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
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DECEMBER MEETING
TUESDAY DEC. 8TH 7:30 p.m.

ASTRONOMICAL TERMS AND NAMES OF THE MONTH:

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. Therefore, in each edition of the STAR, we will review terms as well as objects related to Astronomy and related technologies. These topics are presented on a level that the general public can appreciated.

distance indicators: or Distance measures are used in physical cosmology to give a natural notion of the distance between two objects or events in the universe.

Spheroidal: A spheroid, or ellipsoid of revolution, is a quadric surface obtained by rotating an ellipse about one of its principal axes; in other words, an ellipsoid with two equal semi-diameters. If the ellipse is rotated about its major axis, the result is a prolate (elongated) spheroid, like an American football or rugby ball.

LIBRARIES:

Hank is working with the Cecil County Public Libraries where as the MCAG will participate in there Visions of the Universe Program. More detail to come.

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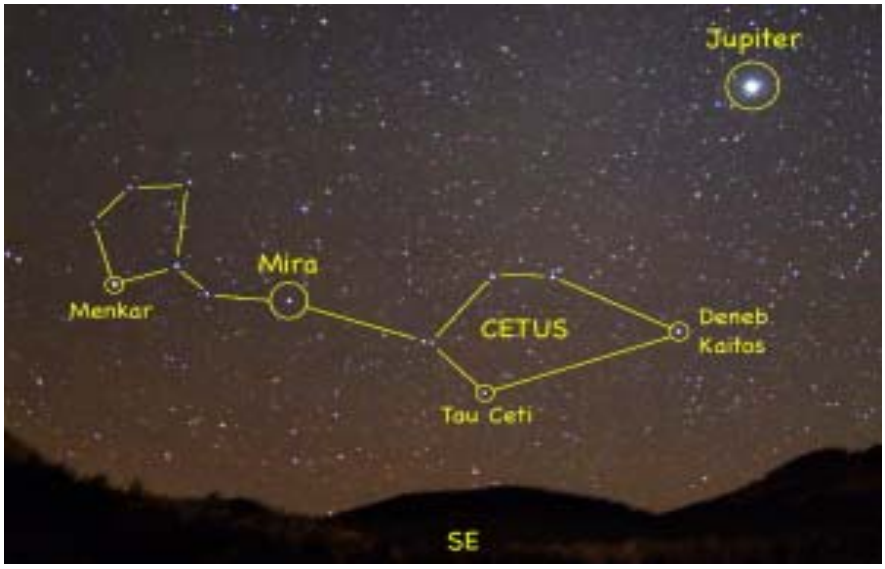
CONSTILLATIONS:

Cetus

Cetus /□siːtəs/ is a constellation. Its name refers to Cetus, a sea monster in Greek mythology, although it is often called 'the whale' today. Cetus is located in the region of the sky that contains other water-related constellations such as Aquarius, Pisces, and Eridanus.



Wedged in between the bright star Fomalhaut to the south and the glittering Pleiades star cluster to the east is the huge, lumbering constellation of Cetus, the Whale. It ranks fourth in overall size among the 88 official constellations; only Hydra, Ursa Major, and Virgo cover more area of the sky. Yet, despite its large size, Cetus claims no star brighter than second magnitude, and has but one of those.

Since ancient times, Cetus has been identified with the mythological beast created by Poseidon's anger at Queen Cassiopeia for daring to boast that her daughter Andromeda was more beautiful than the daughters of Poseidon. This mythological sea monster bore little resemblance to a whale, but seventeenth century astronomers chose to portray the image of a whale in these stars and the image somehow stuck.

In early November, Cetus is completely above our southeastern mountains by 8:00 PM. Its brightest star is Deneb Kaitos, the Whale's Tail, visible just east of the brighter star

Fomalhaut. From there, the Whale extends some 40 degrees to the north and east to the star Menkar, the Whale's Nose. Menkar and four other stars form a distinctive pentagon shape that represents the head of the sea monster.

There are two other noteworthy stars within the constellation of Cetus. First is the star Tau Ceti, a near twin of our own Sun. Because it is almost the same size, temperature, and color as our Sun, it makes a promising target for astronomers searching for Earth-like planets. At a distance of only 11.9 light years, Tau Ceti might become home to a space colony one day as we leave our cradle behind. So far, no planets have been identified orbiting Tau Ceti, but a large ring of rocky debris, not unlike our own asteroid belt, has been detected.

The second star of note within the borders of Cetus is only visible to the naked eye for a few weeks out of each year. It is the star Omicron Ceti, also known as Mira, the Wonderful Star. Mira is a long period variable star that first caught the attention of astronomers many centuries ago. When near maximum light, Mira can sometimes rival Cetus' brightest star, Deneb Kaitos, although it typically maxes out slightly fainter. When near minimum light, a telescope is needed to spot Mira at all. This remarkable star oscillates between these two extremes in a period of about eleven months. Mira is now near its maximum, so keep an eye out for this amazing variable star.

FROM THE WORLD OF ASTRONOMY:

Our Milky Way Galaxy Has a Mysterious 'Great Dark Lane'

A previously unidentified highway of dust extends across the Milky Way, between the sun and the central bulge of the galaxy, scientists have found.

Called the "Great Dark Lane" by the astronomers who announced it, the dusty road twists in front of the bulge of the galaxy.

"For the first time, we could map this dust lane at large scales, because our new infrared maps cover the whole central region of the Milky Way," Dante Minniti, a researcher at Universidad Andres Bello in Chile and lead author of a study describing the findings, told Space.com by email.

Mapping the Milky Way

The center of a spiral galaxy contains a collection of stars that bulge above and below the flatter spirals, much like an egg yolk. The arms that give the galaxies their classification twist around the bulge, often in a beautiful spiral (although sometimes they are more elongated). Lanes of dust often lie between these arms, which present a particular challenge to map out. [Stunning Photos of Our Milky Way Galaxy (Gallery)]

"It is very difficult to map the structure of our galaxy because we are inside, and it is very large and covered with dust clouds that are opaque in the optical," Minniti said.

Working with a team of astronomers, Minniti used the European Space Observatory's Vista Variables in the Via Lactea Survey (VVV), a project to scan the Milky Way using the VISTA telescope in Chile, to study the galaxy in the near-infrared. At this wavelength, telescopes are able to peer through the clouds of dust to a group of objects known as red clump (RC) stars lying within the bulge.

Red clump stars have helium-burning cores that generate a similar brightness no matter what their age or composition is. This makes them reliable distance indicators for astronomers.

Based on the measurement of 157 million stars, Minniti and his team found that the RC stars of the Milky Way's bulge were split into two colors — a difference they determined was caused by dust between the stars and the observers. The astronomers could see a sharp transition between the two distinct groups — the dusty Great Dark Lane dividing them.

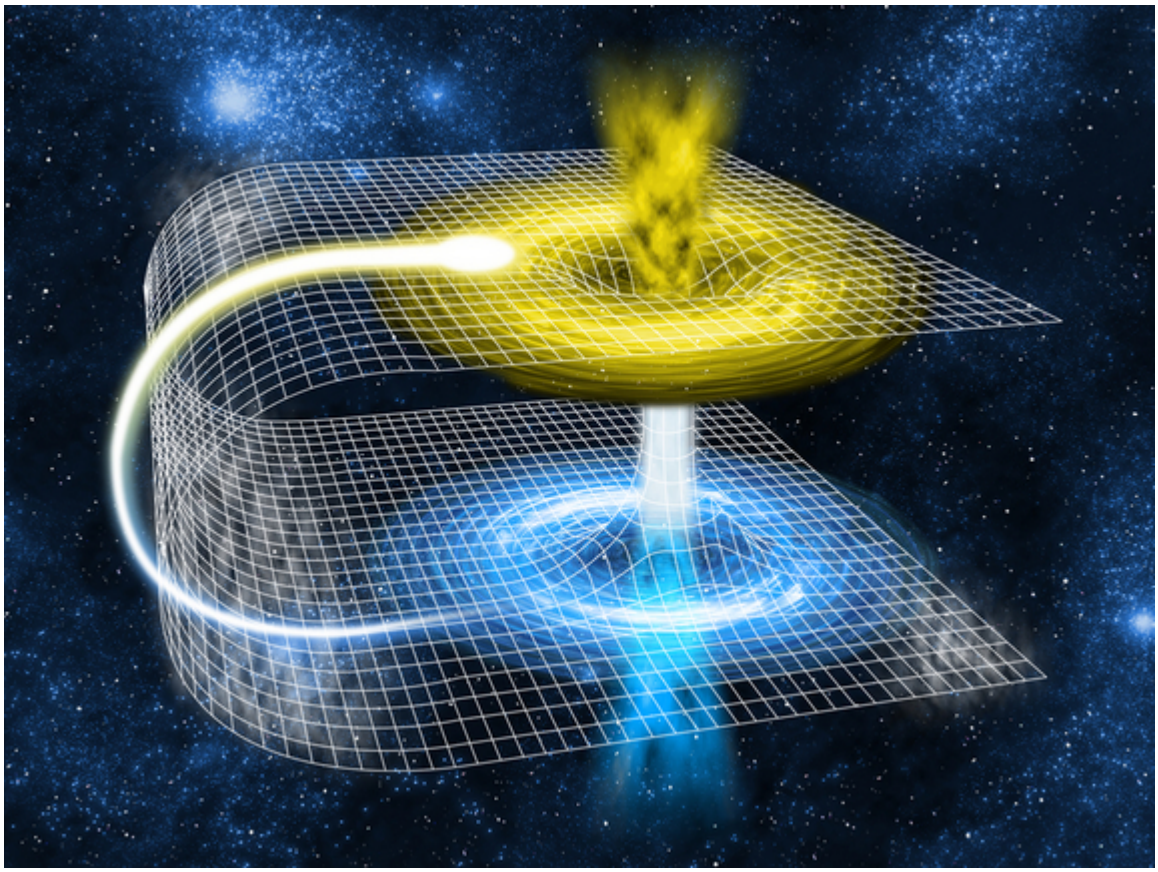
The Great Dark Lane extends approximately 20 degrees across the sky, reaching both above and below the plane of the galaxy. It sits roughly 15,000 light-years from the solar system, although the team is still working to refine the distance. It lies outside of the bulge rather than being contained within it, they said.

If the dust passed through the bulge itself, the red clump stars of the center would have a patchier distribution, rather than a clean break, as some of the stars at a certain height above the plane would be in front of the dust and others would be behind it, the

researchers said. Instead, all of the red clump stars contained within the bulge lie behind the dust, according to the study.

"Detailed maps and modeling are needed in order to test this important galactic feature," the researchers wrote in their paper, which appeared in the journal Astronomy & Astrophysics last year.

What is a Wormhole?



A wormhole is a theoretical passage through space-time that could create shortcuts for long journeys across the universe. Wormholes are predicted by the theory of general relativity. But be wary: wormholes bring with them the dangers of sudden collapse, high radiation and dangerous contact with exotic matter.

Wormhole theory

In 1935, physicists Albert Einstein and Nathan Rosen used the theory of general relativity to propose the existence of "bridges" through space-time. These paths, called Einstein-Rosen bridges or wormholes, connect two different points in space-time, theoretically creating a shortcut that could reduce travel time and distance.

Wormholes contain two mouths, with a throat connecting the two. The mouths would most likely be spheroidal. The throat might be a straight stretch, but it could also wind around, taking a longer path than a more conventional route might require.

Einstein's theory of general relativity mathematically predicts the existence of wormholes, but none have been discovered to date. A negative mass wormhole might be spotted by the way its gravity affects light that passes by.

Certain solutions of general relativity allow for the existence of wormholes where the mouth of each is a black hole. However, a naturally occurring black hole, formed by the collapse of a dying star, does not by itself create a wormhole.

Through the wormhole

Science fiction is filled with tales of traveling through wormholes. But the reality of such travel is more complicated, and not just because we've yet to spot one.

The first problem is size. Primordial wormholes are predicted to exist on microscopic levels, about 10^{-33} centimeters. However, as the universe expands, it is possible that some may have been stretched to larger sizes.

Another problem comes from stability. The predicted Einstein-Rosen wormholes would be useless for travel because they collapse quickly. But more recent research found that a wormhole containing "exotic" matter could stay open and unchanging for longer periods of time.

Exotic matter, which should not be confused with dark matter or antimatter, contains negative energy density and a large negative pressure. Such matter has only been seen in the behavior of certain vacuum states as part of quantum field theory.

If a wormhole contained sufficient exotic matter, whether naturally occurring or artificially added, it could theoretically be used as a method of sending information or travelers through space.

Wormholes may not only connect two separate regions within the universe, they could also connect two different universes. Similarly, some scientists have conjectured that if one mouth of a wormhole is moved in a specific manner, it could allow for time travel. However, British cosmologist Stephen Hawking has argued that such use is not possible. [Weird Science: Wormholes Make the Best Time Machines]

"A wormhole is not really a means of going back in time, it's a short cut, so that something that was far away is much closer," NASA's Eric Christian wrote.

Although adding exotic matter to a wormhole might stabilize it to the point that human passengers could travel safely through it, there is still the possibility that the addition of "regular" matter would be sufficient to destabilize the portal.

Today's technology is insufficient to enlarge or stabilize wormholes, even if they could be found. However, scientists continue to explore the concept as a method of space travel with the hope that technology will eventually be able to utilize them

Credit Space.com

WHAT'S HAPPENING AT MT. CUBA ASTRONOMICAL OBSERVATORY?

December 11 7:30 p.m. Scott Jackson Family Night – The Christmas Star

Due to so many sign ups for the above.

December 14 7:30 p.m. Scott Jackson Family Night – The Christmas Star

THE NIGHT SKY

DECEMBER 12TH THRU THE 20TH SKY:

Friday, December 12

This is the time of year when, around 8 or 9 p.m., Cassiopeia stands very high in the north as a flattened letter M. When will you see it perfectly level? This mostly depends on how far east or west you are in your time zone.

- **See more at:**
- **http://www.skyandtelescope.com/observing/sky-at-a-glance/weeks-sky-glance-december-12-20/#sthash.3llySqR4.dpuf**

Saturday, December 13

The Geminid meteor shower should be at its strongest late tonight and late tomorrow night. Bundle up even more warmly than you think you'll need, find a dark, shadowed site with an open view overhead, lie back in a reclining lawn chair, and watch the stars. Be patient.

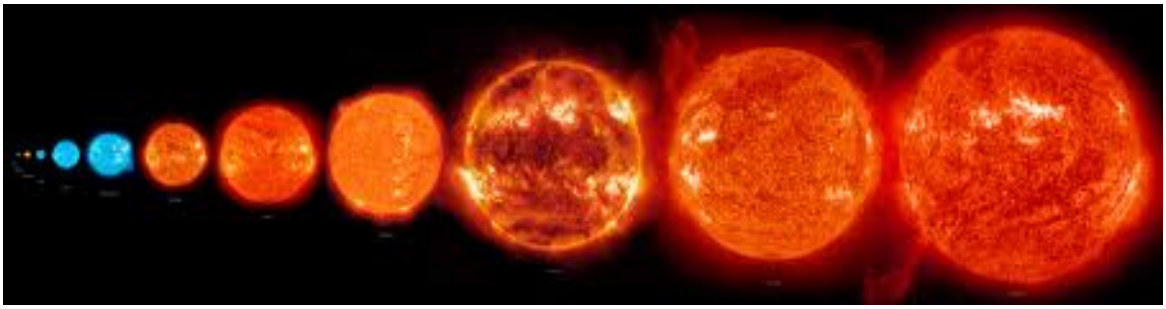
Under a fairly dark sky you may see a meteor every minute or two. You know it's a Geminid if its path, traced far enough backward across the sky, would pass close to Castor and Pollux in Gemini. The Moon, at last quarter, rises around 11 or midnight depending on your location, brightening the sky somewhat.

Monday, December 15

Double shadow transit on Jupiter! Both Io and Europa are casting their tiny black shadows onto the face of Jupiter from 1:12 to 2:02 a.m. Tuesday morning Eastern Standard Time (10:12 to 11:02 p.m. Monday evening Pacific Standard Time).

Europa itself starts crossing Jupiter at 1:18 a.m. EST, and Europa starts crossing the disk at 2:15 a.m. EST. For all about the doings on and around Jupiter for amateur telescopes this month, see "Action at Jupiter" in the December *Sky & Telescope*, page 52.

Algol is near its minimum light this evening, magnitude 3.4 instead of its usual 2.1, for a couple hours centered on 10:22 p.m. EST (7:22 p.m. PST). It takes several additional hours to fade and to rebrighten. Comparison-star chart is shown below.



To learn more, Google Comparison Star Chart.

Tuesday, December 16

Maybe you're familiar with the ET Cluster, NGC 457 in Cassiopeia. But what about its neighbor Sharpless 2-173, a faint nebula containing the weak cluster Mayer 1? Use the Queen's Kite asterism to get there, as Sue French shows in her Deep-Sky Wonders chart and column in the December *Sky & Telescope*, page 56.

Friday, December 19

Have you ever tried to catch Sirius actually rising? If you can find a good view down to the east-southeast horizon, watch for Sirius emerging about two fists at arm's length below Orion's Belt. It now rises sometime around 7:30 or 8 p.m. local time, depending on your location. When a star is very low, it tends to twinkle quite slowly and often in vivid colors. Sirius is bright enough to show these effects well.

Saturday, December 20

A deep mutual eclipse among Jupiter's moons! Callisto will cast its shadow onto Io from 10:13 to 10:32 p.m. Eastern Standard Time. At mid-eclipse, Io should be dimmed by a very noticeable 1.1 magnitude. Compare it carefully with the brightnesses of Jupiter's other moons. Io will appear just to Jupiter's east quite close to Ganymede, which is normally only 0.4 magnitude brighter. Dimmer Callisto will be just a little farther east.

The timing of this is excellent for observers in Europe, though you'll have to go out very late; add 5 hours to the times above to get UT. The timing is fair for North America's East Coast, where Jupiter will be rather low in the east. Westerners miss this one.

Planet Roundup:

Mercury is hidden in the glare of the Sun.

Venus (magnitude –3.9) is beginning to show through the glow of sunset. Look for it just above the southwest horizon 20 or 30 minutes after sundown. The farther south you live the higher it will appear.

Mars (magnitude +1.0, in Capricornus) still glows in the southwest during and after twilight. And it still sets around 8 p.m. local time.

Jupiter (magnitude –2.3, in western Leo) rises in the east-northeast around 9 or 10 p.m. About 40 minutes later, fainter Regulus (magnitude +1.4) rises below it. By dawn they shine high in the southwest — with Regulus now to Jupiter's left.

Saturn (magnitude +0.5, between Libra and Scorpius) is emerging into the dawn sky. During early dawn look for it low in the southeast, far below Arcturus.

Uranus (magnitude 5.8, in Pisces) and Neptune (magnitude 7.9, in Aquarius) are still well up in the southern sky right after dark. Use binoculars or a small telescope and our a finder chart.

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
Membership Form

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

Monthly newsletter that includes details about the groups activities and articles on astronomy as well as other related subjects.

Monthly programs on subjects and topics of astronomical interest.

Free or discounted subscriptions to astronomy related publications.

Free registration to MCAG workshops and classes.

Mention Mount Cuba Astronomical Group and receive a 5% discount at Manor Books in New Castle (http://www.yelp.com/biz/manor-used-books-New Castle)

Name_____

Email Address_____

Home Address_____

Phone (optional)_____

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