# Observations

A Monthly Publication Of The
CHESTER COUNTY ASTRONOMICAL SOCIETY

*Vol. 24, No. 12* ***Three-Time*** *Winner of the Astronomical League's Mabel Sterns Award ☼ 2006, 2009 & 2016* *December 2016*


## In This Issue



## The Elusive Lunar X


*See pg. 3 for Frank Angelini's article on Sudden Ionospheric Disturbances.*

## Membership Renewals Due

| | |
|---|---|
| 12/2016 | Bogusch<br>Moynihan<br>O'Leary |
| 01/2017 | Holmstrom<br>Kellerman<br>Kovacs<br>Linskens<br>McElwee |
| 02/2017 | DiGiovanni<br>Gallagher<br>La Para<br>Munson<br>Ruggeri |

## December 2016 Dates

**7th** • First quarter Moon, 4:03 a.m. EST

**13th** • Full Moon, the Long Night's Moon, 7:05 p.m. EST

**20th** • Last Quarter Moon, 8:55 p.m. EST

**21st** • Winter solstice, 5:44 a.m. EST

**22nd** • The Ursid meteor shower peaks

**29th** • New Moon, 1:53 a.m. EST

## CCAS Annual Holiday Party

Barb and Don Knabb have graciously offered to host the annual CCAS holiday party at their home on Saturday, December 17th, at 6:00 p.m. Their address is 988 Meadowview Lane and their phone number is 610-436-5702. A Google Maps search will provide good directions to their house. Their home is at the end of a cul-de-sac and 988 is on the mailbox. They have a long driveway and the house has a garage facing the street. Please RSVP to dknabb00@comcast.net if you plan to attend.

## Autumn/Winter 2016 Society Events

**December 2016**

**2nd** • West Chester University Planetarium Show: "Dethroning the Earth," in the Schmucker Science Building. The show starts at 7 p.m. and run approximately one hour in length. For more information and reservations, visit the WCU Public Planetarium Shows webpage.

**7th** • PA Outdoor Lighting Council monthly meeting, 1438 Shaner Drive, Pottstown, PA 19465, starting at 7:30 p.m. For more information and directions, visit the PA Outdoor Lighting Council website.

**13th** • Geminid Meteor Shower Peaks. Considered by many to be the best meteor shower in the heavens, the Geminids are known for producing up to 60 multicolored meteors per hour at their peak. The peak of the shower usually occurs around mid-December, although some meteors should be visible from December 6th through the 19th.

**15th-16th** • The von Kármán Lecture Series: Spinning Black Holes, Exploding Stars, and Hyperluminous Pulsars: Recent Results from the NuSTAR Satellite, at the Jet Propulsion Laboratory, Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

**17th** • CCAS Holiday Party at Barb & Don Knabb's home in West Chester, PA. The party is for CCAS members and their families and starts at 6:00 p.m. See page 1 for location and directions.

**20th** • Open call for articles and photographs for the January 2017 edition of Observations.

**21st** • Winter Solstice (6:00 A.M. EST) - The South Pole of the earth will be tilted toward the Sun, which will have reached its southernmost position in the sky and will be directly over the Tropic of Capricorn at 23.44 degrees south latitude.

**26th** • Deadline for newsletter submissions for the January 2017 edition of Observations.

**January 2017**

**6th** • Reservations open for the January 27th planetarium show. To make a reservation, visit the WCU Public Planetarium Shows webpage.

**7th** • PA Outdoor Lighting Council monthly meeting, 1438 Shaner Drive, Pottstown, PA 19465, starting at 7:30 p.m. For more information and directions, visit the PA Outdoor Lighting Council website.

**10th** • CCAS Monthly Meeting, Room 113, Merion Science Center (former Boucher Building), West Chester University. Meet & Greet over coffee and refreshments for members and non-members alike from 7:00 to 7:30 p.m. The meeting starts immediately after at 7:30 p.m. CCAS Member Speaker: Phil Rossomando from the Planetary Society.

**12th-13th** • The von Kármán Lecture Series: Exoplanets: The Quest for Strange New Worlds, Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

**20th** • Open call for articles and photographs for the February 2017 edition of Observations.

**26th** • Deadline for newsletter submissions for the February 2017 edition of Observations.

**27th** • West Chester University Planetarium Show: "Mars & Venus: Our Planetary Neighbors" in the Schmucker Science Building. The show starts at 7 p.m. and runs approximately one hour in length. For more information and reservations, visit the WCU Public Planetarium Shows webpage.

## Minutes from the November 8, 2016, CCAS Meeting

*by Ann Miller, CCAS Secretary*

- Roger Taylor welcomed 15 members to the November 8, 2016 meeting of CCAS. Roger then presented David Hockenberry with a gift to thank him for his hard work as program chair.
- Pete Kellerman visited Wallops Island to witness the launch of the Antares rocket for resupply of the ISS. Pete shared a video of the launch from a site 2 miles away. The video tracked from countdown to the last stage separation.
- Don Knabb, our observing chair, presented the Night Sky for highlights of November and December on the Stellarium software.
- Don also thanked all of the members who turned out to Country Day School of the Sacred Heart last Sunday, November 6, 2016 to help with the star party. Approximately 50 students and 12 club members were present. Don has received thank you notes from the students thanking the club members for sharing the night sky.
- Our next and final star party for the year is Thursday November 10, 2016 at Pocopson Elementary School.
- The CCAS December meeting will not be on our regular meeting night. Don and Barb Knabb have again graciously invited the club to a holiday party at their home on December 17, 2016.

*(Continued on page 11)*

## January 2017 CCAS Meeting Agenda

*by Dave Hockenberry, CCAS Program Chair*

Our next meeting will be held on January 10, 2017, starting at 7:30 p.m. The meeting will be held in Room 112, Merion Science Center (former Boucher Building), West Chester University. Our guest speaker will be Phil Rossomando from the Planetary Society.

In February, John Conrad, NASA Solar System Ambassador, will present "Cassini-Huygens to Saturn and Titan." For our March meeting, Gordon Richards, PhD from Drexel University will present "The LSST and Upcoming Discoveries." In April, CCAS Member Denis O'Leary will be our featured speaker. For our meeting in May, Ed Guinan, PhD, from Villanova University will present "Proxima Centauri B – Is Anybody Home at our Closest Star?"

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 spring 2017 season. If you are interested in presenting, or know someone who would like to participate, please contact me at programs@ccas.us.

## Sudden Ionospheric Disturbance (SID) - Further Clarifications and Future Direction

*by CCAS Member Frank Angelini, Sr.*

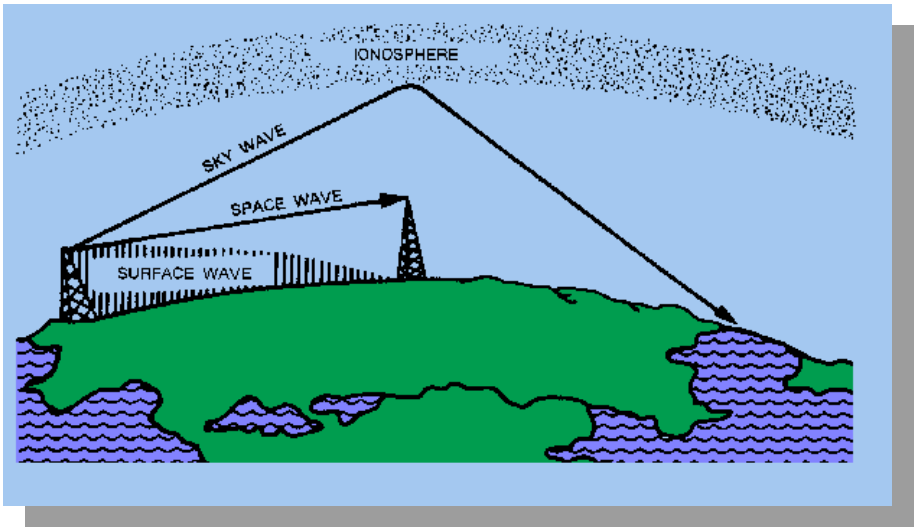



*Figure 1. Graphic Showing Effect of Ions on Radio Waves*

I had the privilege of presenting my SID activities and findings to our society members at the October meeting. Following my presentation, several interesting questions were asked, and although I did my best to answer most of them, a few required further consideration and a bit of research. There never is enough time to thoroughly explore a complex concept in one hour. The purpose of this article is to clarify the SID Monitor concept and offer some insight into the purpose, value and direction of this interesting branch of solar science.

*Q. So how did SID get started?*
A. The initial concept for a concentrated study of the earth and surrounding space goes back to 1957, when over 60,000 scientists from 67 countries organized the first International Geophysical Year (IGY1957). IGY1957 produced many new discoveries such as the Van Allen Radiation Belts, and developed many new concepts such as the magnetosphere and sun storms. Although the Sun was known to be active, not much was understood about how this activity might affect the planet or its inhabitants.

I remember that time like it was yesterday. I was 10 years old, had a burning interest in anything science and was about to be introduced to astronomy by building and observing the heavens through my first telescope, a kit purchased by my parents from Edmund Scientific. The newspapers and magazines of the day were filled with stories about space, rockets, astronauts, and why it was important for us to catch up with the Russians. Little did I realize that my interest in astronomy would continue to provide a challenge and pleasure to me nearly 60 years later.

Some fifty years following IGY1957, the International Heliophysical Year (IHY 2007) attracted scientists and engineers to reaffirm the effort of their predecessors, but this time with a focus specifically on the Sun and its effect on our planet. Following the challenges that IHY 2007 identified, Deborah Scherrer at Stanford took the lead in the US. As education director at the Stanford Solar Center, Dr. Scherrer started a Stanford university project to design, build and distribute instruments to monitor the Sun's impact on the ionosphere, an electrically charged layer 50 miles above the Earth. She and her sponsors began to distribute SID monitors to underprivileged students in the US and many developing countries.

*Q. How does Stanford's Solar Center reach out to the public and encourage this activity?*

A. The Stanford Solar Center is all about education. They are the education and public outreach arm of the Solar Observatories Group.

*Q. How is this project funded?*

A. The Stanford Solar Center is funded by NASA, the National Science Foundation and Stanford University and provides resources, activities, and projects for teachers, students, and the public.

*Q. Who can participate in these programs?*

A. These programs target 4th through 12th grade students and science teachers. They cover a broad range of information relating to the Sun, including solar art, folklore, music, literature, and archaeo-astronomy.

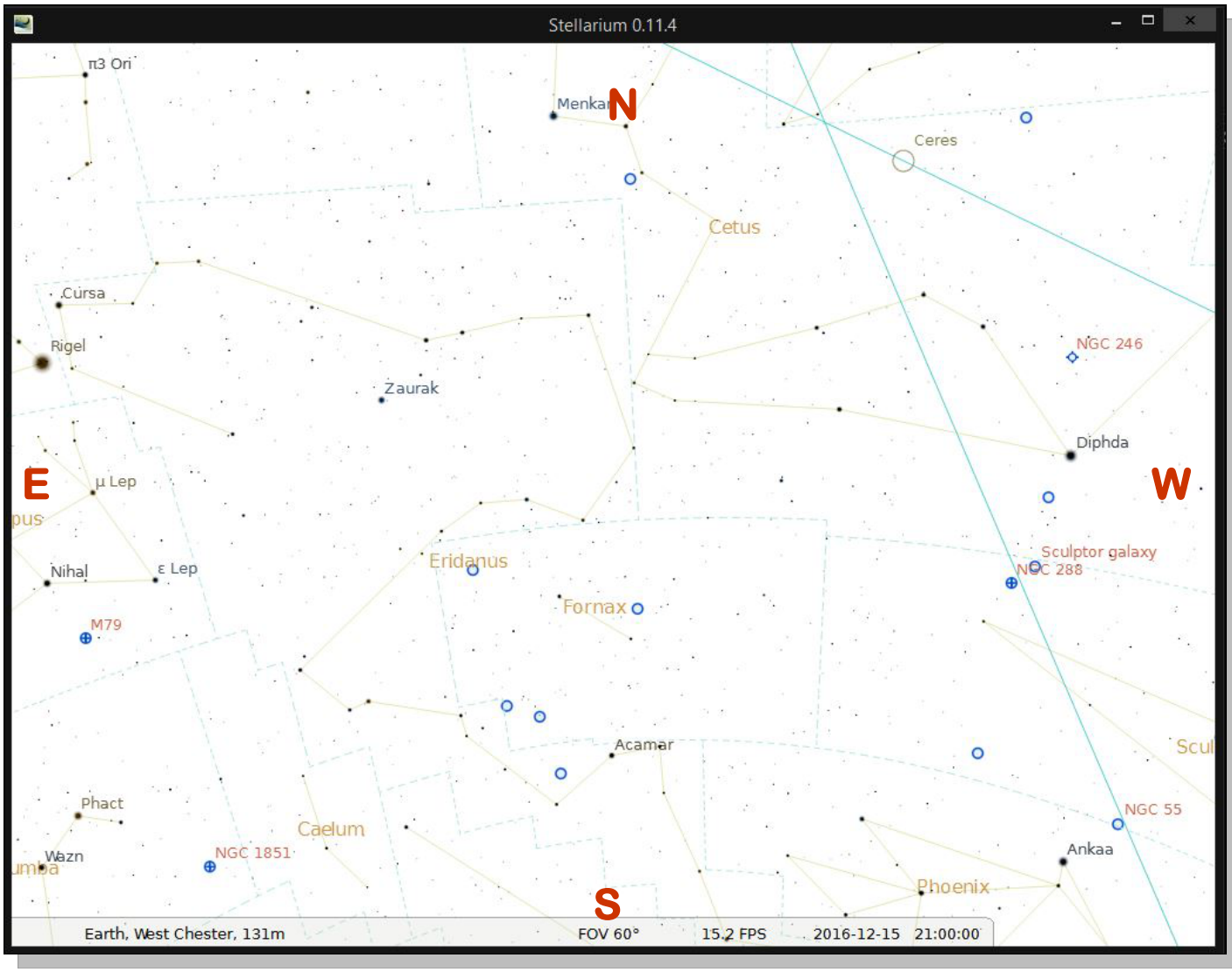
*Q. How do these monitors work?*

*(Continued on page 8)*

# The Sky Over Chester County

December 15, 2016 at 9:00 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 |
|---|---|---|---|---|---|
| 12/01/2016 | 6:34 a.m. EST | 7:04 a.m. EST | 4:36 p.m. EST | 5:06 p.m. EST | 9h 32m 19s |
| 12/15/2016 | 6:45 a.m. EST | 7:16 a.m. EST | 4:37 p.m. EST | 5:07 p.m. EST | 9h 21m 02s |
| 12/31/2016 | 6:52 a.m. EST | 7:22 a.m. EST | 4:46 p.m. EST | 5:16 p.m. EST | 9h 23m 24s |

| Moon Phases | | | | | |
|---|---|---|---|---|---|
| First Quarter | 12/07/2016 | 4:03 a.m. EST | Full Moon | 12/13/2016 | 7:05 p.m. EST |
| Last Quarter | 12/20/2016 | 8:55 p.m. EST | New Moon | 12/29/2016 | 1:53 a.m. EST |

**December 2016 Observing Highlights**
*by Don Knabb, CCAS Treasurer & Observing Chair*

| | |
|---|---|
| **2** | **The crescent Moon is near Venus** |
| **4** | **The crescent Moon is near Mars** |
| **7** | **First quarter Moon, 4:03 a.m.** |
| **12** | **The Moon occults Aldebaran, gamma and theta Tau** |
| **13** | **The Geminid meteor shower peaks tonight** |
| **13** | **Full Moon, the Long Night's Moon, 7:05 p.m.** |
| **20** | **Last Quarter Moon, 8:55 p.m.** |
| **21** | **Winter solstice, 5:44 a.m.** |
| **22** | **The Ursid meteor shower peaks** |
| **29** | **New Moon, 1:53 a.m.** |
| **29** | **Look for the 14-hour old Moon just after sunset – a difficult challenge!** |

**The best sights this month:** Mars, Venus and Mercury are all visible in the hours just after sunset during the first half of December. On the night of December 12th/13th the nearly Full Moon occults three stars in Taurus the Bull and then the Geminid meteor shower reaches its peak the next evening, although all but the brightest fireballs will be overpowered by the Moon.

**Mercury:** The first two weeks of December provide a good observing opportunity for Mercury. The planet closest to our Sun reaches its greatest elongation on December 10th, so a few days before and after that date will be best for finding Mercury low in the west as the glow of the sunset fades.

**Venus:** Our sister planet shines brightly in the glow of the sunset and for several hours after it is dark. It reaches magnitude -4.4 during December, and nothing other than the Moon rivals it in the night sky!

**Mars:** The red planet is visible all month, to the left and above Venus. It is still obvious as a red "star" among the background stars, but Venus shines about 100 times as bright.

**Jupiter:** Jupiter rises during the "wee small hours" and crosses the meridian near dawn at the end of the month.

**Saturn:** The ringed planet passes behind the Sun on December 10th so it is not visible for most of the month, emerging from the glow of sunrise at month's end.

**Uranus and Neptune:** Both gas giants can be viewed a few hours after sunset. The first quarter Moon occults Neptune on the night of December 6th. A sky map can be found at the Sky and Telescope magazine website to help you locate these distant planets.

**The Moon:** Full Moon occurs on December 13th. This full Moon is often referred to as the Full Long Night's Moon; or the Full Cold Moon. It is also sometimes called the Moon before Yule. The term Long Night's 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.

**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

*(Continued on page 7)*

## Through the Eyepiece: Messier 52, an Open Cluster in Cassiopeia

*by Don Knabb, CCAS Treasurer & Observing Chair*

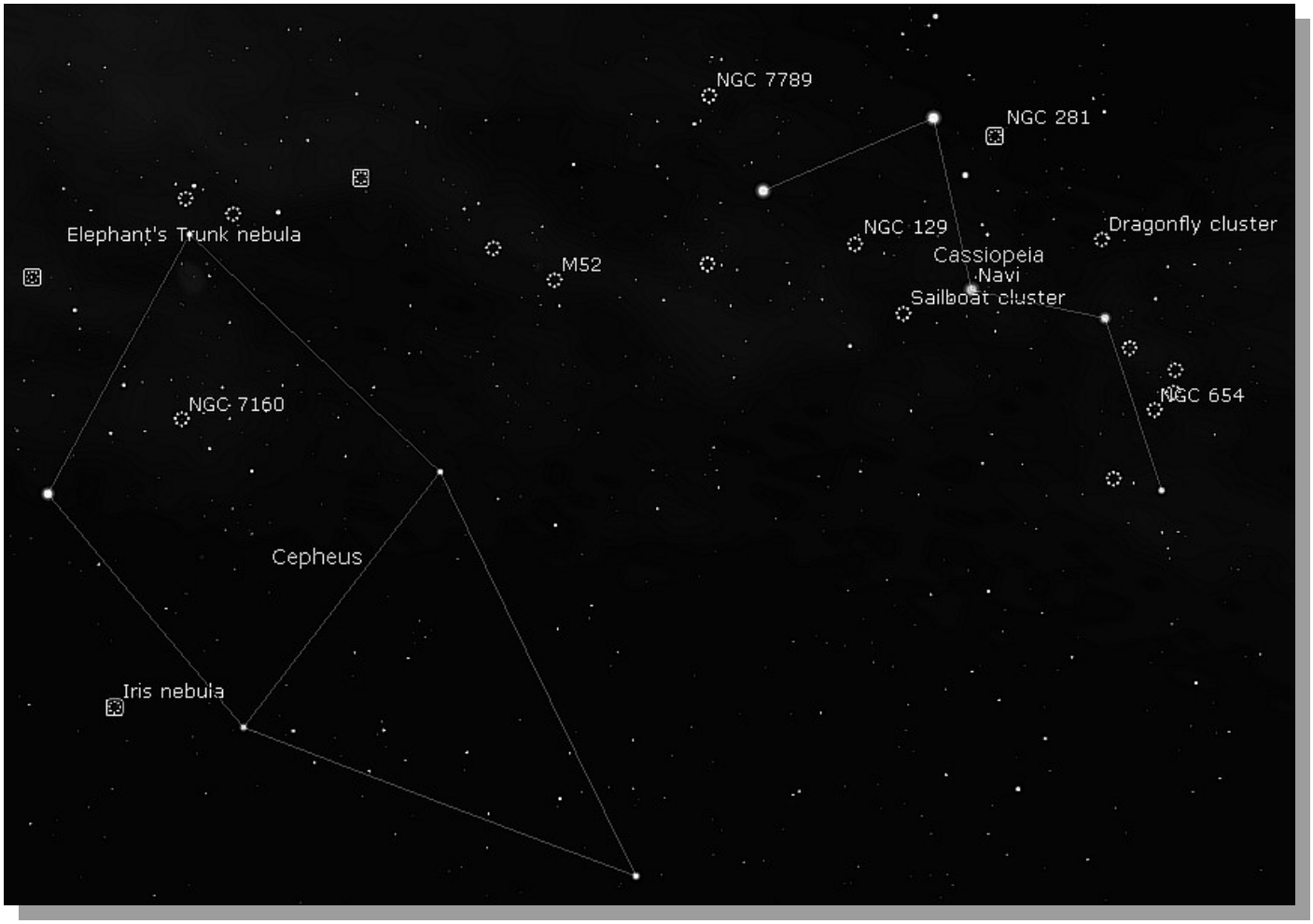



*Image credit: Sky map made with Stellarium planetarium software*

As I am chasing down Messier objects in pursuit of the Astronomical League I am seeing many objects that I have never previously gazed upon. One of the objects that is a delight in the eyepiece is M52, a large open cluster in the constellation Cassiopeia.

Close to the zenith during December we find the constellation Cassiopeia, the large "W" shape high overhead. Within the boundaries of Cassiopeia is the open cluster Messier 52. You can find M52 using this star chart.

Messier 52, also designated NGC 7654, is located in a rich Milky Way field. Nearly 200 stars have been identified as part of this cluster which is roughly 5000 light years away and 35 million years old.

Terence Dickinson, in his classic book *Nightwatch, a Practical Guide to Viewing the Universe*, compares M52 to the Pleiades, but M52 is much smaller because it is 10 times more distant.

M52 was an original discovery of Charles Messier, captured on the night of September 7, 1774. In his notes he writes: "Cluster of very small stars, mingled with nebulosity, which can be seen only with an achromatic telescope."

Sir William Herschel would also observe M52. He writes on August 29, 1873: "All resolved into innumerable small stars without any suspicion of nebulosity." Herschel's son John would also add it to the General Catalog a few years later with less descriptive narrative, but it was Admiral Smyth who described M52′s beauty best when he said: "An irregular cluster of stars between the head of Cepheus and his daughter's

*(Continued on page 7)*

## Eyepiece (cont'd)

*(Continued from page 6)*

throne; it lies north-west-by-west of Beta Cassiopeiae, and one third of the way towards Alpha Cephei. This object assumes somewhat of a triangular form, with an orange-tinted 8th-mag star at its vertex, giving it the resemblance of a bird with outspread wings."

Although I cannot say that I saw the "bird with outspread wings" I did most certainly see the triangular shape. This is a beautiful collection stars that I enjoy staring at for many minutes.

In binoculars M52 will show clearly as a star cloud and will appear as a hazy patch in a telescope finder scope. Even the smallest of telescopes can expect resolution from this multi-magnitude beauty and the more aperture you apply the more stars you will see. M52 is well suited to urban or light polluted skies and stands up well to fairly moonlit conditions and hazy skies.

*(Continued on page 11)*

## Observing Cont'd)

*(Continued from page 5)*

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

**Comets:** There are no bright comets in the sky during December.

*(Continued on page 11)*

*Image credit: CCAS Member Pete La France*

## Sudden Ionospheric Disturbances (Cont'd)

*(Continued from page 3)*

A. As I explained in my 2014 presentation the principle behind SID monitors is directly related to the way radio waves are affected by the ionosphere. Engineers have known for over 100 years that radio waves are reflected and refracted by charged particles or ions. The Ionosphere acts like a mirror because of these ions distributed throughout this part of the atmosphere (See Figure 1 on pg. 3).

Scientists now understand that the ionosphere is very complex, having several layers. Each of these layers can become ionized by energetic particles of various frequencies as shown in Figure 2.

The ionized particles originate in our Sun. Depending on the time of day, weather and radio frequency, the ionosphere will perturb radio waves. These perturbations can be detected, measured and analyzed (Figure 3).

Figure 4 shows the variation of radio wave intensity versus local time.

During the daytime, when VLF radio is transmitted, the D layer is unable to reflect the waves as the ion density is not sufficient. So the radio waves propagate through the D-layer, where they lose energy and reflect off the E and F layers. At night, the D-layer disappears and only the F layer and sporadic E-layers are present so the signal strength does not decrease as the wave no longer has to travel through the D-layer (Figure 5).

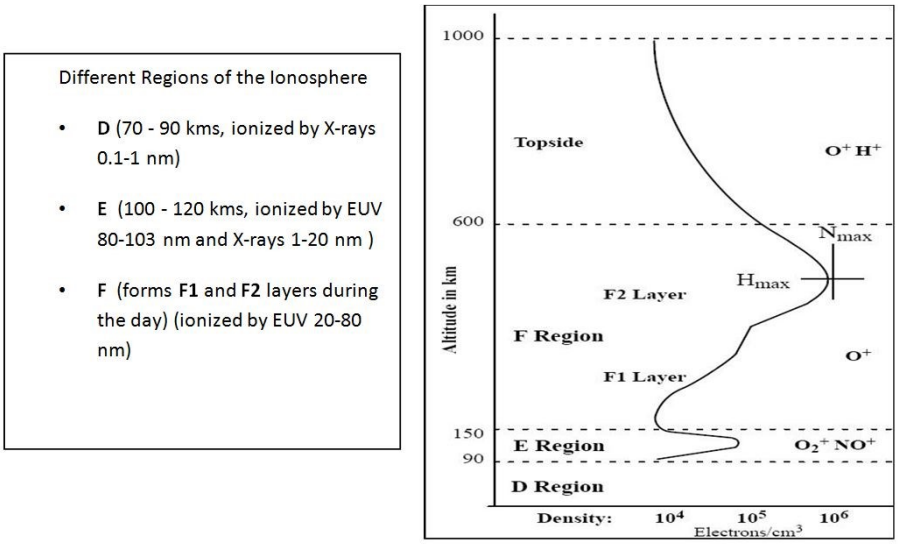



*Figure 2. Ionosphere Regions & Ionization Frequencies*

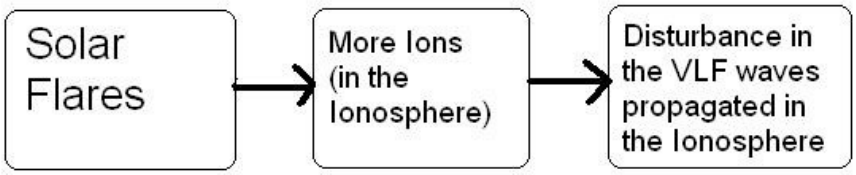



*Figure 3. Solar Flares & Radio Wave Perturbations*

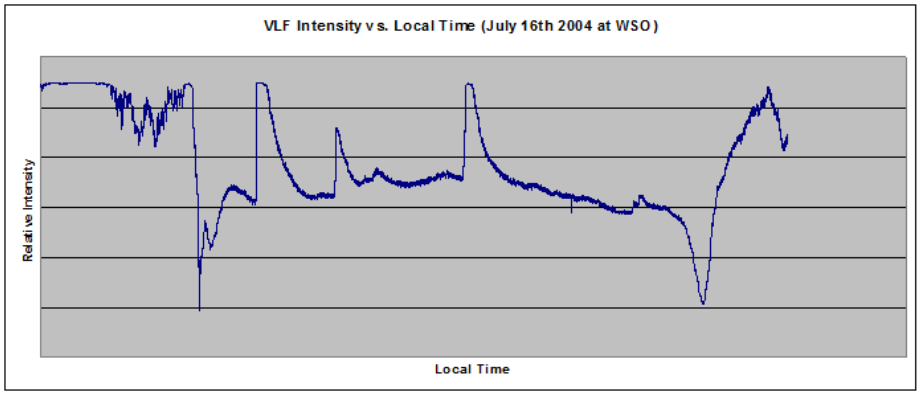



*Figure 4. Radio Wave Intensity vs. Local Time Variation*

During a SID, a highly ionized D-layer forms in the Ionosphere. The ionization is now sufficient to reflect the VLF wave which does not lose energy through an extra ionized layer (Figure 6).

*Q. Can such a simple monitor actually provide useable scientific data?*

A. Since setting up the SID station at my West Chester observatory, I have been able to collect many months of raw data which has been uploaded to Stanford University. These data

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## Sudden Ionospheric Disturbances (Cont'd)

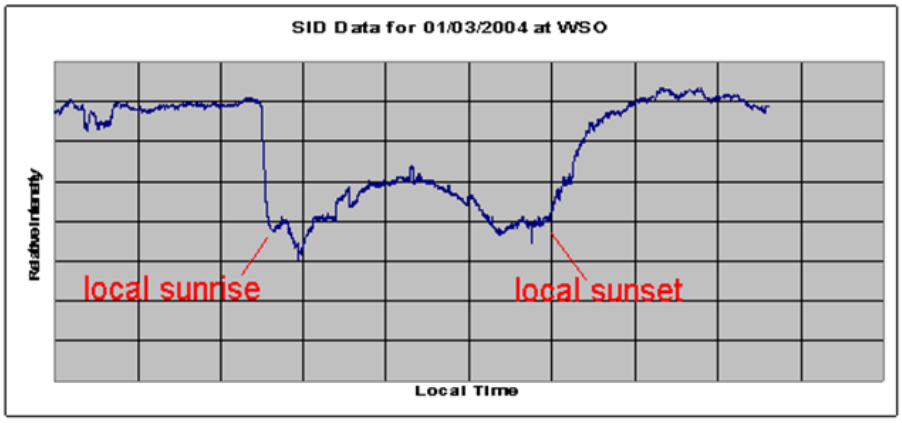



*Figure 5*

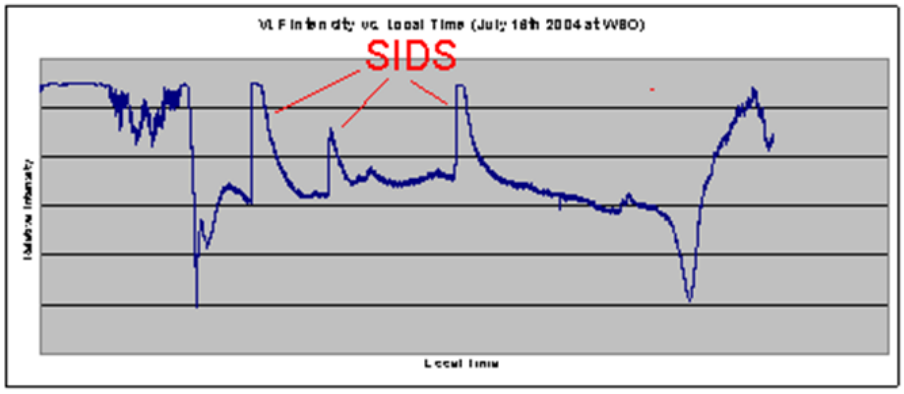



*Figure 6*

*(Continued from page 8)*

have been transformed by Stanford and shared with the worldwide network of over 900 SID stations. The majority of these monitoring stations are run by students and teachers and intended to get students excited about science. However, the data gathered by the SID monitor network is used to augment higher levels of analysis. It is valuable in confirming and clarifying not only the "normal" solar flares and mass ejections but also other types of unusual Ionospheric anomalies affecting radio propagation and even earthquake activity.

Based on their work with SID monitors, a number of students have won awards at science fairs, earned college scholarships and even gone on to careers in science.

## CCAS Original Astrophotography

*by Dave Hockenberry, CCAS Program Chair*

NGC 1624, a small open cluster with associated nebulosity in Perseus. Image taken with Hyperion 12.5" telescope on an AP 1200 mount. Image capture with QSI583wsg camera and MaxIm DL. Guiding with SX Lodestar X2 camera off-axis and SX AO active optics. Images acquired over several nights from 9/6/16 through 11/14/16. Subexposures through AstroDon Gen 2 filters 24 x 10 minute Red, 9 X 10 minute Blue, 13 X 10 minute Green, and 6 X 30 minutes H-alpha. Subexposures calibrated, stacked, False Lum creation from RGB data and deconvolution in CCDStack. False Lum-Ha merge and combination/adjustments in Photoshop CS5. NGC1624 lies about 20,000 light years distant from us and is sometimes referred to as the "Little Cocoon" nebula because of the similarity in appearance. NGC1624 hosts a large star NGC1624 -2, about 35 times our sun's mass, that holds the record for the most powerful magnetic field known around any star (excluding magnetars and other non-stellar objects like black holes).

## Dimming Stars, Erupting Plasma, and Beautiful Nebulae

*by Marcus Woo*

Boasting intricate patterns and translucent colors, planetary nebulae are among the most beautiful sights in the universe. How they got their shapes is complicated, but astronomers think they've solved part of the mystery—with giant blobs of plasma shooting through space at half a million miles per hour.

Planetary nebulae are shells of gas and dust blown off from a dying, giant star. Most nebulae aren't spherical, but can have multiple lobes extending from opposite sides—possibly generated by powerful jets erupting from the star.

Using the Hubble Space Telescope, astronomers discovered blobs of plasma that could form some of these lobes. "We're quite excited about this," says Raghvendra Sahai, an astronomer at NASA's Jet Propulsion Laboratory. "Nobody has really been able to come up with a good argument for why we have multipolar nebulae."

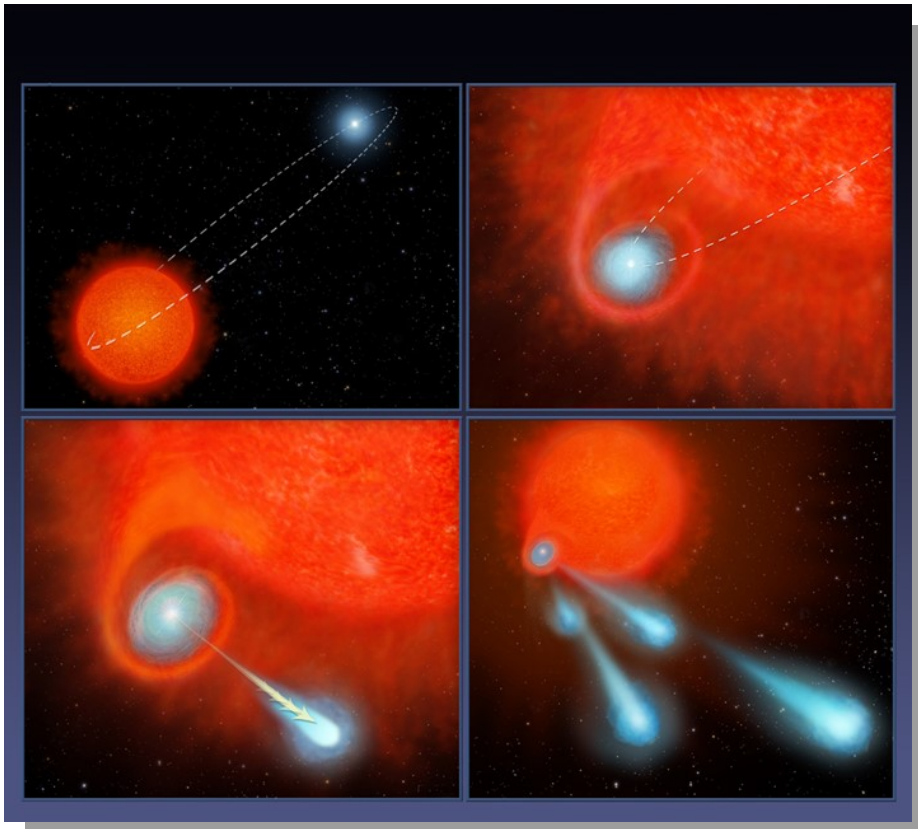
Sahai and his team discovered blobs launching from a red giant star 1,200 light years away, called V Hydrae. The plasma is 17,000 degrees Fahrenheit and spans 40 astronomical units—roughly the distance between the sun and Pluto. The blobs don't erupt continuously, but once every 8.5 years.

The launching pad of these blobs, the researchers propose, is a smaller, unseen star orbiting V Hydrae. The highly elliptical orbit brings the companion star through the outer layers of the red giant at closest approach. The companion's gravity pulls plasma from the red giant. The material settles into a disk as it spirals into the companion star, whose magnetic field channels the plasma out from its poles, hurling it into space. This happens once per orbit—every 8.5 years—at closest approach.

When the red giant exhausts its fuel, it will shrink and get very hot, producing ultraviolet radiation that will excite the shell of gas blown off from it in the past. This shell, with cavities carved in it by the cannon-balls that continue to be launched every 8.5 years, will thus become visible as a beautiful bipolar or multipolar planetary nebula.

The astronomers also discovered that the companion's disk appears to wobble, flinging the cannonballs in one direction during one orbit, and a slightly different one in the next. As a result, every other orbit, the flying blobs block starlight from the red giant, which explains why V Hydrae dims every 17 years. For decades, amateur astronomers have been monitoring this variability, making V Hydrae one of the most well-studied stars.

*(Continued on page 12)*



*This four-panel graphic illustrates how the binary-star system V Hydrae is launching balls of plasma into space.*
*Image credit: NASA/ESA/STScI*

## Minutes (Cont'd)

*(Continued from page 2)*

- David Hockenberry, program chair, announced that Bea Mazziotti is celebrating her birthday with us tonight. We all wish her a happy birthday.

- Tonight's program was presented by Don Knabb our club member and observing chair. Don presented "Understanding the Universe - From Atoms to Galaxies and beyond." Everyone enjoyed the visual aids provided by Don and Barb on understanding the scale of the universe.

## Eyepiece (Cont'd)

*(Continued from page 7)*

As you can see in CCAS member Pete LaFrance's photo on page 7, M52 will fill your eyepiece with stars!

Information credits:

Pasachoff, Jay M. 2000. *A Field Guide to the Stars and Planets.* New York, NY. Houghton Mifflin.

Dickinson, Terence. 2006. *Nightwatch, a Practical Guide to Viewing the Universe.* Buffalo, NY. Firefly Books

http://www.universetoday.com/36015/messier-52/

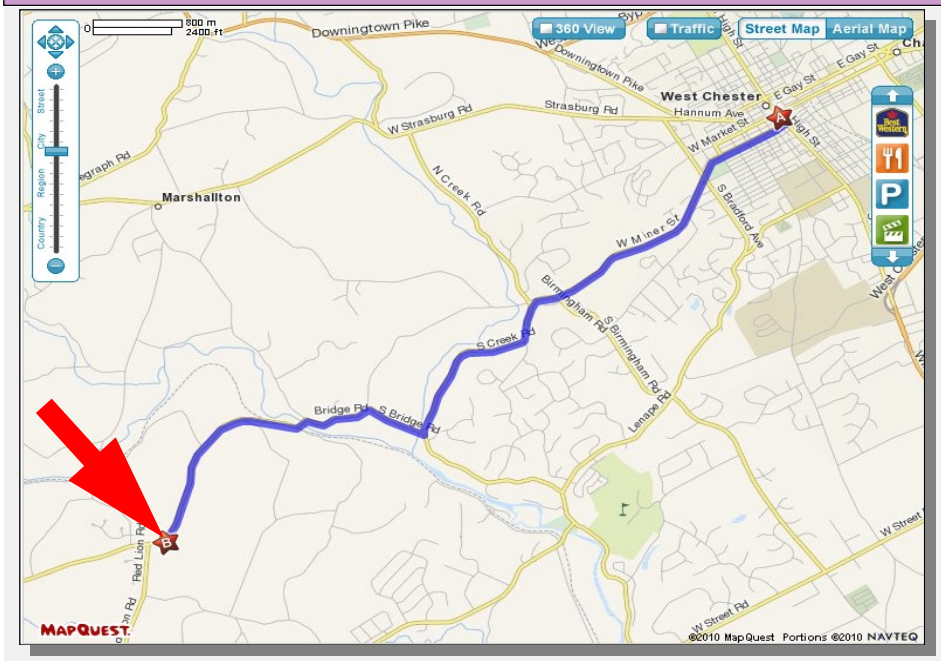
## Observing (Cont'd)

*(Continued from page 7)*

**Meteor showers:** The Geminid meteor peaks on the night of December 13/14, but the show will be hampered by the Full Moon. Still, look early and you might catch a few "Earth-grazers".

You can also look for a lesser known event, the Ursid meteor shower, on the night of December 21/22. The radiant for this shower is near Ursa Minor, so it never goes below the horizon. This shower normally produces only 10 meteors per hour, but it has spiked to 5 times that rate, so it is certainly worth a look.

## *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.

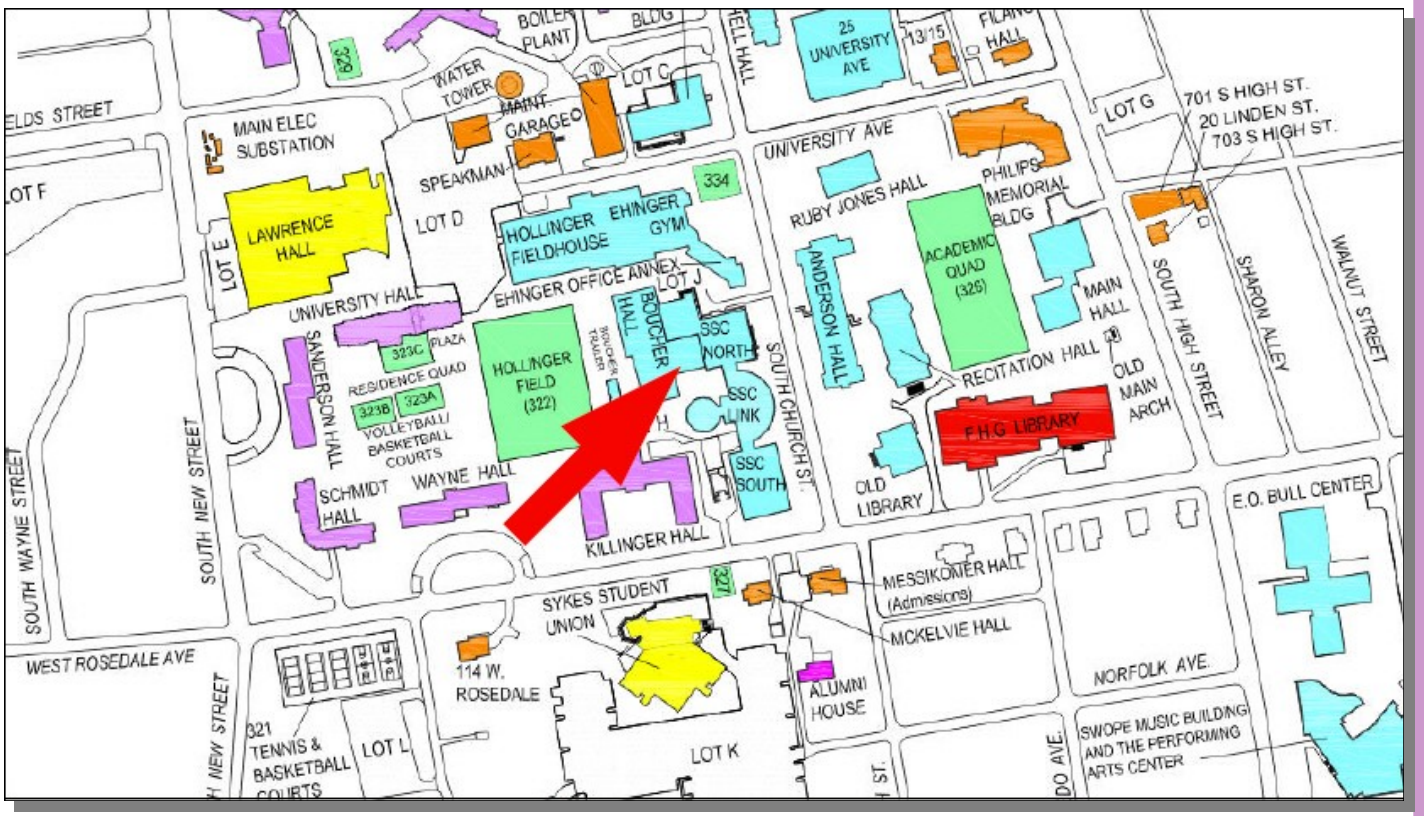
To get to the Myrick Conservation Center from West Chester, go south on High Street in West Chester past the Courthouse. At the next traffic light, turn right on Miner Street, which is also PA Rt. 842. Follow Rt. 842 for about 6 miles. To get to the observing site at the BRC property, turn left off Route 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).




## Space Place (Cont'd)

*(Continued from page 10)*

Because the star fires plasma in the same few directions repeatedly, the blobs would create multiple lobes in the nebula—and a pretty sight for future astronomers.

If you'd like to teach kids about how our sun compares to other stars, please visit the NASA Space Place: http://spaceplace.nasa.gov/sun-compare/en/

*This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!*

## *CCAS Membership Information and Society Financials*

### Treasurer's Report
*by Don Knabb*

**Nov. 2016 Financial Summary**

| | |
|---|---|
| Beginning Balance | $2,009 |
| Deposits | $30 |
| Disbursements | $701 |
| Ending Balance | $1,338 |

### New Member Welcome!

Welcome new CCAS member Alex Kozik from Woodlyn, 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

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:

**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 John Hepler, the newsletter editor, at: **newsletter@ccas.us**.

## CCAS Website

John Hepler is the Society's Webmaster. You can check out our Website at:
**http://www.ccas.us**

John 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 John 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<br>610-430-7768 |
| **Vice President:** | Liz Smith<br>610-842-1719 |
| **ALCor, Observing, and Treasurer:** | Don Knabb<br>610-436-5702 |
| **Secretary:** | Ann Miller<br>610-558-4248 |
| **Librarian:** | Barb Knabb<br>610-436-5702 |
| **Program:** | Dave Hockenberry<br>610-558-4248 |
| **Education:** | Kathy Buczynski<br>610-436-0821 |
| **Webmaster and Newsletter:** | John Hepler<br>410-639-4329 |
| **Public Relations:** | Deb Goldader<br>610-304-5303 |

## 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.**