



# THE STAR

THE NEWSLETTER OF THE  
MOUNT CUBA ASTRONOMICAL GROUP  
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OUR PROGRAMS ARE HELD THE SECOND TUESDAY OF EACH  
MONTH AT 7:30 P.M. UNLESS INDICATED OTHERWISE  
MOUNT CUBA ASTRONOMICAL OBSERVATORY  
1610 HILLSIDE MILL ROAD  
GREENVILLE DE.  
FOR DIRECTION, PLEASE VISIT  
[www.mountcuba.org](http://www.mountcuba.org)

PLEASE SEND ALL PHOTOS AND ARTICLES TO  
[pestrattonmcag@gmail.com](mailto:pestrattonmcag@gmail.com)

## MARCH MEETING REVIEW

Scott Jackson is the Supervisor for the Science Olympiad Astronomy Phase. He did an excellent job of explaining how he develops each test for the Middle School and High School participants. The Middle School test was based on water in our solar system as well as the identification of various objects found in the solar system as well as outside. So, what did Scott do, he gave us the Middle School test. Needless to say, we were all quite surprised at the level of understanding and knowledge required to do well when taking the test.

Well done Scott for you should be commended for the time and effort you put into the Science Olympiad.

As promised in last months STAR, the top 10 finishers in the Astronomy phase of the Science Olympiad were Wilmington Charter Team 1, Wilmington Charter Team 2, Appoquinimink, Cab Calloway Team 1, Newark, Sanford, Cab Calloway Team 2, Caesar Rodney, Archmere and Sussex Tech. There were a total of 58 teams that took part in the Science Olympiad this year. Congratulations to all the teams who participated.

## APRILS MEETING TUESDAY THE 8<sup>TH</sup> AT 7:30 p.m.

All about the Moon  
Speaker Hank Bouchelle

As an icon of astronomy education, you just can't beat the Moon. To embark upon the ways that this is true requires a long list.

The Moon's presence and relative closeness has inspired our urge to GET THERE. Within our neighborhood, there is no place else to go as a first step that is within reach of dreams and our technology. Of course, few human beings can resist the romantic aspects of the Moon. And it rhymes with so many words! Just a coincidence? I don't think so!

The Moon's phases are a piercing reminder of the passing of time, and can be used to tell time. Before street lights, nights were dark. The Moon phases on tall case clocks were not decorations. And knowing the meaning of the phases was not an affectation. These reported to their owners whether or not they could find their nighttime destinations. The circumstances of the Harvest Moon provide more food for more people.

There are a number of happy coincidences regarding the Moon: The Sun is 400 times the diameter of the Moon, but 400 times further away, which means that solar eclipses are possible. Each year the Moon moves about a centimeter further away. In future epochs the Moon will be too distant and appear too small to create a total eclipse.

In the summer, the Sun is high and bright to warm us and grow our food. In the winter the Moon is high and bright all night, to illuminate our travels.

Phenomena  
Hank Bouchelle

Aspect rotation is one of the sub-subtopics in the April 8 Mount Cuba Astronomical Group's program featuring the Moon. The Moon's *libration* is an entirely different phenomenon. These are two of the fascinating details that seem to pop up in astronomy everywhere.

Celestial objects are typically the result of an accumulation of mass. This has been the story since the Big Bang. It produced mostly hydrogen, some helium, and a few lithium atoms that stars have transformed into various atoms and then larger lumps of matter. For larger objects, the process of accumulation liberates heat sufficient to create a relatively uniform liquid sphere. In such cases the densities of various materials cause them to stratify, with the densest materials sinking to the center, and less dense materials to "float" on the surface. In the case of Earth, its core is presumably composed of iron and nickel, while its surface is composed of materials less dense.

For various reasons, smaller objects, like the Moon, are not so uniformly arranged, and pockets of lighter or denser material remain. This can result in behavior similar to that of a beach ball with a quarter taped to its surface. It will roll with an apparent "limp," and come to a stop with the weighted side down.

The Moon and many other satellites experience this condition. Even if an object rotates at its formation, the gravity of its planet eventually drags its rotation to a stop. This is the Moon's condition. As a practical matter, the same side of the Moon faces Earth. The Moon's slight change in its velocity and distance causes a slight "rocking" of the Moon, so a small fraction of the Moon on each side of its face is temporarily revealed. This and other phenomena combine so that with careful observation over a long period of time, these effects permit a view of 58% of the Moon's total surface.

#### **OBSERVATIONS FROM THE COMFORTABLE CHAIR:**

Hank Bouchelle Co-Chair MCAAG

It is rewarding to be able to report in each issue of The STAR that dozens of interested adults have participated in MCAAG programs and added to our reach and service. And our Group has gone national, or at least regional, as our presence extends to libraries in Cecil County, Maryland.

Breaking news!

Beginning with the April 8 Mount Cuba Astronomy Group meeting, folks will be able to do much more than have the opportunity to wrestle the secrets of the Universe into the light!

To maintain their teaching credentials, Delaware teachers are obliged to accumulate 90 education-related contact hours within each five-year period. Various selected Mount Cuba Astronomy Group-related programs, lectures, MCAO Public Nights and activities currently in the planning stage will count toward these total contact

hours. As we move ahead, these opportunities will appear in the Delaware Teacher Center's regular catalog.

It is exciting to see the ways that our group is responding to the interest of the public and educators in the numerous areas and topics within the larger field of astronomy.

But wait! There's more! Preparations continue for the Mount Cuba Astronomical Observatory's Summer Astronomy Camp offered this June. Watch this space!!

### **ASTRONOMICAL TERMS, TOPICS AND NAMES:**

The Mission of the Mt. Cuba Astronomy Group is to increase knowledge and expand awareness of the science of astronomy and related technologies.

When reading the articles in the STAR, you will come across various terms and names of objects you may not be familiar with. When you see a term or name *underlined and italicized* you will also find a brief description in this section of the STAR. In each edition of the STAR, we will review terms as well as objects and topics related to Astronomy and related technologies. These topics are presented on a level that the general public can appreciate.

### **NEW TERMS**

#### **Cepheid Variable**

A Cepheid is a star that varies between a larger, brighter state and a smaller, denser one. They are very luminous variable stars, of a class that was especially massive and hot, using up their fuel early, leaving them in this pulsating condition.

Polaris: Better known to most as the North Star.

#### **Spectrograph**

A spectrograph is an instrument that separates an incoming wave into a frequency spectrum. There are several kinds of machines referred to as spectrographs, depending on the precise nature of the waves. The term was first used in 1884.

#### **Libration**

Any one of five points in the plane of a system of two large astronomical bodies orbiting each other, as the Earth-moon system, where the gravitational pull of the two bodies on an object are approximately equal, and in opposite directions. A solid object moving in the same velocity and direction as such a libration point will remain in gravitational equilibrium with the two bodies of the system and not fall toward either body.

## NEW TOPIC

### Classifications of Galaxies

# Types of Galaxies

Galaxies are classified primarily by their shape and come in 3 main types:

***Elliptical*** – These galaxies have little to no structure, rotation, or interstellar matter. This results in minimal star formation and a dominance of the long lived, red stars. These ellipsoid-shaped collections of stars are the most common type of galaxy.

***Spirals*** – These galaxies are disk-shaped with either a round central hub (unbarred) or a hub shaped like a bar (barred). They rotate with spiral arms that contain interstellar dust and gas, promoting star formation and an abundance of young stars.

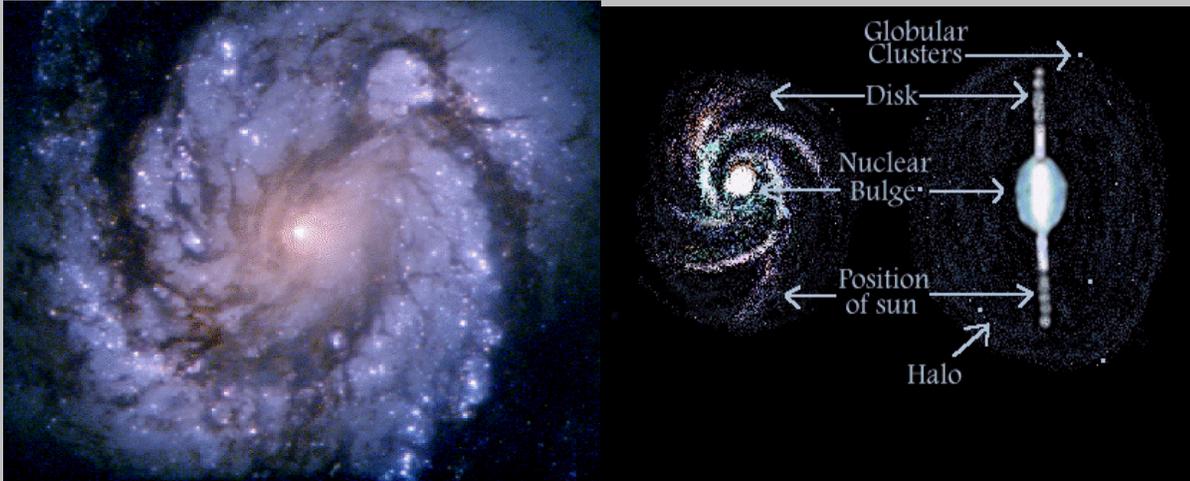
***Irregular*** – These galaxies have an irregular shape and are considered to be the result of the collisions of galaxies. As a result, they generally contain a complex mix of interstellar gas and dust, young stars, and old stars.

Elliptical galaxies are shaped like a spheroid, or elongated sphere. In the sky, where we can only see two of their three dimensions, these galaxies look like elliptical, or oval, shaped disks. The light is smooth, with the surface brightness decreasing as you go farther out from the center. Elliptical galaxies are given a classification that corresponds to their elongation from a perfect circle, otherwise known as their ellipticity. The larger the number, the more elliptical the galaxy is. So, for example a galaxy of classification of E0 appears to be perfectly circular, while a classification of E7 is very flattened. The elliptical scale varies from E0 to E7. Elliptical galaxies have no particular axis of rotation.



Elliptical galaxy M87

Spiral galaxies have three main components: a bulge, disk, and halo (see right). The bulge is a spherical structure found in the center of the galaxy. This feature mostly contains older stars. The disk is made up of dust, gas, and younger stars. The disk forms arm structures. Our Sun is located in an arm of our galaxy, the Milky Way. The halo of a galaxy is a loose, spherical structure located around the bulge and some of the disk. The halo contains old clusters of stars, known as globular clusters.



Irregular galaxies have no regular or symmetrical structure. They are divided into two groups, Irr I and Irr II. Irr I type galaxies have HII regions, which are regions of elemental hydrogen gas, and many Population I stars, which are young hot stars. Irr II galaxies simply seem to have large amounts of dust that block most of the light from the stars. All this dust makes it almost impossible to see distinct stars in the galaxy.



[NGC 1427A](#), an example of an irregular galaxy.

## **MCAO PUBLIC OUTREACH:**

### **COMMUNITY**

The MCAO along with the MCAG will be offering a summer camp. For more information please contact Hank Bouchelle at 302-983-7830 or email Hank at [hbouchelle@live.com](mailto:hbouchelle@live.com)

Woodside Creamery has contacted the MCAG asking us to bring some telescopes to the creamery again this year so their customers have a chance to view objects in our solar system. We have selected the follows evenings May 3, June 7, July 5, August 2, and Sept 6. All are all Saturdays with the 1<sup>st</sup> Quarter Moon well placed in the sky. We will start around 7:30pm and go until Woodside closes at 9:00pm.

This is a great chance for a family outing. Not only do you have some great ice cream but a chance to see the moon as well as Saturn with its rings and Jupiter and its moons.

A new opportunity for MCAG. The Cecil County Library is considering a monthly program on Astronomy. More details to come.

### **SCHOOLS:**

Hank has been working with the director of the Delaware Teacher Center to create informal courses and workshops that will give participating teachers credit for their continuing certification. The requirement is 90 contact hours within five years, and may include Mount Cuba Astronomical Observatory (MCAO) or Mount Cuba Astronomy Group (MCAG) events. These activities may also be in the form of public outreach, such as programs at regional libraries, to which teachers are invited.

We in the MCAG should offer any support we can give to Hank in his effort for this could certainly turn out to be a big boost for us.

## **NEWS FROM THE WORLD OF ASTRONOMY:**

The North Star has remained an eternal reassurance for northern travelers over the centuries. But recent and historical research reveals that the ever-constant star is actually changing.

After dimming for the last few decades, the North Star is beginning to shine brightly again. And over the last two centuries, the brightening has become rather dramatic.

"It was unexpected to find," Scott Engle of Villanova University in Pennsylvania told SPACE.com. Engle investigated the fluctuations of the star over the course of several years, combing through historical records and even turning the gaze of the famed Hubble Space Telescope onto the star.

**(In) constant as the North Star**

Scientists have known since the early 20th century that the familiar star was part of a pulsating class known as Cepheid variables. Its variations were suspected as early as the mid-1800s, but unlike most Cepheid variables, the pulses of Polaris are very small.

"If it had not been so popular as the North Star, we likely wouldn't have known it was a Cepheid until modern times," Engle said.

In the early 1990s, scientists realized that the oft-lauded brightness of Polaris was beginning to decline. Engle and his group began to research the star around the beginning of 2000, when they found that the dropping brightness was on the rise again.

"It started increasing rather rapidly," Engle said.

Curious, the team began to search historical records to see what other measurements they could find. Combing through data from the past century, they compared the information on Polaris with observations of other celestial bodies from the same telescopes and details about the instruments to compare the relative brightness of Polaris over the years. They found that the star had grown brighter over the past hundred years.

The next step was to determine just how far back the increasing brightness went. Engle pursued observations by Danish astronomer Tycho Brahe in the 16th century and Persian astronomer Abd al-Rahaman al-Sufi in the 10th century, using information from historical texts to determine just how bright the star was in the ancient sky.

According to Engle, if we take the measurements of al Sufi and Ptolemy at face value, the North Star has brightened by about two and a half times over the last two centuries. Modern interpretations of the historical data indicate that it could be as much as 4.6 times brighter than it was in ancient times. Too bright to handle

As they pursued the historical documents, Engle and his team continued to monitor the increasing brightness of Polaris but they were stymied when a modern CCD device—essentially a very sensitive digital camera—replaced the older imaging device on their telescope. The newer technology was too sensitive to image the bright North Star.

The team relied on observations from amateur astronomer, Richard Wasatonic, whose backyard telescope still utilized the less-sensitive imaging equipment. They also obtained observations from astronomers in Croatia and the Czech Republic who still utilized older equipment.

"We have to beg, borrow and steal to find people who use older photoelectric equipment," Engle said, acknowledging the irony of wanting to use older equipment.

The team ran into similar difficulties when they sought to image Polaris with the Hubble Space Telescope. Even after receiving approval, he said that the HST team was

very hesitant to let Engle and his colleagues image the bright star, concerned that the sensitive Cosmic Origins Spectrograph (COS) might suffer.

"They basically said, we know you've been approved, but you really have to convince us you aren't going to damage our instrument," Engle said.

The HST observations provided insights into the atmosphere of Polaris, which is changing along with its brightness.

Engle presented the results of his ongoing research in a poster session at the American Astronomical Society meeting in Washington, D.C. earlier this month.

#### **A less-than-standard candle**

Polaris isn't the only Cepheid variable changing over time. Engle described an ongoing study of 15 other Cepheids most of which have shown unexpected long-term changes in their average brightness.

"For a long time, Cepheids have been prized because, even though they pulsate, they're consistent," Engle said.

Such consistency has led to them being dubbed as one of the 'standard candles' of the universe. Standard candles are objects whose known brightness allows them to accurately measure distances across space.

"It is possible that a good bit of Cepheids are undergoing these changes," Engle said. "They might be very, very complex stars, much more than we originally thought."

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Credit to Space.com

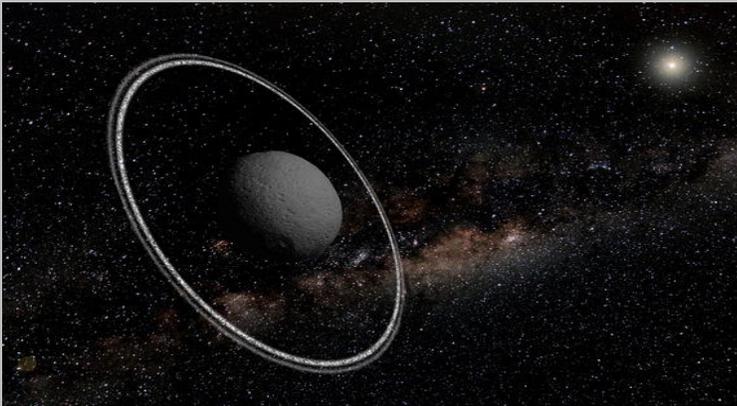
### **NASA's Spitzer telescope completes 360-degree panorama of the Milky Way**



NASA's Spitzer telescope has helped researchers catch two galaxies merging, and now it's created the clearest panorama of our Milky Way galaxy. The telescope took over 2 million infrared snapshots of our galaxy over the course of a decade, and with the help of GLIMPSE mapping data, researchers were able to create a stunning 360-degree picture. Since our galaxy is shaped similarly to a flat disk, most of the stars that we see are concentrated in the middle. That's how the telescope was able to capture over half the stars in the galaxy's disk, even if it only covers 3 percent of the entire sky. NASA plans to use the panoramic map to help guide the James Webb Space Telescope into areas where stars form, to make even more detailed observations.

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Article by Valentina Palladino

### ASTRONOMERS ASTOUNDED BY NEW DISCOVERY



An artist's view of the rings surrounding the asteroid Chariklo, which is only 155 miles (250 kilometers) across. The asteroid is the first non-planetary body in the solar system discovered to have its own ring system. Image released March 26.

Scientists have made a stunning discovery in the outer realm of the solar system — an asteroid with its own set of rings that orbits the sun between Saturn and Uranus. The space rock is the first non-planetary object ever found to have its own ring system, researchers say. The pair of space rock rings encircle the asteroid Chariklo. They were most likely formed after a collision scattered debris around the asteroid, according to a new study unveiled. The asteroid rings also suggests the presence of a still-undiscovered moon around Chariklo that's keeping them stable, researchers said.

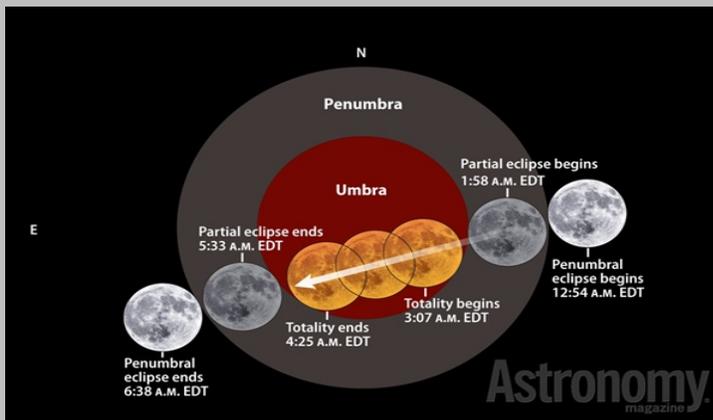
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Article by Nola Taylor Redd, SPACE.com Contributor

## LUNAR ECLIPSE APRIL 15<sup>TH</sup>

The chart below list the times for the Eclipse in the Wilmington area.

Event	UTC Time	Time in Wilmington*	Visible in Wilmington
Penumbral Eclipse begins	Apr 15 at 4:55 AM	Apr 15 at 12:55 AM	Yes
Partial Eclipse begins	Apr 15 at 5:59 AM	Apr 15 at 1:59 AM	Yes
Full Eclipse begins	Apr 15 at 7:08 AM	Apr 15 at 3:08 AM	Yes
Maximum Eclipse	Apr 15 at 7:46 AM	Apr 15 at 3:46 AM	Yes
Full Eclipse ends	Apr 15 at 8:23 AM	Apr 15 at 4:23 AM	Yes
Partial Eclipse ends	Apr 15 at 9:32 AM	Apr 15 at 5:32 AM	Yes
Penumbral Eclipse ends	Apr 15 at 10:36 AM	Apr 15 at 6:36 AM	No, under horizon

\* The Moon is under the horizon in Wilmington some of the time, so that part of the eclipse is not visible.



This illustration shows the main events that will occur during the total lunar eclipse April 15. In addition to the times listed on the diagram, mid-eclipse occurs at 3:46 A.M. EDT. Note that in some time zones, events may occur before midnight, so if you live in one of those, the date will be April 14.

For information and educational purpose only.  
Article by Roen Kelly: Astronomy Magazine

### APRILS SKY:

#### Planet watch for April

Mercury is too close to the sun to be observed this month.

Venus is now a “morning star,” rising in the east just before the sun.

Mars is in opposition on April 8 and closest to the Earth on April 14. It is visible in Virgo all night long.

Jupiter shines brightly in the South in Gemini most of the night, setting in the Northwest around 2 a.m. The Great Red Spot is easier to see than in many recent years, showing a distinct orange color.

Saturn, in Libra, rises in the eastern sky around 10 p.m., and is visible the rest of the night.

Uranus is too close to the Sun to be visible.

Neptune is close to Venus in Aquarius all month, rising just before the sun.

**TELESCOPE WORKSHOP:**

It is anticipated that we shall begin the casting procedure for our new Sundial at the next meeting. Dave has devised a new casting method that will include some of the mold being cast in concrete. It should be quite interesting to watch this process unfold. All workshop gatherings are on the fourth Thursday of each month unless otherwise notified.

**PUBLIC NIGHTS AT MCAO:**

<u>April 7</u>	<u>Harry Shipman</u>	<u>Splendors of the Southern Skies</u>
<u>April 21</u>	<u>Stan Owocki</u>	<u>From Galaxies to Stars and Planets: What’s the Spin on Astronomical Disks.</u>
<u>May 5</u>	<u>Rob Lancaster</u>	<u>To be determined</u>
<u>May 19</u>	<u>Scott Jackson</u>	<u>How Astronomical Events changed history.</u>

If you know of anyone who is interested in Astronomy or someone who would like to learn more, please do not hesitate to extend an invitation to them to attend our meetings. If they have an interest in joining, our application is below.

**MOUNT CUBA ASTRONOMICAL GROUP  
MGAG**



**Membership Form**

**The Mt. Cuba Astronomical Group is a tax-exempt organization dedicated to astronomy education and public outreach. Benefits of membership include:**

**You will receive a monthly newsletter that contains information about the group's activities as well as several articles about current astronomical activity and events both local and national.**

**We offer monthly programs on subjects and topics of astronomical interest.**

**Free or discounted subscriptions to astronomy related publications.**

**Mention the MCAG and receive a 5% discount at Manor Books in New Castle.**

**Please send application to:**

**MCAO  
P. O. Box 3915  
Greenville De. 19807  
Attention: Carolyn Stankiewics**

**Name** \_\_\_\_\_

**Home address** \_\_\_\_\_

\_\_\_\_\_

**E-mail address** \_\_\_\_\_

**Phone (optional)** \_\_\_\_\_