



# Observations

A Monthly Publication Of The  
CHESTER COUNTY ASTRONOMICAL SOCIETY

Vol. 27, No. 5 **Three-Time Winner of the Astronomical League's Mabel Sterns Award** ☼ 2006, 2009 & 2016

May 2019

## In This Issue

|                                  |       |
|----------------------------------|-------|
| CCAS Spring Events.....          | 2     |
| April 2019 Meeting Minutes.....  | 2     |
| May 2019 Meeting Agenda.....     | 2     |
| First Image of a Black Hole..... | 3     |
| The Sky Over Chester County:     |       |
| May 2019.....                    | 4     |
| May 2019 Observing               |       |
| Highlights.....                  | 5     |
| Through the Eyepiece:            |       |
| M100 in Coma Berenices.....      | 6     |
| NASA Night Sky Network.....      | 8     |
| CCAS Directions:                 |       |
| Brandywine Red Clay              |       |
| Alliance.....                    | 9     |
| Membership Renewals.....         | 10    |
| New Member Welcome.....          | 10    |
| CCAS Directions:                 |       |
| WCU Map.....                     | 10    |
| Treasurer's Report.....          | 10    |
| CCAS Information                 |       |
| Directory.....                   | 11-12 |

## M100 in Coma Berenices



Image courtesy of CCAS President Dave Hockenberry. For more about M100, see pg. 6

## Membership Renewals Due

|         |   |
|---------|---|
| 05/2019 | Cunningham<br>Hertweck<br>Klapholz<br>La France<br>O'Hara   |
| 06/2019 | Crabb<br>Hanspal<br>Harris<br>Hebding<br>Mazziotta & Calobrisi<br>McCausland<br>Poley<br>Sigler-Quick<br>Thomas |
| 07/2019 | Hockenberry & Miller<br>Hunsinger<br>Johnston   |

## May 2019 Dates

- 4th** • New Moon, 6:45 p.m. EDT
- 5th-6th** • The Eta Aquariid meteor shower peaks
- 10th** • The Moon is in M44, The Beehive Cluster
- 11th** • First Quarter Moon, 9:12 p.m. EDT, and International Astronomy Day
- 12th** • The Lunar Straight Wall is visible
- 18th** • Full Moon, the Full Flower Moon or the Frog Croaking Moon, 5:11 p.m. EDT
- 25th** • Last Quarter Moon, 12:33 p.m. EDT



## CCAS Upcoming Nights Out

In addition to our monthly observing sessions at the Myrick Conservancy Center, BRC (see pg. 2), 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, May 11, 2019** - CCAS Special Observing Session at Anson Nixon Park, Kennett Square, PA. The observing session is from 8:00 p.m. to 9:30 p.m.
- ☼ **Saturday, May 25, 2019** - CCAS Special Observing Session at Welkinweir, Pottstown, PA. The observing session starts at sunset.
- ☼ **Saturday, June 8, 2019** - CCAS Special Observing Session at Bucktoe Creek Preserve, Avondale, PA, from 8:30 to 10:00 p.m. The event is open to be public but registration for non-CCAS members is required through The Land Conservancy for Southern Chester County website.

## Spring Society Events

### May 2019

**9th-10th** • The von Kármán Lecture Series: [Cubesats](#), at the Jet Propulsion Laboratory, Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

**10th** • CCAS monthly observing session at Myrick Conservancy Center, BRC. The observation session starts at dusk.

**10th** • [National Astronomy Day](#). CCAS Special Observing Session at [Anson Nixon Park](#), Kennett Square, PA. The observing session is from 8:00 p.m. to 9:30 p.m.

**14th** • CCAS monthly meeting in Room 113, Merion Science Center, WCU. Meet & Greet over coffee and refreshments from 7:10 to 7:30 p.m. The meeting starts at 7:30 p.m. Guest Speaker: Dr. Chris D'Andrea, "Supernovae: Going Out with a Bang."

**20th** • Open call for articles and photographs for the June 2019 edition of [Observations](#).

**25th** • CCAS Special Observing Session at [Welkinweir](#), Pottstown, PA. The observing session starts at sunset.

**26th** • Deadline for newsletter submissions for the June 2019 edition of [Observations](#).

**30th** • [Cherry Springs Star Party](#), Coudersport, PA. Through Sunday, June 2nd.

### June 2019

**30th** • End of [Cherry Springs Star Party](#), Coudersport, PA.

**7th** • CCAS Monthly Observing Session, Myrick Conservancy Center, BRC. The observing session starts at sunset.

**8th** • CCAS Special Observing Session at Bucktoe Creek Preserve, Avondale, PA, from 8:30 to 10:00 p.m. The event is open to be public but registration for non-CCAS members is required through The Land Conservancy for Southern Chester County website. A small fee is required by The Land Conservancy of Southern Chester County to attend this event.

**20th-21st** • The von Kármán Lecture Series: [Such Stuff as Dreams are Made On—Designing Tomorrow's Space Missions Today](#), at the Jet Propulsion Laboratory, Jet Propulsion Laboratory, Pasadena, California. Live stream of free lecture presented by NASA & Caltech.

**20th** • Open call for articles and photographs for the July 2019 edition of [Observations](#).

**26th** • Deadline for newsletter submissions for the July 2019 edition of [Observations](#).

## CCAS Monthly Meeting Minutes

by *Bea Mazziotta*, CCAS Secretary

- The April 9, 2019, meeting was held in the WCU Mather Planetarium. After a meet and greet (with donuts!) in an adjacent room, Club President Dave Hockenberry invited the 21 attendees and members into the planetarium.
  - He announced that Stella Bentley had been awarded a Night Sky Network certificate for her exceptional outreach efforts.
  - He also announced that Bruce Ruggeri would take over Program Chair duties effective immediately.
- The monthly night sky overview was dispensed with and Dave introduced the evening's speaker, Dr. Marc Gagné. Dr. Gagné is a professor of astronomy at WCU.
  - He teaches introductory through graduate classes, has a PhD in physics, and has recently published an on-line textbook to complement his Galaxies and Cosmology course.
  - Dr. Gagné's presentation focused on Super Novae, Black Holes, and Neutron Stars. The program started with stunning photos of the universe that were projected on the planetarium dome.
  - Dr. Gagné then discussed how super novae create black holes and neutron stars and spread organic molecules throughout the universe.
  - He also discussed how advanced technology, such as EHT and LIGO, is greatly enhancing our understanding of the cosmos.
  - In closing, he spoke of an upcoming live feed from the Event Horizon Telescope team that promised to announce a major astronomical breakthrough.
  - That live feed, broadcast on 4/10/19, released the first actual photograph of a black hole.

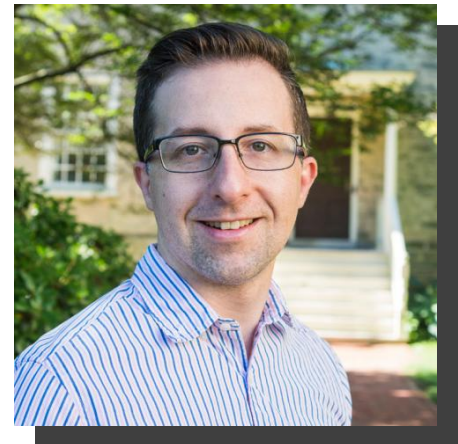
## May 2019 CCAS Meeting Agenda

by *Bruce Ruggeri*, CCAS Program Chair

Our next meeting will be held on May 14, 2019, starting at 7:30 p.m. The meeting will be held in Room 113, Merion Science Center (former Boucher Building), West Chester University. Our guest speaker is Dr. Chris D'Andrea, astronomy professor at Haverford College. He will be presenting a talk entitled, "Supernovae: Going Out with a Bang."

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

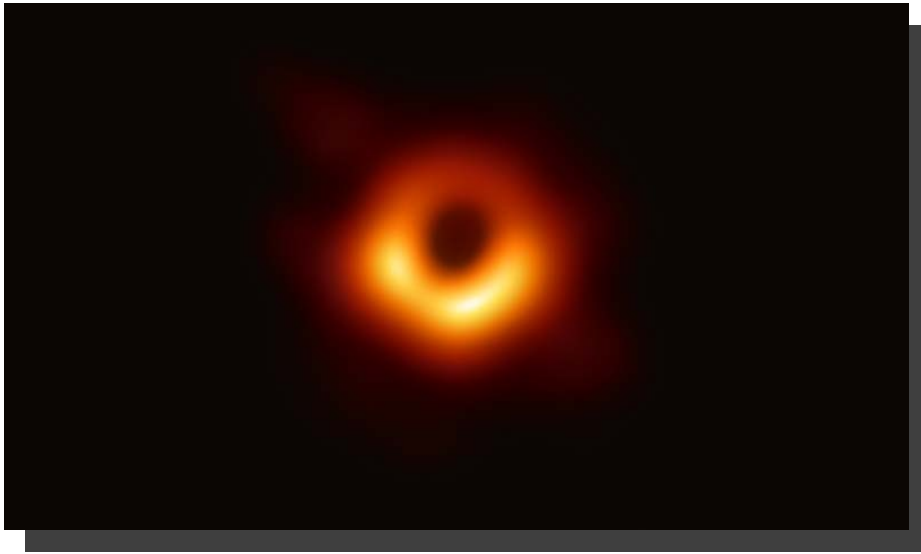


*Dr. Chris D'Andrea  
Haverford College*

looking for presenters for our 2019-2020 season. If you are interested in presenting, or know someone who would like to participate, please contact me at [programs@ccas.us](mailto:programs@ccas.us).

## Event Horizon Telescope Release's Humanity's First Ever Black Hole Image

by Korey Haynes, *Discover Magazine*



*The first ever image of a black hole shows the supermassive black hole at the heart of galaxy M87. (Credit: Event Horizon Telescope)*

On Wednesday, April 10, 2019, astronomers revealed the first image ever taken of a black hole, bringing a dramatic conclusion to a decades-long effort. The iconic image offers humanity its first glimpse at the gas and debris that swirl around its event horizon, the point beyond which material disappears forever. A favorite object of science fiction has finally been made real on screen.

Their target was a nearby galaxy dubbed M87 and its supermassive black hole, which packs the mass of six and half billion suns. Despite its size, the black hole is so far from Earth – 53 million light-years – that capturing the image took a telescope the size of the planet.

This monumental accomplishment was only possible thanks to the Event Horizon Telescope (EHT). The image data was taken back in 2017 but scientists have spent two years piecing it together. That's because EHT is made of up eight independent observatories that are scattered across the globe, cooperating together to act as one enormous

detector. Shep Doleman, director of the EHT, announced at today's press event, "We are delighted to report to you today that we have seen what we thought was unseeable." Researchers made their grand announcement simultaneously in seven different countries this morning, accompanied by a series of scientific papers published at the same time in [The Astrophysical Journal Letters](#).

Black holes are so massive and dense, not even light can escape their pull. They're often referred to as a singularity, or a point source, because they take up zero actual space. But this mysterious singularity is surrounded by the sphere of its event horizon. And anything that travels past it is doomed to fall into the black hole, with no hope of escape. That means the black hole itself is literally dark – it neither reflects nor gives off any light. So there's nothing to photograph, no matter how advanced the technology. In the Event Horizon Telescope's image, it simply appears as a central dark blob, or what astronomers often call the

black hole's "shadow."

Feryal Özel is an astrophysicist at the University of Arizona and an EHT collaborator. She explains the shadow as the black hole absorbing the light around it. The light stems from the hot gas that's swirling around it and gets heated as it falls into the black hole. "So, our telescopes are able to pick up the light as long as it comes not from the immediate vicinity of the black hole, but just outside it," Özel says. "When the light falls into the event horizon, that part is dark in the image. Whether or not shadow is the perfect word, it imprints this darkness on the surrounding emission."

The Event Horizon Telescope's eight partnering observatories are spaced around the world and linked together through a process known as interferometry. And in fact, some of those individual observatories, like the massive Atacama Large Millimeter Array, or ALMA, are themselves interferometers, arrays of telescopes spread across many miles.

April 10th's image is just the first astronomers expect EHT to produce. The observatory's other main target is the black hole at the center of the Milky Way, Sagittarius A\*. While it sits 1,000 times closer than M87, it's also roughly 1,000 times smaller, so it takes the same amount of observing power. But because it's smaller, the material swirling around its event horizon moves much faster, completing one circuit every few minutes, as opposed to a few days to circle M87. "It makes

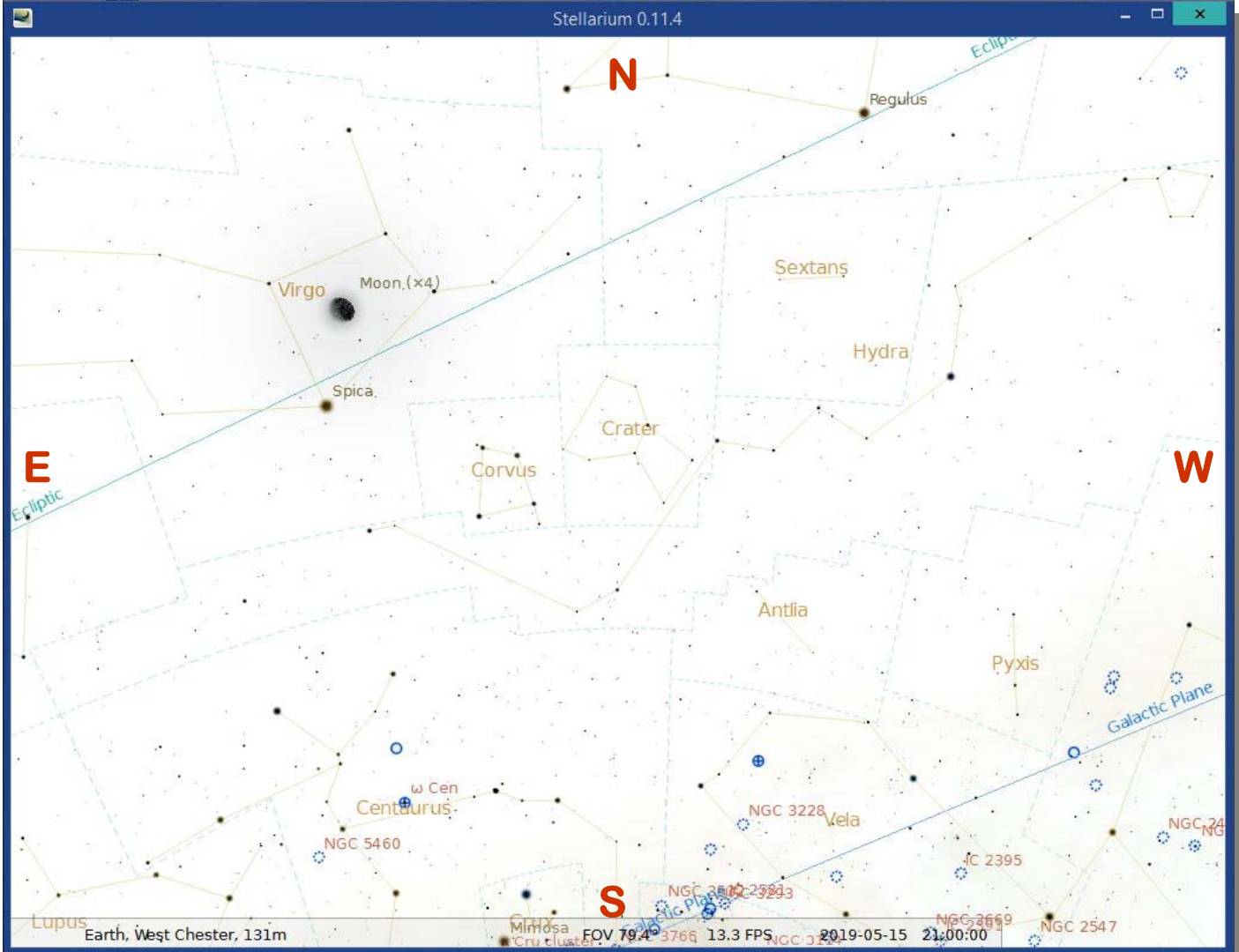
*(Continued on page 10)*



# The Sky Over Chester County

May 15, 2019 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](http://www.stellarium.org).



| Date       | Civil Twilight Begins | Sunrise       | Sunset        | Civil Twilight Ends | Length of Day |
|------------|-----------------------|---------------|---------------|---------------------|---------------|
| 05/01/2019 | 5:31 a.m. EDT         | 6:01 a.m. EDT | 7:55 p.m. EDT | 8:24 p.m. EDT       | 13h 53m 55s   |
| 05/15/2019 | 5:15 a.m. EDT         | 5:45 a.m. EDT | 8:08 p.m. EDT | 8:39 p.m. EDT       | 14h 22m 59s   |
| 05/31/2019 | 5:02 a.m. EDT         | 5:34 a.m. EDT | 8:22 p.m. EDT | 8:54 p.m. EDT       | 14h 47m 46s   |

### Moon Phases

|               |            |                |           |            |               |
|---------------|------------|----------------|-----------|------------|---------------|
| First Quarter | 05/11/2019 | 9:12 p.m. EDT  | New Moon  | 05/04/2019 | 6:45 p.m. EDT |
| Last Quarter  | 05/26/2019 | 12:33 p.m. EDT | Full Moon | 05/18/2019 | 5:11 p.m. EDT |

## May 2019 Observing Highlights

by Don Knabb, CCAS Treasurer & Observing Chair

|     |   |
|-----|---|
| 4   | <b>New Moon, 6:45 p.m. EDT</b>  |
| 5/6 | <b>The Eta Aquariid meteor shower peaks</b>                                     |
| 6   | <b>A thin crescent Moon is near Aldebaran in Taurus</b>                         |
| 10  | <b>The Moon is in M44, The Beehive Cluster</b>                                  |
| 11  | <b>First Quarter Moon, 9:12 p.m. EDT, and International Astronomy Day</b>       |
| 12  | <b>The Lunar Straight Wall is visible</b>                                       |
| 18  | <b>Full Moon, the Full Flower Moon or the Frog Croaking Moon, 5:11 p.m. EDT</b> |
| 25  | <b>Last Quarter Moon, 12:33 p.m. EDT</b>  |
| 28  | <b>Dwarf planet Ceres is at opposition</b>                                      |

**The best sights this month:** Mars is still visible but is fading fast, so enjoy it while we can before it falls behind us and eventually becomes an early morning planet. King Jupiter is well up in the sky around 11:00 by month's end, so gaze at this wonderfully complex planet with its four "dancing" moons. For a deep sky treat, lie back in a beach chair or on a blanket and look for the Coma Star Cluster, a dim patch of speckled gray that is as big as a golf ball held at arm's length. In our skies it is best viewed with binoculars.

**Mercury:** Mercury passes behind the Sun during May and is visible low in the evening sky during the last few days of the month.

**Venus:** Venus rises about an hour before the Sun and shines brightly at magnitude -3.8.

**Mars:** Mars continues to fade and shrink, but is still a nice sight as the sky gets fully dark. Early in May it is hanging between the horns of Taurus the Bull. Around mid-month Mars is close to the open cluster M35.

**Jupiter:** The king of the planets rises 3 hours after sunset at the start of the month but only 40 minutes

after sunset at month's end. It is highest in the sky around 2 or 3 a.m.

**Saturn:** Saturn rises several hours behind Jupiter and is highest in the sky just before dawn.

**Uranus and Neptune:** Neither gas giant is in good viewing position during May.

**The Moon:** The Moon is full on May 18<sup>th</sup>. Native Americans called this the Full Flower Moon. In most areas, flowers are abundant everywhere during this time, thus, the name of this Moon. Other names include the Full Corn Planting Moon, or the Milk Moon. Native Canadians called this The Full Frog Croaking Moon.

**Constellations:** Spring is here, and with it the Big Dipper is high overhead. Follow the arc to bright Arcturus and find Boötes. Just to its left is the Northern Crown, Corona Borealis. Leo is easy to find just after sunset looking due south. And bright Vega in Lyra is rising as the night gets a bit later. Stay out later still and watch Cygnus the Swan fly above the eastern horizon.

**Messier/deep sky:** Would you like to see 500,000 stars at one time? Look nearly overhead during May, to the northwest and not far from Arcturus and find M3, the third object cataloged by Charles Messier. This globular cluster is one of the largest and brightest. Then look about twice as far the other direction from Arcturus and find M5, another fine globular cluster. Under extremely good conditions it is said that both these clusters can be detected with the naked eye. Unfortunately, that will not be possible in the skies of Chester County.

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

**Meteor showers:** The Eta Aquariid meteor shower peaks on the night of May 5/6. This is not expected to be a good show for Northern Hemisphere observers, but unexpected outbursts can happen with any meteor shower, so why not take a look? These meteors are dust left behind by Halley's Comet!

## Through The Eyepiece: M100 in Coma Berenices

by Don Knabb, CCAS Treasurer & Observing Chair

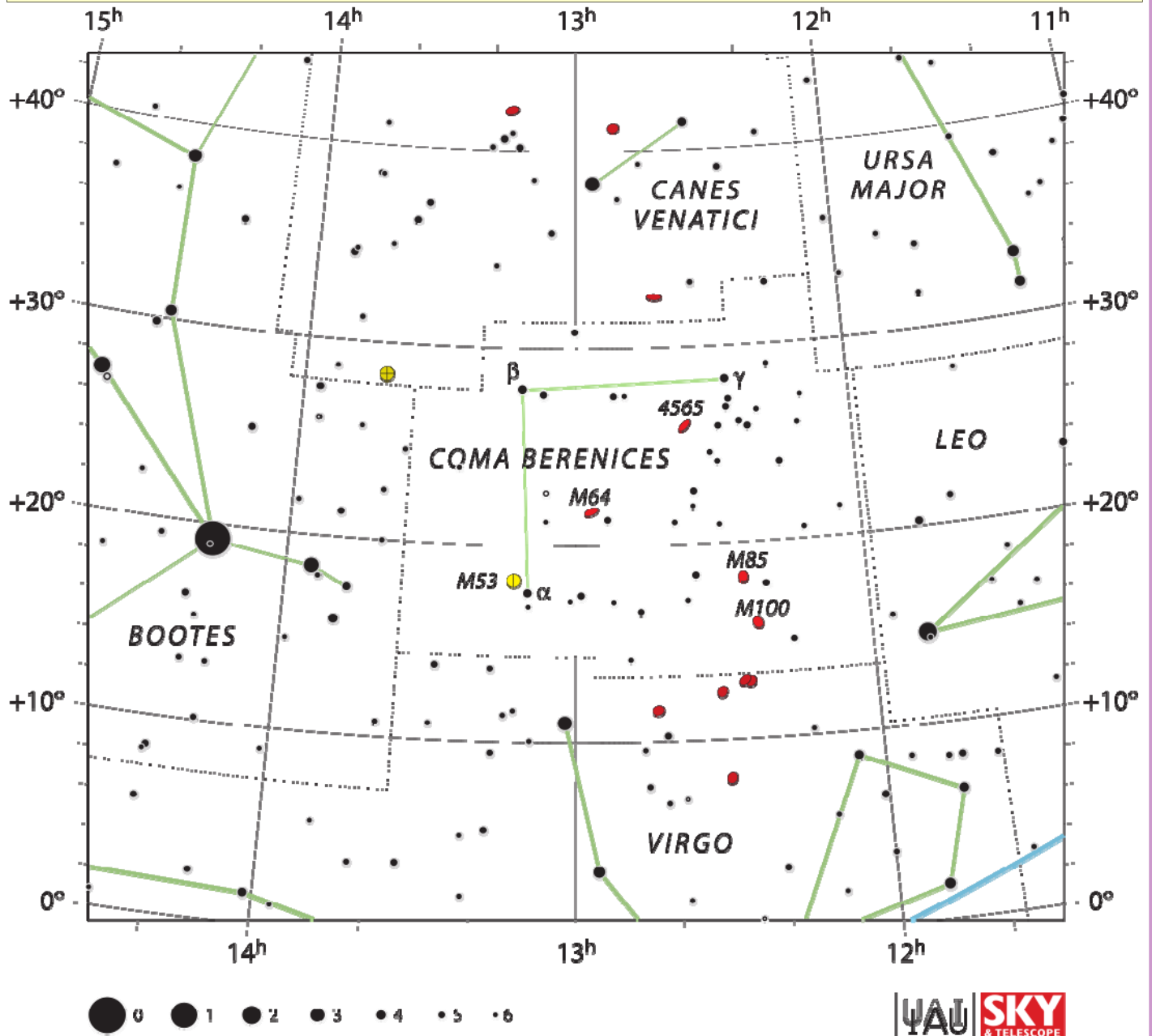


Image credit: IAU and Sky & Telescope magazine (Roger Sinnott & Rick Fienberg)

Messier 100 (also known as NGC 4321) is an example of a grand design intermediate spiral galaxy located within the southern part of the constellation Coma Berenices. It is one of the brightest and largest galaxies in the Virgo Cluster, located approximately 55 million light-years distant from Earth and has a diameter of 167,000 light

years and contains 1 trillion stars, roughly the size of the Milky Way.

Coma Berenices is an ancient asterism in the northern sky which has been defined as one of the 88 modern constellations. It is located between Leo and Boötes. Its name means "Berenice's Hair" in Latin and refers to

Queen Berenice II of Egypt, who sacrificed her long hair as a votive offering. Coma Berenices is the only modern constellation named for a historic person.

Messier 100 is a stunning example of a grand design spiral galaxy, a type of galaxy with prominent and very well-defined spi-

*(Continued on page 7)*

## Eyepiece (Cont'd)



Photo credit: NASA, ESA, STScI and Judy Schmidt

(Continued from page 6)

ral arms as can be seen in the amazing photograph on the front page taken by CCAS president Dave Hockenberry.

M100 was discovered by Pierre Méchain, Charles Messier's fellow comet hunter who discovered eight comets in his lifetime. The discovery was on March 15, 1781 and M100 was subsequently entered in Messier's catalogue of nebulae and star clusters after Charles Messier made observations of his own on April 13, 1781. The galaxy was one of the first spiral galaxies to be discovered, and was listed as one of fourteen spiral nebulae by Lord William Parsons of Rosse in 1850.

After the discovery of M100 by Méchain, Charles Messier made observations of the galaxy depicting it as a nebula without a star. He pointed out that it was difficult to recognize the nebula because of its faintness. William Herschel was able to identify a bright cluster of stars within the nebula during observations he did before John Herschel expanded the findings in 1833.

With the advent of better telescopes, John Herschel was able to see a round, brighter galaxy; however, he also mentioned that it was barely visible through clouds. Admiral William Henry Smyth extended the studies of M100, detailing it as a pearly white nebula and pointing out diffuse spots. It was Admiral Smyth who described it the best: "A round nebula, pearly white, off the upper part of the Virgin's left wing."

The galaxy became famous in the early 1990s with the release of two images of the object taken with Hubble before and after a major repair to the telescope. These three images are of the central region of M100, taken with three generations of cameras that were sequentially swapped out aboard the Hubble Space Telescope, and document the consistently improving capability of the observatory. The image on the left was taken with the Wide Field and Planetary Camera 1 as it was originally installed when Hubble was launched in 1990. The photo is blurry due to a flaw in Hubble's primary mirror. Celestial images

could not be brought into a single focus. The middle image was taken in late 1993 with Wide Field and Planetary Camera 2 that was installed during the December 1993 space shuttle servicing mission. The camera contained corrective optics to compensate for the mirror flaw, and so the galaxy snapped into sharp focus when photographed. The image on the right was taken with a newer instrument, Wide Field Camera 3, that was installed on Hubble during the space shuttle servicing mission in May, 2009.

- Information credits:
- [https://en.wikipedia.org/wiki/Messier\\_100](https://en.wikipedia.org/wiki/Messier_100)
- 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
- <https://www.universetoday.com/49532/messier-100/>



## NASA Night Sky Notes: Watching the Late Spring Skies

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](http://nightsky.jpl.nasa.gov) to find local clubs, events, stargazing info and more.

Late spring brings warmer nights, making it more comfortable to observe a good showing of the **Eta Aquarids** meteor shower. Skywatchers can also look for the delicate **Coma Star Cluster**, and spot the **Moon** on the anniversary of **Apollo 10**'s "test run" prior to the Moon landing in 1969.

The **Eta Aquarids** meteor shower should make a good showing this year, peaking the morning of May 6. This meteor shower has an unusual "soft peak," meaning that many meteors can be spotted several days before and after the 6th; many may find it convenient to schedule meteor watching for the weekend, a night or two before the peak. You may be able to spot a couple dozen meteors an hour from areas with clear dark skies. Meteors can appear in any part of the sky and you don't need any special equipment to view them; just find an area away from lights, lie down on a comfy lawn chair or blanket, relax, and patiently look up. These brief bright streaks are caused by Earth moving through the stream of fine dust particles left by the passage of Comet Halley. While we have to wait another 43 years for the famous comet grace our skies once more, we are treated to this beautiful cosmic postcard every year.

While you're up meteor watch-

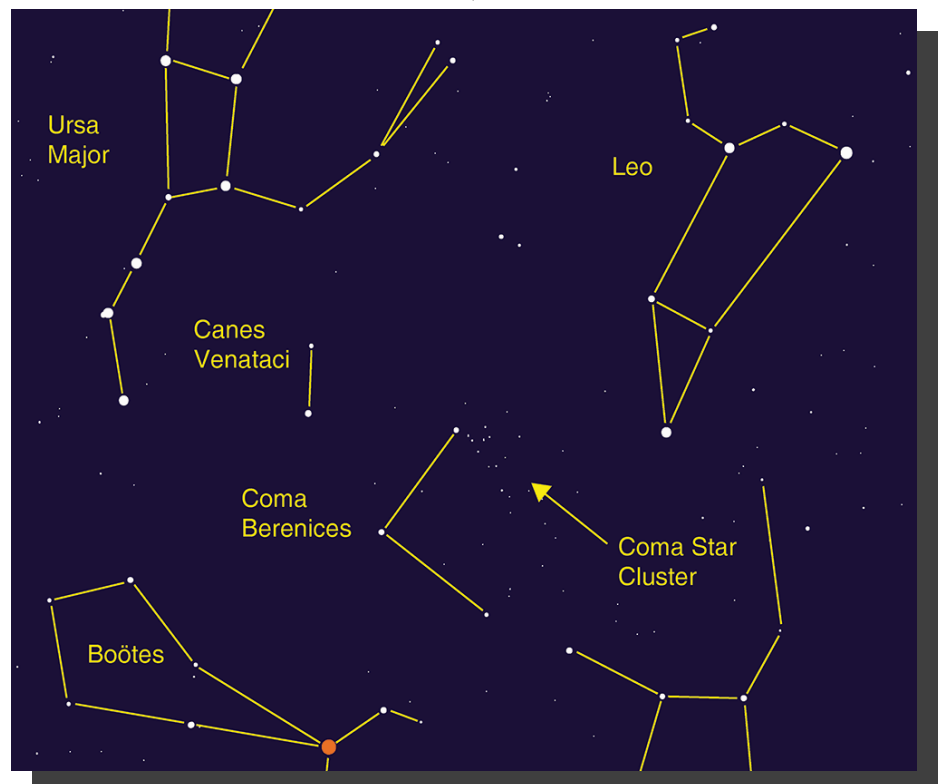


ing, try to find a delightful naked eye star cluster: the **Coma Star Cluster** (aka Melotte 111) in the small constellation of Coma Berenices. It can be spotted after sunset in the east and for almost the entire night during the month of May. Look for it inside the area of the sky roughly framed between the constellations of Leo, Boötes, and Ursa Major. The cluster's sparkly members are also known as "Berenice's

Hair" in honor of Egyptian Queen Berenices II's sacrifice of her lovely tresses. Binoculars will bring out even more stars in this large young cluster.

May marks the 50<sup>th</sup> anniversary of the Lunar Module's test run by the **Apollo 10** mission! On May 22, 1969, NASA astronauts Thomas Safford and Eugene Cernan piloted the Lunar Module - nicknamed "Snoopy" - on a test descent towards the lunar surface. Undocking from "Charlie Brown" - the Command Module, piloted by John Young - they descended to 47,400 feet above the surface of the Moon before returning safely to the orbiting Command Module. Their success paved the way for the first humans to land on the Moon later that year with Apollo 11. Look for the Moon

*(Continued on page 9)*



Try to spot the Coma Star Cluster! Image created with assistance from [Stellarium](http://Stellarium)



## Night Sky Notes (Cont'd)



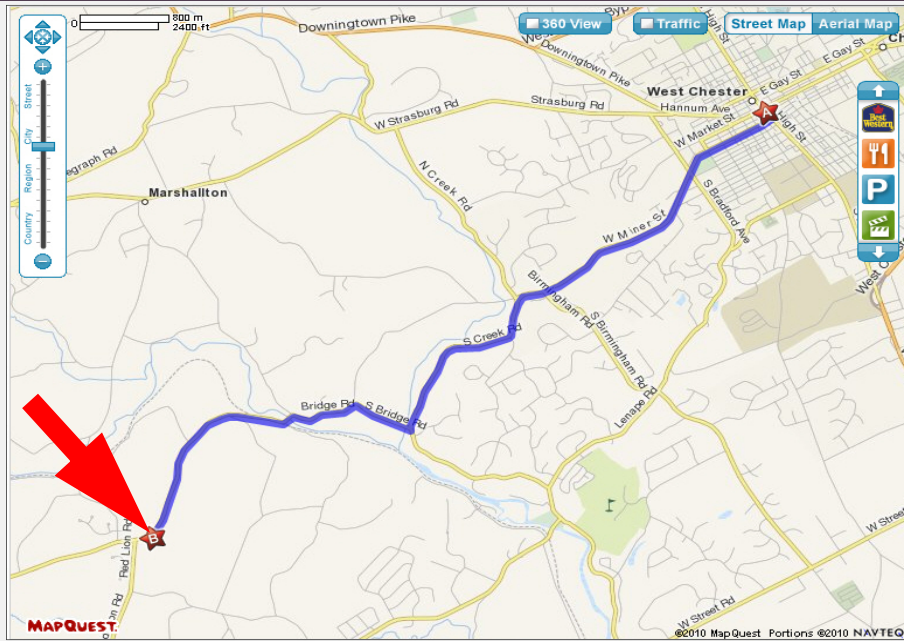
A view of Apollo 10's Lunar Module from the Command Module as it returned from maneuvers above the lunar surface. Photo Credit: NASA Source: <http://bit.ly/apollo10view>

(Continued from page 8)

on the morning of May 22, before or after dawn, and contemplate what it must have felt like to hover mere miles above the lunar surface. You'll also see the bright giant planets Saturn and Jupiter on either side of the Moon before sunrise. When will humans travel to those distant worlds?

You can catch up on all of NASA's current and future missions at [nasa.gov](http://nasa.gov)

## 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).



### Black Hole Image (Cont'd)

(Continued from page 3)

Sagittarius A\* harder,” Özel concedes.

Even more exciting are the repeat images of M87 and other black holes yet to come. By watching how the black hole does or doesn't change with time, astronomers can learn about stable features of the black hole, and watch how material disappears past the event horizon.

[Editor's Note: To learn more about the Event Horizon Telescope and its imaging capabilities, read the [entire article](#) at *Discover magazine*.]

### CCAS Membership Information and Society Financials

#### Treasurer's Report

by Don Knabb

#### April 2019 Financial Summary

|                   |         |
|-------------------|---------|
| Beginning Balance | \$1,188 |
| Deposits          | \$135   |
| Disbursements     | -\$0    |
| Ending Balance    | \$1,323 |

#### New Member Welcome!

Welcome new CCAS members John & Margaret Quinn from Exton, Rangan Aylam & Janet Martin-Alyam from West Chester, and Marilyn Rossomando from Glenmoore, 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.



**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](mailto: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**  
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## 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](mailto: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](mailto: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](mailto: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](mailto:treasurer@ccas.us)

### Sky & Telescope 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**.