



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 DIRECTIONS PLEASE VISIT

www.mountcuba.org

PLEASE SEND ALL PHOTOS AND ARTICLES TO

pestrattonmcag@gmail.com

JANUARY 14TH MEETING
TUESDAY 7:30 p.m.

We have two talks on the agenda for this month.

Mary Webb and Robert Stack will be giving a talk on Annie Jump Cannon. Annie was born in Delaware. She made quite a big contribution to the field of Astronomy. Attend the meeting and learn more.

Carolyn Stankiewicz will speak on “Astronomy and Astrology. Same Roots”
Carolyn will also speak on “A different take on stars”.
Short video clip and CD presentation will be given.

We have rescheduled Decembers program for February 11th meeting.

Program: The Moon as a Clock

Don't forget the contest Hank set up. Please review your December STAR for the details.

The View from a Comfortable Chair:

Hank Bouchelle

Efforts are underway to ally the MCAG with other organizations to everyone's advantage, especially our members! More specific information to come.

Phenomena : Sun comes up, Sun goes down...

The observant among us may have noticed that evenings are becoming more prolonged, as the Sun sets a little later each day. Worthy of note is the fact that this trend begins on December 7, variously called Delaware Day or Pearl Harbor Day.

Everyone *knows* that the winter solstice, the ‘shortest day’ of the year, occurring on or about December 21. The “Leap Year day” at the end of February often but not always shifts the dates of the equinoxes and solstices, so the dates for the equinoxes and the solstices change do not always occur on the same dates each year. We can observe this four-year drift, and the changing length of daylight in a sunrise/sunset table.

The Naval Observatory prepares tables of sunrise and sunset for every day of every year (http://aa.usno.navy.mil/data/docs/RS_OneYear.php) for about 22,000 locations worldwide . And if a location has too few residents to make the information worth posting (sorry, Greenville), we can set its geographical information (latitude and longitude), to find the sunrise/set data. The data for Wilmington, DE is at http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl. When we check Dover's table, we see that it's sunrise/set table differs (http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl) !!

The Sun on December 21 sets three minutes later than on December 7. We can see that the sunset and sunrise times change most slowly near the solstices, and more quickly near the equinoxes. The total period of daylight can change by as much as four or five minutes in just a single day.

For Wilmington, we see that on June 21 the Sun rises at 4:35 am (Standard Time), but does not set until 7:34 pm (Standard Time). The Sun is in our sky for nearly 16 hours! And in the winter, the situation is reversed! No wonder winter can be so cold! Most of the day's 24 hours have no Sun!

It is entertaining to check regions in the far north and on the Equator, and fun for the whole family! Since elementary school, teachers have spoken of the 'Land of the Midnight Sun' and the six-months of day and night. The Sun sets in Barrow, Alaska on November 18 at 1:45 pm. It does not rise again until 1:28 pm on January 22 (http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl).

The table for Quito, Ecuador is at http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl. We see little difference in the period of daylight there, and this is true of tropical regions in general.

Quito, Ecuador

	Rise	Set.
June 21	11:11 am	11:17 pm
December 21	11:06 am	11:14 pm

This being true, tropical countries, like Ecuador and Costa Rica, are unlikely to apply Daylight Savings Time.

Time zones developed in response to the requirements of railroad schedules and long-distance travel. Before standard time and time zones, the time of day was essentially what a town sundial said, though they can be off by as much as 18 minutes. (Had you bought a watch in the early 1800s, it came with a small piece of paper under the back cover showing the difference between "local sundial time" and Standard Time so that the watch could be reset if it stopped.)

Evidence of an era when a time was not exactly the correct time, is an old photograph from the Wilmington, DE train station. On the wall are three clocks showing the time for Baltimore, Wilmington, and Philadelphia. Each of them showed a different time of day.

But the most interesting case of all has to be China. The entire country is on a single time zone. When I asked our guide how this could be true, he responded, "We tried time zones, but we had too many train wrecks."

EDITOR'S NOTE:

In last months Editor's Note, I stated:

"It is the goal of this Newsletter to first and foremost reach out to students, teachers and the general public. At the same time, we need to hold the interest of our members who have an intermediate or advance level of Astronomy and its related fields."

To accomplish that goal, I would like to extend an offer to anyone who would like to contribute an article or two for the STAR.

MCAG PUBLIC OUTREACH:

SCHOOLS:

An Invitation to Get Involved!

You, too, can be an elementary Student' s Carl Sagan!!

On January 8, 2014 the Appoquinimink School District hosts a Space Night from 6:00 – 7:30 p.m. at Appoquinimink High School, in Middletown – a short drive, for fourth and fifth grade students and their parents. Anyone with an interest in astronomy is invited to attend and share information, ideas or materials with students and their parents. The evening's format is a number of tables or stations around which the students and parents may circulate.

Individuals with binoculars or telescopes are particularly invited!! For more information, or to offer assistance --

Contact Hank Bouchelle at hbouchelle@live.com or 302-983-7830.

On the high school front, there are several schools getting ready for the Science Olympiad. Scott Jackson will once again hold the Help Sessions at Mt. Cuba. Scott will also develop and administer the final exam to be held in March.

LIBRARIES:

As a reminder, please don't forget the following dates. On January 17th Hank will be giving a lecture on the Constellations of Winter – Ancient Myths and Colors of Stars. He will give the talk at the Newark Free Library, 750 Library Ave. at 7:30 p.m. Hank will give the same lecture on Wednesday January 29th at the Brandywine Library 1300 Foulk Rd. also at 7:30 p.m.

ASTRONOMICAL TERMS AND NAMES OF THE MONTH:

Beginners Level Topics.

In order to enjoy star gazing; you must first become familiar with the various Constellations. Try this web site. STARDATE.org for it has most the Constellations. Click on the name of the Constellation to view the figure or design. Another great site is SKYMAPONLINE.net When you first enter this site you will see a map for a certain city. Click on the name of the city and look just above it. You can select from several US cities. Select Philadelphia and a sky map for Philadelphia will appear.

Terms that you may encounter.

Parsec.

A measure of distance and not time. $3.08567758 \times 10^{16}$ meters.

Constellation

A formation of stars perceived as a figure or design.

Some names of Constellations you will hear.
Orion, Canis Major, Gemini, Cepheus, Taurus, Leo.
CONTEST:

In Star Wars Episode IV: A New Hope, Han Solo convinces Obi-Wan that his ship is fast enough to get to Alderaan by saying: "You've never heard of the *Millennium Falcon*?... It's the ship that made the Kessel Run in less than twelve parsecs."
What is wrong with this statement?
The first person to reply with the correct answer will win a Night Sky Planisphere.

WHAT IS A SPIRAL GALAXY?

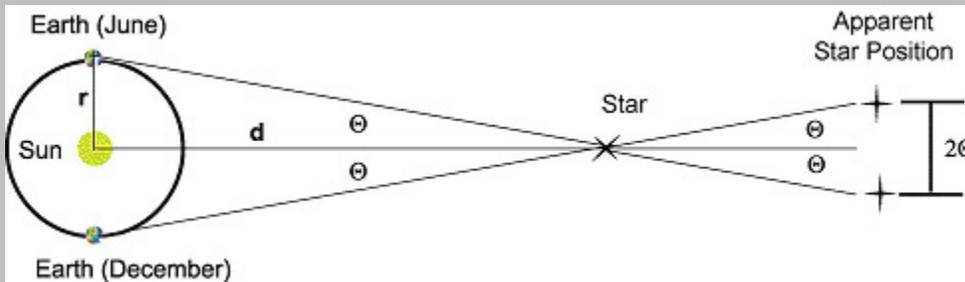
A spiral galaxy like the Milky Way has 3 basic components to its visible matter: (1) the disk (containing the spiral arms), (2) the halo, and (3) the nucleus or central bulge. These components are indicated schematically in the adjacent figure. The halo and the nucleus are also referred to collectively as the *spherical component* of the galaxy since they have an approximately spherical distribution with respect to the center of the galaxy.

In addition to these visible components, the galaxy also contains at least three other components that are "invisible": the galactic magnetic field, charged particles trapped in the galactic magnetic field, and a halo of "dark matter" that is of unknown composition but that makes itself felt by its gravitational influence on the visible matter.



WHAT IS THE TRIGONOMETRIC PARALLAX

How to determine how far away an object is from the Earth.



Astronomers use several techniques for discovering how far away an object is. The first is called trigonometric parallax and is based on geometry, but it is only good for up to about 500 light-years. The principle behind this method is elegantly simple: Earth orbits the Sun at a known radius and when the Earth is at opposite ends of its orbit it results in a star appearing in a slightly different positions against distant background stars that allow us to use simple trigonometry to calculate how far away it is (see diagram below). The parallax (symbolized by the Greek letter, Θ) is defined as the angular size of an elliptical arc that the star seems to trace against the background of space. Since,

$$\tan \Theta = r/d$$

where the tan refers to the tangent of a triangle, r is the radius of the Earth's orbit (equal to 1 A.U.), and d is the distance to the star. Since an astronomer can determine the parallax by comparing photographs taken in, say, June and December and the Earth's radius is well-established value, calculation of the distance follows easily!

You can quickly demonstrate the idea behind trigonometric parallax to yourself by placing one finger in front of you and keeping it in that position. Close your right eye and make a mental note of your fingers position against the background. Now close your left eye and view your finger again note how the position against the background has changed! This is the same principle behind the trigonometric the Sun parallax method used by astronomers. Just like your finger seems to move based on which eye is open, a star appears to move against the background of space due to the Earth's movement around the sun.

ASTROGEOLOGY:

The science that applies the principles of geology to the study of solid bodies of the solar system other than the earth. Using the techniques of geophysics, geochemistry, and other fields of geology, scientists can learn about the composition, structure, and development of such bodies as the moon and the various planets and their satellites. Scientific data and photographs transmitted to earth by space probes are important

sources of information in Astrogeology. Another valuable source of information is the direct analysis of meteorites and of rock samples from the moon.

WEB SITES OF INTEREST:

<http://www.universetoday.com/107259/101-astronomical-events-for-2014/>
<http://www.space.com/24048-best-skywatching-events-2014.html>

TELESCOPE WORKSHOP:

We will continue the workshop on Thursday the 30th at 7:30. As usual, we will meet at Mt. Cuba Astronomical Observatory. All are welcome.

OTHER MCAG ACTIVITIES:



Most of us can remember the time when we could look at the night sky and see what seemed to be countless stars. Those days are gone. On most nights it is hard for me to find the North Star Polaris. There is hope and help is on the way for we now have an organization that is fighting to get the sky we remember back.

The IDA or International Dark-Sky Association is fighting to rid us of the current outdoor lighting and replace them with LED lights.

Here is an example of what the IDA just recently accomplished.

TUCSON, AZ, AND TOULOUSE, FRANCE –

The International Dark-Sky Association (IDA) announced today the designation of the first International Dark Sky Place in France. In naming the Pic du Midi International Dark Sky Reserve (IDSR), IDA is pleased to recognize the immense local efforts to preserve and protect the exceptionally dark night skies over the Pyrénées Mountains.

"In creating the Reserve, the Pic du Midi team has not only protected a vanishing resource, they have made it better than it was," said IDA Executive Director Bob Parks. "We commend and celebrate their exceptional efforts."

If you would like to volunteer your time or make a donation, visit – www.darksky.org

MCAG STAR PARTIES.

Dates

Saturday 2/1/14 -6:30 p.m.

Saturday 3/22/14 - 7:30 p.m.

Saturday 4/5/14 - 7:30 p.m.

Place. Brandywine Creek State Park.

41 Adams Dam Rd., Wilmington, DE 19807

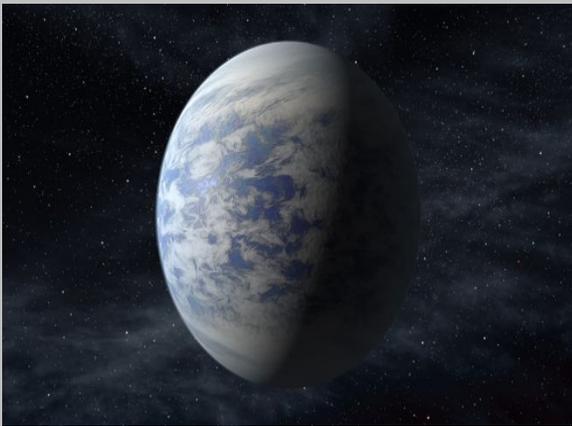
If you would like to attend, call the Park [\(302\) 577-3534](tel:302-577-3534) in advance to register. There may be a small charge for the program. For MCAG members working the event, there is no admission fee. If weather is questionable, call park after **12 p.m.** to see if event is cancelled.

Directions:

Google 41 Adams Dam Rd., Wilmington, DE 19807

ONGOING ARTICLE:

ExoPlanets Part 2.



Above are two Artist versions of ExoPlanets. The one to the left is a Terrestrial Planet which you first saw in the December STAR. The one to the right is a Gas Giant. This photo was taken using the Subaru Telescope in Hawaii. If we could travel to this giant planet, we would see a world still glowing from the heat of its formation with a color reminiscent of a dark cherry blossom, a dull magenta.

The question becomes how did the Artist determine what both of these planets look like?

The following is a write up Scott Jackson did for the MCAG which gives us some clues as to how this is done. Thank you Scott for your contribution.

For a few stars, Astronomers have been able to get a hint of what the average color of the Planet would be by subtracting the color of the star alone (the planet is behind the star) from the color of the star plus the color of the ExoPlanet right after it emerges from behind the star.

In one recent example, they found that the ExoPlanet had to have a blue color so the artist showed a blue color – with some clouds the Terrestrial Planet above. This blue color was not from water – the planet was just too hot for water to exist (the temperature of the water gave the water a velocity greater than the escape velocity from the star.)

Another way is to do a heat balance to estimate the surface temperature of the ExoPlanet. If hot enough it may “glow” red in the visible spectrum – that is why many artists show a glowing surface for the “hot Jupiters” the Gas Giant above. In a couple of cases (from the spectrum) they can see signatures of molecules – from the atmosphere of the planet. The artist will then presume things may look like bands on Jupiter.

The real problem is trying to paint what the surface of an ExoPlanet looks like. Beyond these methods, it is a flat out imagination on the part of the artist. To learn more about this process visit:

<http://www.artsnova.com/blog/2013/07/29/604/>

NEW TOPICS FOR THE MONTH:

DARK MATTER

Dark matter is a type of matter *hypothesized* in astronomy and cosmology to account for a large part of the mass that appears to be missing from the universe. Dark matter cannot be seen directly with telescopes; evidently it neither emits nor absorbs light or other electromagnetic radiation at any significant level. Instead, the existence and properties of dark matter are inferred from its gravitational effects on visible matter, radiation, and the large-scale structure of the universe. According to the Planck mission team, and based on the standard model of cosmology, the total mass–energy of the known universe contains 4.9% ordinary matter, 26.8% dark matter and 68.3% dark energy. Thus, dark matter is estimated to constitute 84.5% of the total matter in the universe.

Planck is a European Space Agency (ESA) mission with significant NASA involvement in hardware and science, managed by the Jet Propulsion Laboratory, California Institute of Technology. Planck data products are provided by the Planck Consortium.

Although the existence of dark matter is generally accepted by the mainstream scientific community, there is no generally agreed direct detection of it. Other theories, including MOND and TeVeS, are some alternative theories of gravity proposed to try to explain the anomalies for which dark matter is intended to account.

Astrophysicists hypothesized dark matter due to discrepancies between the mass of large astronomical objects determined from their gravitational effects and the mass calculated from the "luminous matter" they contain: stars, gas, and dust. It was first postulated by Jan Oort in 1932 to account for the orbital velocities of stars in the Milky Way and by Fritz Zwicky in 1933 to account for evidence of "missing mass" in the orbital velocities of galaxies in clusters. Subsequently, many other observations have indicated the presence of dark matter in the universe, including the rotational speeds of galaxies by Vera Rubin, in the 1960s–1970s, gravitational lensing of background objects by galaxy clusters such as the Bullet Cluster, the temperature distribution of hot gas in galaxies and clusters of galaxies, and more recently the pattern of anisotropies in the cosmic

microwave background. According to consensus among cosmologists, dark matter is composed primarily of a not yet characterized type of subatomic particle. The search for this particle, by a variety of means, is one of the major efforts in particle physics today.

JANUARY SKY

Full Moon and New Moon.

We normally have one New Moon and One Full Moon nearly every month. A New Moon occurs when the Moon is directly between the Earth and the Sun. A full Moon occurs when the Moon is directly opposite the Earth from the Sun and will be fully illuminated as seen from Earth. This full moon was known by early Native American tribes as the Full Wolf Moon because this was the time of year when hungry wolf packs howled outside their camps. It is true, look it up.

This month we will have two New Moons and one Full Moon. New Moons will occur January 1st and January 30th. The full moon will occur January 16th.

Other interesting happenings

January 2, 3 - Quadrantids Meteor Shower. The Quadrantids is an above average shower, with up to 40 meteors per hour at its peak. It is thought to be produced by dust grains left behind by an extinct comet known as 2003 EH1, which was discovered in 2003. The shower runs annually from January 1-5. It peaks this year on the night of the 2nd and morning of the 3rd. The thin crescent moon will set early in the evening leaving dark skies for what could be an excellent show. Best viewing will be from a dark location after midnight. Meteors will radiate from the constellation Bootes, but can appear anywhere in the sky.

January 5 - Jupiter at Opposition. The giant planet will be at its closest approach to Earth and its face will be fully illuminated by the Sun. This is the best time to view and photograph Jupiter and its moons. A medium-sized telescope should be able to show you some of the details in Jupiter's cloud bands. A good pair of binoculars should allow you to see Jupiter's four largest moons, appearing as bright dots on either side of the planet.

MCAG MISSION STATEMENT:

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

To provide MCAG members and the general public with monthly educational programs in astronomy and astronomy-related topics

To engage in outreach to the public as well as MCAG members to provide engaging and informational activities of astronomical interest, including public lectures and observing.

To support a responsive, informative, and useful newsletter for its members and the general public.

To support educational institutions, including schools and their teachers, in their efforts to engage and inform their stakeholders in the area of astronomy, formally and informally, and as appropriate its relationship to mathematics.

To hold formal and informal courses, work-shops, and retreats that support its members' interests, and engage and inform the general public.

To offer publications and materials of astronomical interest to its members at a discount as they may be available, and to the general public when possible.

To develop and support affiliations with like-minded institutions.

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.

Mt. Cuba Astronomy Group

Membership Form

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

- Monthly newsletter that includes details about the Group's activities and much astronomical information
- Monthly programs on subjects and topics of astronomical interest
- Free or discounted subscriptions to astronomy-related publications
- Free registration for MCAG workshops and classes
- Mention Mt. Cuba Astronomy Group and receive a 5% discount at Manor Books in New Castle (<http://www.yelp.com/biz/manor-used-books-New Castle>)



Mail to:

Ms. Carolyn Stankiewicz
1001 Woodstream Dr.
Wilmington, DE 19810

Name _____

Name(s) (children, if any, and age): _____

E-mail address: _____

Home address: _____

Phone (optional): _____