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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MAY'S MEETING
TUESDAY the 13th @ 7:30 p.m.

Carolyn Stankiewics will give a mini talk on the Southern Constellations. Hank will also give a mini talk regarding the details of two orbiting objects. Read Phenomena later in the STAR. There should be a fair amount of time for observing so let's hope the is sky clear and bright.

APRILS MEETING REVIEW

Hank Bouchelle did a wonderful job of presenting a thurough overview of topics on our closest neighbor the Moon. He began by explaining how the moon was formed and concluded with the best view of Earth from the moon.
I have included an article on the Moon in this issue of the STAR. Most of what is included in the article was covered by Hank in his presentation.

OBSERVATIONS FROM THE COMFORTABLE CHAIR
Hank Bouchelle Co-Chair MCAG

Another year of the Mount Cuba Astronomy Group is drawing to a close. Tempus fugit!! It is completely rewarding to watch the interest and participation in our group grow. A few examples:

We have learned much from programs and speakers whose topics were as diverse as buying a ticket to space, the adventures and accomplishments of Annie Jump Cannon, and the details of constructing an exquisitely accurate sundial. We also heard a first-hand account of an astronomically-related visit to Hawaii.

Soon we resume our Woodside Creamery Star Parties in Hockessin. For details, see elsewhere in The STAR, or contact star party host extraordinaire Dave Groski – david.m.groski@dupont.com. There is always something happening astronomically. An example is that Neptune is at opposition with (opposite) the Sun in late August, thus rising at sunset and up all night.

The MCAG offers Delaware teachers additional ways to advance their professional development and accumulate contact-hour credits for continuing teacher certification.

The schedule and details regarding the MCAO Summer Astronomy Camp this June are confirmed, and registrations are accumulating. For information, contact hbouchelle@live.com or 302-983-7830.

The accomplished Scott Jackson and our all-too-humble STAR editor, Paul Stratton, are continuing presences in the annual Delaware Science Olympiad.

Phenomena

Hank Bouchelle
May 2014

One of mankind's most tumultuously intellectual fistfights dealt with the identity of the object at the center of the Solar System (and for that matter, the Universe). To the early Ancients, the answer was obvious. One needed only casual notice to show that it is Earth. Thus, for these folks the Universe had seven "planets" orbiting Earth. The names of these "planets" gave names to the days of the week. The Sun's day was Sunday; Saturn's day was Saturday, and so on.

Unlike the unambiguous romance language-designation of celestial objects (like Mardi – *Mars* day and Mercredi – *Mercury* day, in French), English has substantial roots in Norse languages. This makes it difficult to identify the planet celebrated, for example, Friday or Thursday. These designations relate to Norse/Saxon/ Old High German deities. Friday honors the goddess Freyja, while Wednesday celebrates Oden (or Woden).

Eventually sufficient evidence and argumentation led to a critical mass of opinion leaders who persuaded most people that the Sun holds the central position. However, nothing is as simple as we might hope. Worse, from time to time we have to decide between Truth or Facts. (Full disclosure: I am dedicated to the former, and have the scars, metal plates, and nervous tics to prove it.)

It must be noted that the most sophisticated computer programs, calculating the most spacious of time intervals into the past and future, cannot identify a date when the planets are all in alignment, like pearls on a string. Of course, when we observe a few of the planets in a line, it is merely an artifact of our location rather than the relationships among the planets themselves. The three stars aligned in Orion's "belt' can be as distant from each other as we are to them.

However, when a few of the planets, especially the larger ones, are on the same side of the Sun, the center of mass of the Solar System (the *barycenter*) can be 500,000 miles above the surface of the Sun. In such situations, the Sun is clearly not the center of the Solar System, whose true center resides approximately one million miles away from the Sun's center.

One of our MCAG's May 13 meeting mini-talks attempts to address a similar Earth/Moon state of affairs. We hope to see you there!

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. When you see a term or name *underlined, italicized and in red* 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 appreciated.

NEW TERMS AND TOPICS:

What is a radio telescope?

Radio telescope is an astronomical instrument consisting of a radio receiver and an antenna system that is used to detect radio-frequency radiation emitted by extraterrestrial sources. Because radio wavelengths are much longer than those of visible light, radio telescopes must be very large in order to attain the resolution of optical telescopes.

What is a solar mass?

An astronomical unit of mass equal to our sun's mass, 1.981×10^{30} kilograms. You may come across a number such as .5 solar mass which translates to one half the mass of our sun. Perhaps you may see an object with a billion solar masses which translate to one billion times the mass of our sun.

What is a qausi-stellar radio sources?

This is best answered with history. When radio telescopes were first turned on the heavens, point sources of radio waves were discovered (along with spread-out regions of emission along our Milky Way). Astronomers using ordinary visible-light telescopes turned toward these radio points and looked to see what was there. In some cases a supernova remnant was found, in others, a large star-birth region, in others a distant galaxy. But in some places where point sources of radio waves were found, no visible source other than a stellar-looking object was found (it looked like a point of like --- like a star does). These objects were called the *"qausi-stellar radio sources",* or "quasars" for short. Later, it was found these sources could not be stars in our galaxy, but must be very far away --- as far as any of the distant galaxies seen. We now think these objects are the very bright centers of some distant galaxies, where some sort of energetic action is occurring, most probably due to the presence of a super massive black hole at the center of that galaxy (super massive = made up from a mass of about a billion *solar masses*).

MCAG PUBLIC OUTREACH:

The MCAG along with the MCAO will be offering a summer camp. For more information see the Attachment to this email or please contact Hank Bouchelle at 302-983-7830 or email Hank at 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 1st 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 it's moons.

A write up of the Creamery Star Party.

The weather looked to be perfect on May 3 for our first Outreach at the Woodside Creamery but it's Delaware so you never know. I arrived at 7:30pm to find Scott Jackson, ready to go with his 10" Meade SCT. I set up my 8" homemade Dob next to him and within a few minutes we were showing the Moon and Jupiter to a number of people. A few minutes later Vic Leonard from A.I. dupont high school arrived with a number of members of the school's astronomy club. Unfortunately, it wasn't too much longer and a cold front started to roll in and clouded us out. Woodside provides us with token so we could get free ice cream. The rain drops soon started to fall, so Scott and I packed up and we hung out with the rest of the group for awhile, and enjoyed our ice cream and good conversation. Even thou the observing was cut short by the weather we still had a good time. By the time I got home the skies had cleared and I was able to observe Mars from my backyard. Delaware weather!

The next event is scheduled for June 7th, hopefully the weather will be better and more of the group will come out and enjoy the event.

Submitted by Dave Groski. Well done and thanks Dave.

NEWS FROM THE WORLD OF ASTRONOMY:

THE MOON;

Scientists have pinned down the birth date of the moon to within 100 million years of the birth of the solar system — the best timeline yet for the evolution of our planet's natural satellite.

This new discovery about the origin of the moon may help solve a mystery about why the moon and the Earth appear virtually identical in makeup, investigators added.

Scientists have suggested the moon was formed 4.5 billion years ago by a gigantic collision between a Mars-size object named Theia and Earth, a crash that would have largely melted the Earth. This model suggested that more than 40 percent of the moon was made up of debris from this impacting body. (Current theory suggests that Earth experienced several giant impacts during its formation, with the moon-forming impact being the last.)

However, researchers suspected Theia was chemically different from Earth. In contrast, recent studies revealed that the moon and Earth appear very similar when it comes to versions of elements called isotopes — more so than might be suggested by the current impact model. (Isotopes of an element have differing numbers of neutrons from one another.)

"This means that at the atomic level, the Earth and the moon are identical," study lead author Seth Jacobson, a planetary scientist at the Côte d'Azur Observatory in Nice, France, told Space.com. "This new information challenged the giant impact theory for lunar formation."

How the moon evolved

No one seriously disputed an impact as the most likely scenario for the formation of the moon, Jacobson said. However, a virtually atomically identical moon and Earth threw the exact circumstances of the collision into question, he said.

Now, by pinpointing when the moon formed, Jacobson and his colleagues could help explain why the moon and Earth are mysteriously similar. The scientists detailed their findings in the April 3 issue of the journal Nature.

Efforts to date the moon-forming impact have proposed a range of ages. Some have argued for an early event, about 30 million years after the birth of the solar system, whereas others suggested that it occurred more than 50 million years and possibly as much as 100 million years after the solar system formed.

To help solve this mystery, Jacobson and his colleagues simulated the growth of the solar system's rocky planets — Mercury, Venus, Earth and Mars — from a protoplanetary disk of thousands of planetary building blocks orbiting the sun.

By analyzing how these planets formed and grew from more than 250 computer simulations, the researchers discovered that if the moon-forming impact was early, the amount of material accreted onto Earth afterward was large. If the impact was late, the amount would then be small.

This artist's illustration depicts a giant impact object …

Past research had calculated the amount of material accreted onto Earth after the moon-forming impact. These estimates are based on how so-called highly *siderophile* or "iron-loving" elements such as iridium and platinum show a strong tendency to move into Earth's core. After each giant impact the nascent Earth sustained, these elements would have leached from Earth's mantle and bonded with heavy, iron-rich material destined to sink to Earth's heart.

Moon birth mystery

After the last giant impact that formed the moon, the mantle should have been almost completely stripped of iridium, platinum and their cousins. These elements are still present in the mantle, but only in small amounts, which suggests only a small amount of material accreted onto Earth after the moon-forming impact.

The researchers calculated the moon-forming impact must have occurred about 95 million years after the formation of the solar system, give or take 32 million years.

"A late moon-forming event, as suggested by our work, is very consistent with an identical Earth and moon," Jacobson said.

In addition, recent analyses propose that the impact that created the moon required a faster, more energetic collision than previously suggested. This makes sense if the impact took place relatively late with an older protoplanetary disk, as the new findings suggest.

"Older disks tend to be dynamically more active, since there are fewer bodies left in the disk to distribute energy amongst," Jacobson said.

These new findings raise an interesting new puzzle. While they suggest the moon and the Earth formed together nearly 100 million years after the solar system arose, evidence from meteorites from Mars suggests that the Red Planet formed as little as a few million years after the solar system was born.

"This means that Earth and Mars formed over dramatically different timescales, with Mars forming much faster than the Earth," Jacobson said. "How can this be? Is it just a matter of size? Location? What about Mercury and Venus? Did they grow on similar timescales to the Earth or on timescales more similar to Mars? I think these are some of the really important questions that we, as a community of planetary scientists, will be addressing in the future.

A DIAMOND PLANET

— The diamond planet is part of a binary star system located 4,000 light-years from Earth.

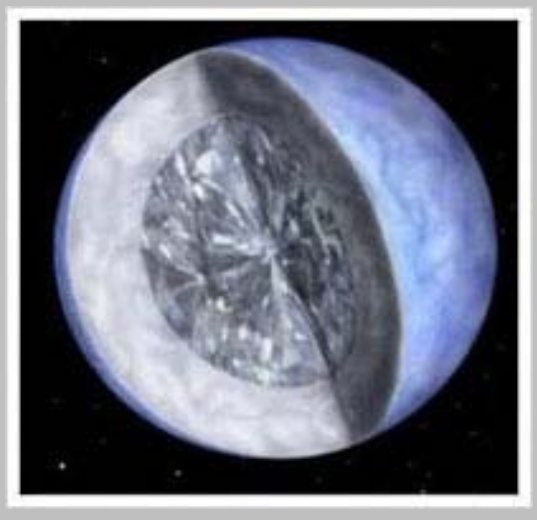
— The body is the leftovers of a once-massive star, now reduced to solid crystal-like carbon — diamond.

— Scientists would like to find a pulsar with a black hole companion.

Astronomers have found the remains of a once-massive star, now transformed into a solid diamond five times bigger than Earth.

The object circles a pulsing companion star about 4,000 light years from Earth in the constellation Serpens (The Snake), which lies about one-eighth of the way toward the center of the Milky Way galaxy.

Astronomers noticed that the steady pulses of energy coming from the star, known as J1719-1438, were regularly and minutely disturbed, a phenomenon caused by the gravitational tug of another, smaller circling object.



NEWS: Planet in the Sky With Diamonds

By measuring the pattern, scientists were able to figure out how far away the second object circles and its mass, leading to the realization that they had found a bizarre binary system, with one partner reduced to a diamond core.

"In this case, something with the mass of our sun has evolved to be something the mass of a planet — quite extraordinary," astronomer Michael Keith, with the Australia Telescope National Facility, wrote in an email to Discovery News.

The companion to J1719-1438 never got big enough to produce elements much heavier than carbon, so after its lighter-weight hydrogen and helium were stripped away that would leave a solid core of carbon — diamond.

"Due to the immense pressure, the carbon will be in a dense crystal-like structure, although much more closely packed than in a diamond on Earth," Keith said.

The system is now stable, with no evidence that it will change for billions of years.

NEWS: Diamond Oceans Possible on Uranus, Neptune

"Of course, this also means that it could well have been around for a long time, just waiting for us to find it. Since it's likely to last for longer than the Earth or the sun, I would say that in this case, a diamond really is forever," Keith said.

The diamond planet was found as part of an ongoing search for pulsating stars, known as pulsars, which scientists like to use as probes.

"We'd like to find a pulsar with a black hole companion," Michael Kramer, director of the Max Planck Institute for Radio Astronomy in Bonn, Germany, told Discovery News. "It's the exotic case that tell us most about the laws of physics and what's going on in the universe."

Credit to Discovery News. The research is published in this week's Science.

<u>TELESCOPE WORKSHOP:</u>

During Aprils workshop, Dave Groski and Robert Stack were able to offer assistance to some people who were having problems with their telescopes.

<u>MAY'S SKY:</u>

May 5 and 6 - Eta Aquarids Meteor Shower Peak - This shower is composed of dusty remnants of the famed Halley's Comet. The long-running shower is visible from April 19th until May 28, but peaks overnight on May 5th with up to 60 sightings per hour. The first quarter moon should set right around midnight local time, which will really improve

conditions for spotting meteors. Though the meteors can appear anywhere in the sky, it will appear that they are coming from the Aquarius constellation.

May 10th. – Saturn in opposition best time to view.

May 24th. – Meteor shower. Remnants of the comet P/209 Linear. This could be impressive.

PUBLIC NIGHTS AT MCAO:

5-May-14	**Rob Lancaster**	**To be determined**
19-May-14	**Scott Jackson**	**How Astronomical Events changed history**
9-June-14	**Greg Weaver**	**The Southern skies-stars**

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

MOUNT CUBA ASTRONOMICAL GROUP
MGAG

Membership

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.

Membership Application

Name_____

Home address_____

_____

E-mail address_____

Phone (optional)_____

Please send application to:

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