to the 'black shirts' in the control room. They were the other key players in yesterday's success, responsible for a different JPL spacecraft: MarCO. Because when the Atlas V lifted off from Vandenberg Air Force Base in California in May, the first interplanetary launch from the US west coast launch base, it carried not just InSight but also the *first 2 interplanetary cubesats*, known as Mars Cube One (MarCO-A and MarCO-B). Also known as WALL-E and EVE, these identical cubesats each measured 4 by 8 by 12 inches and weighed about 30

(Continued on page 13)

The Sky Over Chester County

December 15, 2018 at 8:00 p.m. ET

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



Date	Civil Twilight Begins	Sunrise	Sunset	Civil Twilight Ends	Length of Day
12/01/2018	6:33 a.m. EDT	7:03 a.m. EDT	4:36 p.m. EDT	5:06 p.m. EDT	9h 32m 57s
12/15/2018	6:44 a.m. EST	7:15 a.m. EST	4:36 p.m. EST	5:06 p.m. EST	9h 21m 16s
12/31/2018	6:51 a.m. EST	7:22 a.m. EST	4:45 p.m. EST	5:15 p.m. EST	9h 23m 07s

Moon Phases					
			New Moon	12/07/2018	2:20 a.m. EST
First Quarter	12/15/2018	6:49 a.m. EST	Full Moon	12/22/2018	12:48 p.m. EST
Last Quarter	12/29/2018	4:34 a.m. EST			

December 2018 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

7	**New Moon, 2:20 a.m. EST**
14	**Lunar X visible, 5 p.m. EST**
14	**Geminid meteor shower peaks**
14	**The Moon and Mars are close in evening twilight**
15	**First Quarter Moon, 6:49 a.m. EST**
15	**The Lunar Straight Wall is visible**
16	**Comet 46P/Wirtanen is at closest approach**
21	**Winter solstice, 5:22 p.m. EST**
22	**Ursid meteor shower peaks**
22	**Full Moon, the Full Long Night Moon or the Chief Moon, 12:48 p.m. EST**
29	**Last Quarter Moon, 4:34 a.m. EST**

The best sights this month: With planets fading from view we need to look for other entertainment during December, and there is plenty to see! The Geminid meteor shower peaks on the night of December 13/14 and should give an excellent show after the Moon sets around 10:30. Then Comet 46P/Wirtanen is at closest approach on December 16th and should be easily visible in binoculars, possibly even to the naked eyes. But the best view might be a few days earlier when the Moon will be less bright. Look for the Geminid meteors and Comet Wirtanen on the same night and prepare to be dazzled! And if that's not enough, look for the famous Lunar X on December 14th at 5:00 p.m.

Mercury: Mercury is visible in the morning sky around mid-month.

Venus: Our sister planet shines brightly in the morning sky all month, nearly 33 degrees high at sunrise most of the month.

Mars: The red planet is high in the south at sunset and sets around 11:30. Unfortunately Mars is falling behind in our race around the Sun and is becoming smaller in the eyepiece of your telescope every day. On December 7th Mars and Neptune are less than a degree apart in the sky.

Jupiter: Jupiter is visible in the pre-dawn sky after the first week of December.

Saturn: We bid goodbye to Saturn by mid-month when it falls into the glow of the sunset.

Uranus and Neptune: Uranus is high in the sky a few hours after evening twilight ends. Neptune is much lower in the sky, near Mars. And on December 7th Mars and Neptune are very close in the sky, only 15 arc-minutes apart!

The Moon: Full Moon is on December 22nd. This is the Full Cold Moon; or the Full Long Night Moon. It is also sometimes called the Moon before Yule. The term Long Night Moon is appropriate because the midwinter night is indeed long, and because the Moon is above the horizon for a long time. The midwinter full Moon has a high trajectory across the sky because it is opposite a low Sun. Native Canadians called this the Chief Moon.

A special event occurs on December 14th when the famous Lunar X is visible around 5 p.m.

Constellations: Ah, December skies! It's cold enough to be quite clear, but not the freezing, bone chilling cold of January and February. It seems odd to go outside after sunset and still see the Summer Triangle, but indeed there it is diving into the west. Look to the east and you will see the constellations that make it worth dressing warmly and spending some time outside during the cold December nights. Bright Capella in Auriga is high in the east to the upper left of the "V" of Taurus the Bull. Just behind Taurus is Orion the Hunter, the most easily recognized constellation of the winter months.

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

(Continued on page 7)

Through The Eyepiece: Caroline's Rose, NGC 7789

by Don Knabb, CCAS Treasurer & Observing Chair

NGC 7789 is an open cluster that lies in the constellation Cassiopeia near the plane of our Milky Way galaxy. One of the major omissions from Messier's catalogue, it was discovered by Caroline Hershel in 1783. This cluster is known as Caroline's Rose because when seen visually its loops of stars and dark lanes look like a swirling pattern of rose petals.

This image below was provided by Brent Crabb, an amateur astrophotographer in southern California. Although this is an excellent image of Caroline's Rose, the only way to appreciate this beautiful object is with your eye at the eyepiece of a telescope at a dark sky site.

This splendid cluster is large, rich, fairly dense and well-resolved. The cluster covers an area half the size of the full moon. At least 150 stars are visible in a 16' area. The cluster's brighter members are 11th and 12th magnitude objects distributed in concentric rings. The cluster has no distinct border and its outlying stars seem to blend into the surrounding star field. With a total apparent magnitude of 6.7, NGC 7789 compares favorably with many of Messier's star clusters.

Caroline Herschel, born in 1750, was a German-British astronomer, the sister of astronomer Sir William Herschel with whom she worked throughout both of their careers. At the age of ten, Caroline was struck with typhus, which stunted her growth and she never grew past four foot three. Due to this deformation,

Image credit: http://en.wikipedia.org/wiki/Caroline_Herschel

her family assumed that she would never marry and that it was best for her to remain a house servant. Instead she became a significant astronomer in collaboration with William.

Caroline discovered 8 comets and over a dozen deep sky objects between 1783 and 1797 using a small telescope given to her by her brother William. Caroline once rode 30 miles on horseback, at night, to the Royal Greenwich Observatory, in order to report a comet that she had discovered. She wanted to be sure there would be no delay in its confirmation.

NGC 7789 is an open or galactic star cluster about 8,000 light-years distant toward the constellation Cassiopeia and lies near the plane of our Milky Way galaxy. All the stars in the cluster were likely born at the same time but the brighter and more massive ones have more rapidly exhausted the hydrogen fuel in their cores.

An open cluster is a group of up to a few thousand stars that were formed from the same giant molecular cloud and have roughly the same age. More than 1,100

(Continued on page 7)

Image credit: Brent Crabb, astrophotographer

Eyepiece (Cont'd)

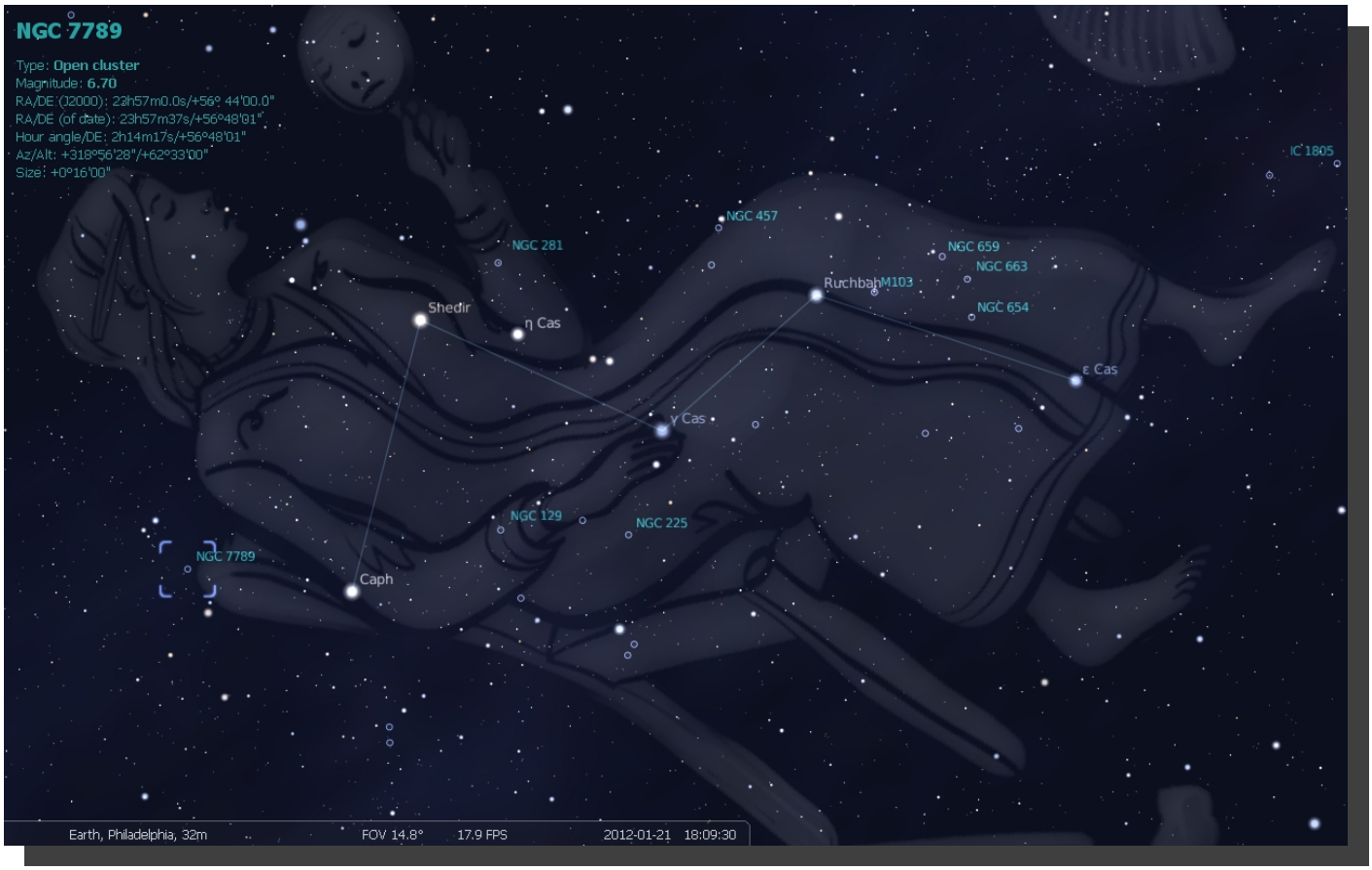


Image credit: Stellarium planetarium software

(Continued from page 6)

open clusters have been discovered within the Milky Way galaxy, and many more are thought to exist. They are loosely bound to each other by mutual gravitational attraction and become disrupted by close encounters with other clusters and clouds of gas as they orbit the galactic center. Open clusters generally survive for a few hundred million years. In contrast, the more massive globular clusters of stars exert a stronger gravitational attraction on their members, and can survive for many billions of years.

Caroline's Rose is located near Cassiopeia's right shoulder in the sky map. When you are under the stars, once you find Cassiopeia, find Caph, the bright star near Cassiopeia's right elbow in the sky map. Then scan to the west to find Caroline's Rose.

Information credits:

http://www.nightsky.at/Photo/GalClu/NGC7789_WN.html
http://observing.skyhound.com/archives/oct/NGC_7789.html
http://apod.nasa.gov/apod/ap990709.html
http://en.wikipedia.org/wiki/NGC_7789
http://en.wikipedia.org/wiki/Caroline_Herschel
Sky Safari iPad app

Observing (Cont'd)

(Continued from page 5)

in Perseus. And of course, don't miss M42, the Orion Nebula, which is a truly awesome telescopic object.

Comets: Comet 46P/Wirtanen should be easy to find with binoculars through all of December, assuming predictions of the comet's brightness hold true. The night of closest approach is December 16th, but you'll need to wait until after midnight when the Moon sets.

Meteor showers: The Geminid meteor shower, one of the most reliable meteor showers of the year, peaks in the early morning hours of December 14th. Up to 120 "shooting stars" per hour are possible from this shower. The Moon sets at 10:30 on the evening of December 13th, so from then until dawn we should have a great show!

The LaFrance Observatory

by Don Knabb & Pete LaFrance

Pete LaFrance is one of the founding members of the Chester County Astronomical Society. You have seen many of his photographs of deep sky objects in the articles I write for our newsletter. Pete told me he had made some improvements to his observatory and we thought it would be of interest to our members who may be considering building a home observatory.

Pete built his observatory 15 or 20 years ago in the back of his Avondale home. It is of cinder block construction with vinyl covering and he constructed the dome from plywood, sheet metal and resin. It was very heavy! Over the years, the dome had deteriorated and had begun to leak. To the right is a picture of the original dome.

So rather than construct another dome, Pete built a standard peaked roof with a removable panel. The peak is off center to allow access to objects near the zenith.

The roof rotates on wheels that run on a solid ½ inch hardened steel rod that Pete shaped into a ring. The roof is moved by a drive motor and a wheel. Pete can rotate the dome either direction by flipping a switch. He controls the rotation at the observatory or remotely from inside his house by computer control, but he must come out and flip the direction switch to change the direction of rotation.

Pete has a computer in the observatory that is networked to a computer in his house. Once he has the observatory open and his scope and camera configured and powered, he can control his rig from the house computer.

Pete's Observatory with the Original Dome

Removing the Panel from the Replacement Peaked Roof

Pete has several telescopes and cameras. The one in the picture at right is a Celestron 9.5 that he uses for planetary photography. He also has a Celestron 11 astrograph and a Celestron 11 Fastar, which is a telescope where the camera is fastened at the front

(Continued on page 9)

Observatory (Cont'd)

Top to bottom: Open Observatory; Drive Rails; Rotation System Detail; Celestron 9.5" Telescope

(Continued from page 8)

end of the scope and the scope cannot be used for visual observing, only for astrophotography. He also has an Orion 130mm EON refractor.

His guide scope is a Brandon 80mm refractor with an Orion Starshoot autoguider. His camera is a ZWO174 monochrome with a filter wheel. He likes the ZWO because it is small and does not obscure a large area on his Fastar scope.

Pete's mount is a Celestron CGE Pro that he bought used about 2 years ago. The mount is fastened onto a concrete filled pier that is bolted to the concrete foundation.

Inside the observatory Pete has installed red and white Christmas lights. The red lights are on a dimmer to preserve his night vision when in the observatory.

The only thing that Pete would do differently is to offset the peak of the roof further from the center line of the roof. It is offset somewhat, but when trying to image an object that is near the zenith his finder scope and guide scope are obstructed by the roof.

Pete has been pursuing astrophotography since 1988. As mentioned above he is one of the founding members of our club and served as treasurer for a lengthy period. I might also add that he is a talented plumber and is in business with his sons. You can see his astrophotography on his website: http://www.plafrance.org/

Science Fiction Themed Soviet Era Holiday Cards

by Amber Frost & Zeon Santos

When the Russian Empire gave way to the Union of Soviet Socialist Republics they officially, and legally, became a nation of atheists, a sharp turn away from their religious roots. This made things hard for the devoutly Catholic, and really put a damper on the Christmas festivities, but holiday card artists managed to save the day by sneaking in images of Saint Nick with a little white lie.

These clever artists combined the Soviet space obsession with images of who they claimed to be "Ded Moroz," a wizard from Russian mythology who happens to look an awful lot like Santa Claus. They combined icons from mythology, cool sci-fi stuff and traditional holiday fare into one utterly amazing outer space scene, creating the kind of Christmas cards most geeks would love to send out to this day.

On these pages are some "holiday" cards from the Soviet era, but one can easily detect efforts at sneaking familiar Christmas traditions into what had become the "Soviet New Year" celebration. You can see the character of Ded Moroz, formerly an evil sorcerer from Slavic mythology—he was said to freeze and kidnap children without conciliations from their parents. His striking resemblance to Santa is the result of a massive rebrand by the Orthodox Church to mimic the Dutch Saint Nicholas.

Of course, after the Russian Revolution, Ded Moroz was declared "an ally of the priest," and was subsequently (and somewhat awkwardly) retrofitted over the Soviet New Year holiday. In 1935, high-ranking Soviet politician (and primary facilitator of the famine-genocide in the Ukraine), Pavel Petrovich Postyshev spoke out in defense of Christmas, arguing that its pre-Christian origins and value to children should exempt it from condemnation as bourgeois or religious. This paved the way for a more lenient view on the holiday.

(Continued on page 11)

Ded Moroz doesn't need reindeer, he's got satellites!

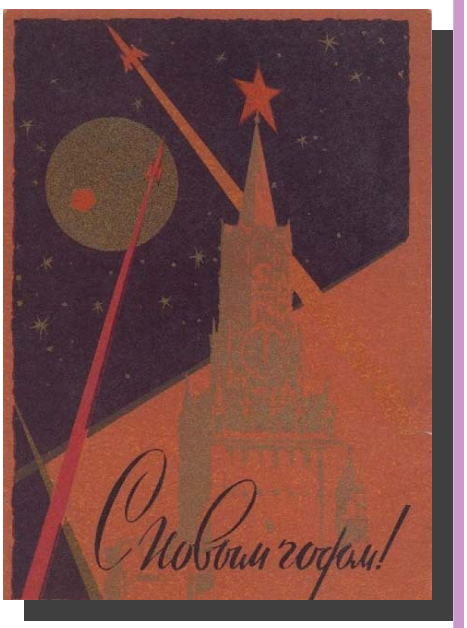
Ded Moroz and Cosmonaut boy Rocketing into the Sky

Soviet Cards (Cont'd)

Cosmonaut boy is a character seen almost as frequently as Ded Moroz, emphasizing the child-centric focus of the holiday

And here's Ded Moroz riding an actual Communist star around the cosmos

Note the icons of industrial economy in the tree—factory, bridge, dam, rocket, mine cart, etc.



While the dynamic geometry of Soviet Constructivism is commonly thought in the US to represent the overwhelming majority of Soviet art, this beautiful example is actually somewhat anomalous in a sea of cards of bright colors and cherubic faces

(Continued from page 10)

In 1937, Stalin even commissioned a Ded Moroz for public appearances, commanding, however, that they wear blue, so as not to be conflated with the Western Saint Nicholas. There were even Soviet Nativity Scenes with Ded Moroz as Joseph, a Snow Maiden (Ded Moroz' helper) as Mary, and the baby New Year as Jesus.

As you can see above, Soviets fashioned some truly surreal feats of cultural synthesis with Ded Moroz, Communist iconography, and the USSR's omnipresent symbol of ambitious futurism: space travel.

NASA Night Sky Notes: Observe Apollo 8's Lunar Milestones

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.

December marks the 50th anniversary of NASA's Apollo 8 mission, when humans first orbited the Moon in a triumph of human engineering. The mission may be most famous for "Earthrise," the iconic photograph of Earth suspended over the rugged lunar surface. "Earthrise" inspired the imaginations of people around the world and remains one of the most famous photos ever taken. This month also brings a great potential display of the Geminids and a close approach by Comet 46P/Wirtanen

You can take note of Apollo 8's mission milestones while observing the Moon this month. Watch the nearly full Moon rise just before sunset on December 21, exactly 50 years after Apollo 8 launched; it will be near the bright orange star Aldebaran in Taurus. The following evenings watch it pass over the top of Orion and on through Gemini; on those days five decades earlier, astronauts Frank Borman, Jim Lovell, and Bill Anders sped towards the Moon in their fully crewed command module. Notice how the Moon rises later each evening, and how its phase wanes from full on Dec 22 to gibbous through the rest of the week. Can you imagine what phase Earth would appear as if you were standing on the Moon, looking back? The three brave astronauts spent 20 sleepless hours in orbit around the Moon,

starting on Dec 24, 1968. During those ten orbits they became the first humans to see with their own eyes both the far side of the Moon and an Earthrise! The crew telecast a holiday message on December 25 to a record number of Earthbound viewers as they orbited over the lifeless lunar terrain; "Good night, good luck, a merry Christmas and God bless all of you - all of you on the good Earth." 50 years later, spot the Moon on these holiday evenings as it travels through Cancer and Leo. Just two days later the astronauts splashed down into the Pacific Ocean after achieving all the mission's test objectives, paving the way for another giant leap in space exploration the following year.

The Geminids, an excellent annual meteor shower, peaks the evening of December 13 through the morning of the 14th. They get their chance to truly shine after a waxing crescent Moon sets around 10:30 pm on the 13th. Expert Geminid observers can spot around 100 meteors per hour under ideal conditions. You'll spot quite a few meteors

(Continued on page 13)

Caption: Earthrise, 1968. Note the phase of Earth as seen from the Moon. Nearside lunar observers see Earth go through a complete set of phases. However, only orbiting astronauts witness Earthrises; for stationary lunar observers, Earth barely moves at all. Why is that? Credit: Bill Anders/NASA

Night Sky Notes (Cont'd)

(Continued from page 12)

by avoiding bad weather and light pollution if you can, and of course make sure to bundle up and take frequent warming breaks. The Geminids have an unusual origin compared to most meteor showers, which generally spring from icy comets. The tiny particles Earth passes through these evenings come from a strange "rock comet" named asteroid 3200 Phaethon. This dusty asteroid experiences faint outbursts of fine particles of rock instead of ice.

You can also look for comet 46P/Wirtanen while you're out meteor watching. Its closest approach to Earth brings it within 7.1 million miles of us on December 16. That's 30 times the average Earth-Moon distance! While passing near enough to rank as the 10th closest cometary approach in modern times, there is no danger of this object striking our planet. Cometary brightness is hard to predict, and while there is a chance comet 46P/Wirtanen may flare up to naked eye visibility, it will likely remain visible only via binoculars or telescopes. You'll be able to see for yourself how much 46P/Wirtanen actually brightens. Some of the best nights to hunt for it will be December 15 and 16 as it passes between two prominent star clusters in Taurus: the Pleiades and the V-shaped Hyades. Happy hunting!

Catch up on all of NASA's past, current, and future missions at nasa.gov.

InSite (Cont'd)

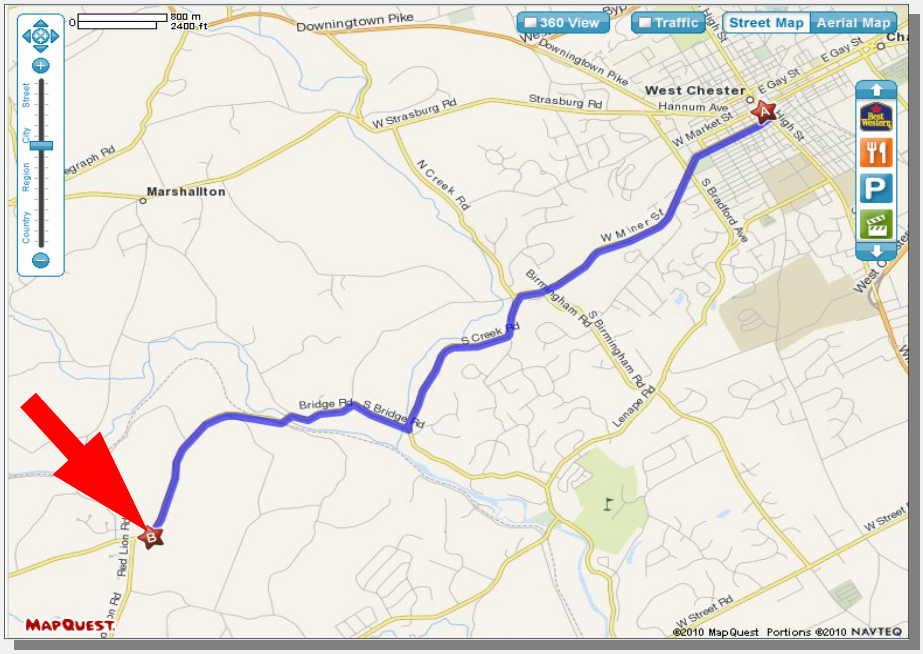
(Continued from page 3)

lbs. As this figure illustrates, while they flew by Mars, they successfully relayed in real-time the entry, descent, and landing events of InSight, without which the JPLers in the control room would have had a much longer time to wait for confirmation of success.

One final personal note: my memory when the Atlas lifted off from launch pad SLC-3 East in May 2018 was of another Atlas launch from the *exact same launch pad, 50 years earlier*. Sadly, that vehicle which my crew launched into a southern trajectory (polar orbit) did not achieve orbit. About 10 minutes after liftoff, the dozen experiments were deployed but re-

(Continued on page 14)

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).

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).

InSite (Cont'd)

(Continued from page 13)

mained inside the payload fairing (which did not separate as programmed) and so the whole mission descended into the southern Pacific Ocean – and many lessons were learned in the ensuing lengthy failure analysis.

New Member Welcome!

Welcome new CCAS members Steve DellaPenna from Coatesville, and Chris Etherington from West Chester, PA. We're glad you decided to join us under the stars! Clear skies to you!

CCAS Membership Information and Society Financials

Treasurer's Report

by Don Knabb

Nov. 2018 Financial Summary

Beginning Balance	$1,001
Deposits	$45
Disbursements	-$0
Ending Balance	$1,046

CCAS Annual Holiday Party

(Continued from page 1)

driveway and they have use of their neighbor's driveway at 1481 Valley Road for any overflow. Dave and Don Knabb will be handling parking as people come and go. If any folks have a problem with steps, especially if the weather is bad, let them know in advance and they will reserve parking in their garage for you – only two steps up to get inside. Please RSVP to toxophilus1@verizon.net or toxophilus1@juno.com or give them a call.

Membership Renewals

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

Don Knabb
988 Meadowview Lane
West Chester PA 19382

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

CCAS Information Directory

Join the Fight for Dark Skies!

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

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

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

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

http://www.darksky.org

Dark-Sky Website for PA

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

http://www.POLCouncil.org

Find out about Lyme Disease!

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

http://www.LymePA.org

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

Good Outdoor Lighting Websites

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

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

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

http://www.starrynightlights.com

★ ★ ★ ★ ★

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

Phone: **484-291-1084**

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

Local Astronomy-Related Stores

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

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

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

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

http://www.skiesunlimited.net

★ ★ ★ ★ ★

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

4403 Main Street
Philadelphia, PA 19127

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

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

http://www.spectrum-scientifics.com

CCAS Information Directory

CCAS Lending Telescopes

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

CCAS Lending Library

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

Contributing to *Observations*

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

Or mail the contribution, typed or handwritten, to:

Dr. John 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:	Roger Taylor 610-430-7768
Vice President:	Liz Smith 610-842-1719
ALCor, Observing, and Treasurer:	Don Knabb 610-436-5702
Secretary:	Ann Miller 610-558-4248
Librarian:	Barb Knabb 610-436-5702
Program:	Dave Hockenberry 610-558-4248
Education:	TBA
Webmaster and Newsletter:	John Hepler 410-639-4329
Public Relations:	TBA

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.**