



THE STAR

THE NEWSLETTER OF THE
MOUNT CUBA ASTRONOMICAL GROUP
VOL. 3 NUM. 2

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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
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GREENVILLE, DE
FOR DIRECTIONS PLEASE VISIT
www.mountcuba.org

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OCTOBER'S MEETING:
TUESDAY THE 14th at 7:30 p.m.
Mt. Cuba Astronomical Observatory.

Dave Groski will give a brief talk on the Edmund Scientific Spilhaus astronomical clocks that he has restored.

Hank Bouchelle will present the October night sky. Lots of good things to look for in October.

And of course, we will do some observing weather permitting.

SEPTEMBER'S MEETING REVIEW:

Scott Jackson gave an informative talk on the parks he visited this summer. Cherry Springs State Park near West Branch, Pa Upside is open fields with clear views. Downside site is closed at night so once you're in you are in till morning. Long drive from Rt. 15. Hills Creek State Park near Mansfield, NJ is close and does have a few relatively clear viewing sites but mostly wooded area.

Hank Bouchelle, presented a great talk on the moon. I think Hank really wants to go there. The specific subject matter dealt with the Harvest Moon. Of particular interest to me was what makes this Harvest Moon a Super Moon. It qualifies because the moon turns full less than one day after reaching lunar perigee – the moon's closest point to Earth for the month.

He also showed the group a Solar Viewer which can be purchased from www.rainbowsymphony.com Mine is on the way. What fun it shall be to view the Sun without damaging ones eyes should be quite interesting.

In closing, he reviewed the old faithful Sky Calendar.

EDITOR'S NOTE:

If you have trouble opening a hyperlink, right click and select open hyperlink. Sometimes they work by clicking on the link and sometimes you need to right click.

In September's issue, I included an article on a specific constellation. It was well received so I shall continue this series with Aquarius. Next up is the Great Bear. Please see Constellations below.

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OBSERVATIONS FROM THE CONFORTABLE CHAIR

Hank Bouchelle Co-Chair MCAG

On October 7, 2014 the MCAG offered the first of what we can expect to be many and continuing teacher/members of the public workshops. This first workshop was held in a newly refurbished planetarium, intended as an introduction to the Solar System and the stars arranged around it.

The goal is to provide knowledge and experiences to the participants. I believe that the way to accomplish these goals is as much as possible to connect everyday, if not mundane, experiences to its underlying meaning or composition. If you have an electric stove you have seen the heater coil turn first red and then orange as it gets hotter. Candles operate on combustion, but the yellow color of its flame is the next step up in temperature. We realize intuitively that the blue flame of a blowtorch signals an extremely high temperature. That the Sun appears yellow reveals that it is in the middle. In fact, the Sun is exactly average in most ways. It is middling in temperature, mass, and diameter. In fact, the Sun is also middle-aged!

Phenomena

A Solar System with Pepperoni: A Recipe

Something afoot in the Universe causes large, loosely-bound volumes of material to contract into rotating disks. In general terms gravity is at work, of course. We normally expect gravity to pull such forms into more or less compact spheres, like the Sun or Earth. Saturn's rings and billions of galaxies all around us reveal disk-light shapes. To the same effect pizza makers toss a more or less spherical lump of dough into the air that becomes through rotation a pizza crust.

A pizza can provide a nearly perfect model of the Solar System: Place a yellow bell pepper in the center of the pizza and around it arrange eight or nine (depending on your religion) pepperonis.

The pizza, just like the early Solar System, thinned as it rotated to create a "flat" Solar System. If we imagine ourselves on the third pepperoni from the Sun, we notice immediately that the Sun and planets are arranged around us, but we can only see them if we look toward the path around us. There are no Solar System objects "over our heads" nor down "beneath us." This path is the ecliptic and it makes objects relatively easy to find. For the northern hemisphere this path is arrayed from the eastern horizon,

relatively high in the south, and then toward the western horizon. If we want to see planets in the night sky we need only observe the path of the Sun in the daytime sky!

Even the pepperoni rinds around the pepperoni slices serve our model. The rinds represent the circular path that the planets' satellites follow as they move around their planets. They, too, are creatures of the ecliptic. They, too, lie on the same path constraining the apparent path of the planets.

There only two major distractions in the pepperoni Solar System. One is the wildly distorted distances among our pepperoni planets. Associated with this is the hopeless task of making planets to scale. Even if we went for the small and made the scale one inch to a million miles, the Sun would be about eight-tenths of an inch in diameter and Pluto, planet or not, would be microscopic and 100 yards away.

And then there is the problem of the varying velocities of the planets. The size of the orbital path increases with each planet outward. The orbital velocity of each planet also falls with distance with the Sun.

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 appreciate.

Supergiants: Supergiants are among the most massive and most luminous stars. They occupy the top region of the Hertzsprung–Russell diagram with bolometric absolute magnitudes between -5 and -12 and temperatures from about 3,500K to over 20,000K.

See more on the Hertzsprung-Russell diagram below.

Centaur: An object that has an unstable orbit and crosses giant planets' orbits. Mythological centaurs had both human and horse features, while centaurs in the solar system may have both comet and asteroid characteristics.

Metastable state: Full Definition of METASTABLE STATE. : A state of precarious stability; specifically: such a state of an atom which though excited cannot emit radiation without a further supply of energy. This is a great topic to do some further study of since it is a term used in Chemistry as well as Physics.

Type Ia supernova: Type Ia supernovae occur in binary systems (two stars orbiting one another) in which one of the stars is a white dwarf while the other can vary from a giant

star to an even smaller white dwarf.^[1] A white dwarf is the remnant of a star that has completed its normal life cycle and has ceased nuclear fusion. However, white dwarfs of the common carbon-oxygen variety are capable of further fusion reactions that release a great deal of energy if their temperatures rise high enough.

MCAG PUBLIC OUTREACH:

SCHOOLS:

Dr. Bouchelle and Jerome Hill, a science teacher at A. I. DuPont Middle School have now begun teaching basic Astronomy classes to teachers which can be applied towards their accreditation requirements.

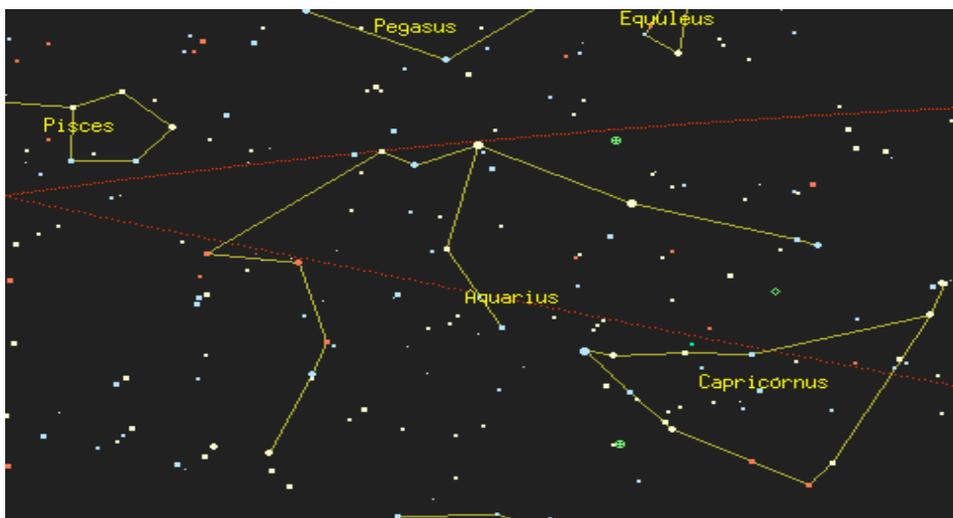
Dave Groski will continue as an advisor to the A. I. DuPont High School Astronomy Club and Paul Stratton is looking forward to working with the students at Conrad Schools of Science on the Science Olympiad project.

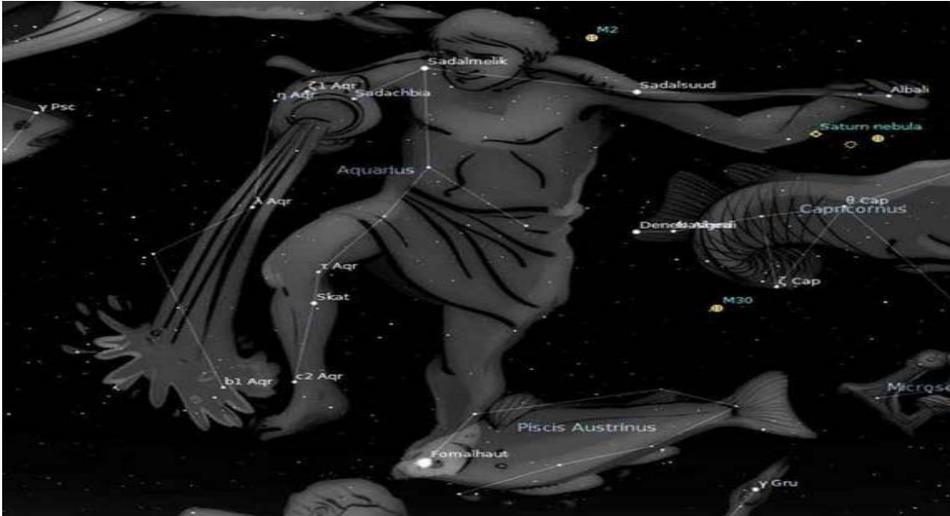
CONSTELLATIONS:

AQUARIUS

Aquarius, or the "Water Bearer," is a constellation in the southern hemisphere. It is one of the 12 constellations of the Zodiac family, which lie on the Sun's apparent path in the sky. Its name means "water bearer" or "cup bearer" in Latin. Aquarius is one of the oldest recognized constellations in the sky. In Greek mythology, it is identified with Ganymede, a handsome young man Zeus fell in love with and, taking the form of an eagle (Aquila), carried off to Olympus to serve as cup-bearer to the gods.

The stars in the Aquarius constellation can be interpreted as resembling the figure of a man holding a bucket with a pouring stream of water. The constellation Crater is often referred to as his cup. In Babylonian astronomy books, Aquarius is called "GU.LA" or "The Great One" and identified with the god Ea, the ruler of the southern quarter of the Sun's path, the "Way of Ea." In the Hindu zodiac, Aquarius is called "kumbha," which also means "water-pitcher."





The top picture will help you locate Aquarius while the bottom picture will help you imagine why it is called the Water Bearer.

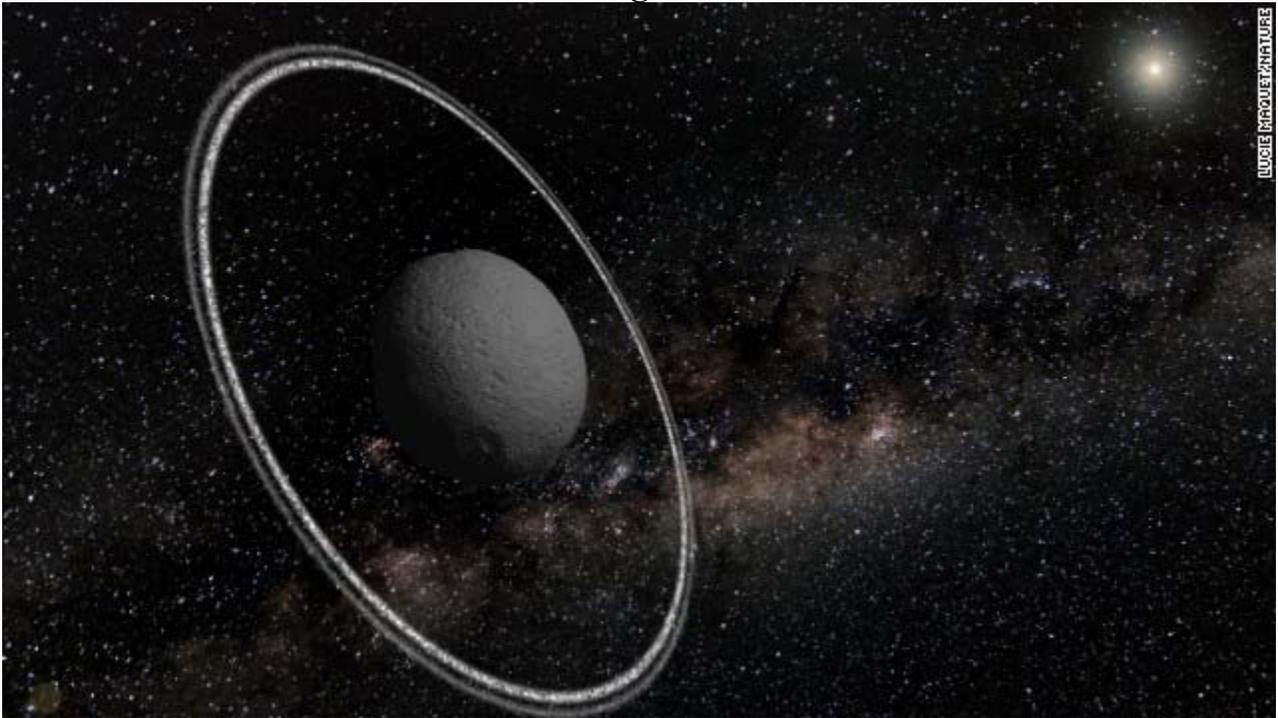
The Aquarius constellation occupies an area of 980 square degrees and contains five stars with known planets. It can be seen at latitudes between $+65^\circ$ and -90° and is best visible at 9 p.m. during the month of October. The constellation lies in the region sometimes referred to as the Sea, or the Water, an area occupied by many water-related constellations, including Cetus (the Whale), Delphinus (the Dolphin), Eridanus (the Great River) and Pisces (the Fish). In sidereal astrology, the Sun passes through Aquarius from mid-February to mid-March. In popular (tropical) astrology, the Sun is considered to pass through Aquarius from January 20 to February 18.

The brightest star in the Aquarius constellation is Beta Aquarii, also known by its traditional name Sadalsuud. The name derives from the Arabic phrase "sa'd al-suud," meaning "luck of lucks." Beta Aquarii has a magnitude of 2.9 and lies 610 light-years from Earth. It is classified as one of the rare yellow supergiants.

For additional information, go to TopAstronomer.com

NEWS FROM THE WORLD OF ASTRONOMY:

Astronomers find first asteroid with rings



This is an artist's interpretation of the ring system around asteroid Chariklo.

The remote asteroid Chariklo orbits between Saturn and Uranus in the outer solar system. Researchers published a study in the journal Nature showing evidence of rings around it.

Lead author Felipe Braga-Ribas of the Observatorio Nacional/MCTI in Rio de Janeiro said the discovery came as a complete surprise.

"We weren't looking for a ring and didn't think small bodies like Chariklo had them at all," he said in a statement.

Chariklo is fairly small -- 250 kilometers (150 miles) in diameter. It is classified as a "centaur,"

The asteroid is only the fifth solar system object whose rings have been detected. Jupiter, Saturn, Uranus and Neptune also have rings.

Telescopes at seven different locations, including the European Southern Observatory's La Silla site in Chile, saw a star seem to disappear for a few seconds on June 3, 2013. This happened because the star's light was obscured by Chariklo.

The star's brightness also diminished a few seconds before and after that main blocking of light. Astronomers discovered that rings were responsible, and calculated their size, shape and orientation.

The two rings orbiting the asteroid are relatively narrow: 7 kilometers and 3 kilometers across. They are separated by a gap of 9 kilometers. Scientists are informally calling these rings Oiapoque and Chui, after rivers near the northern and southern ends of Brazil.

The gravitational interactions from small moons may be keeping the orbiting material in ring form, scientists said.

"So, as well as the rings, it's likely that Chariklo has at least one small moon still waiting to be discovered," Braga-Ribas said in a statement.

And someday the rings themselves may lead to a moon being formed, scientists said. On a larger scale, a similar process could have been involved in the making of our own moon, as well as other planetary satellites.

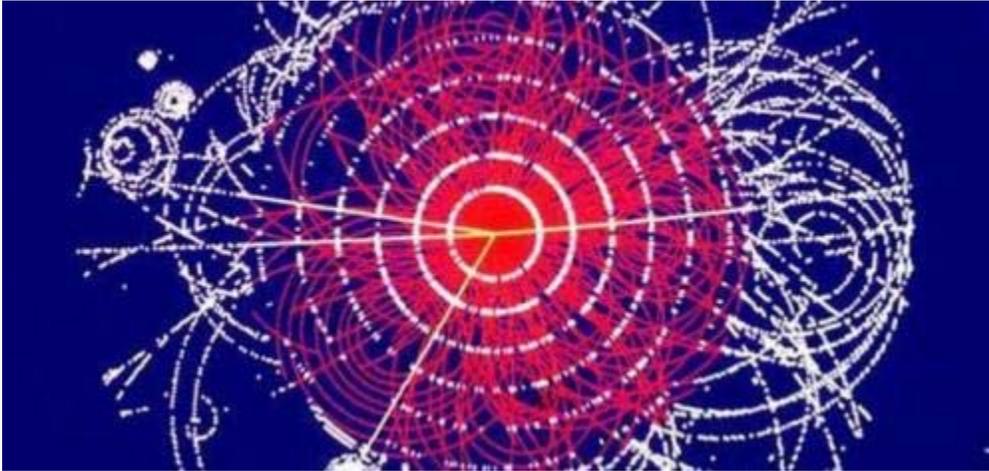
How these rings came to be is mysterious. One idea is that a collision created a disc of debris, the European Southern Observatory said.

"This discovery suggests that the event(s) responsible for the origin of the rings is relatively recent, or that a fortuitous balance of forces have combined to help sustain them," said Ed Beshore, deputy principal investigator for NASA's OSIRIS-REx mission, which aims to visit a near-Earth asteroid and bring a sample back to Earth. Beshore was not involved with this study.

Scientists planning [OSIRIS-REx](#), targeting an asteroid called Bennu, are finding challenges with the dynamics of small celestial bodies, Beshore said. The Nature study reinforces the idea that asteroids, comets and other relatively small bodies are "no longer second-class citizens in our solar system," he said.

"Indeed, they may harbor important clues about the origins and mechanisms that helped create our planet Earth, and the processes that supported the rise of life here," he said.

Is the universe a stable quantum system?

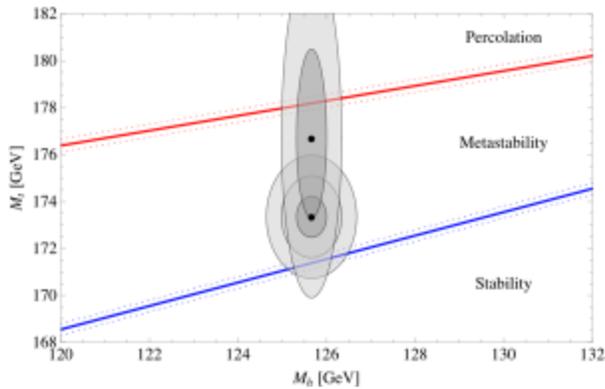


According to legend, when Damocles declared that his king, Dionysius, must have a posh and easy life, Dionysius offered to trade places with Damocles. There was only one catch. Dionysius decreed that a sword be suspended over the throne by a single horse hair, so that Damocles would always know the peril of being king. Since then the Sword of Damocles has come to represent a threat of doom that could strike without warning. While the prospect of living under a hanging sword doesn't seem pleasant, stories of impending doom are quite popular, particularly within popular science.

Every now and then some science news story will hit the press trumpeting the latest Damocles sword. Giant asteroid could wipe out life on Earth! Nearby supernova could kill us all! Solar flares could destroy civilization! Geomagnetic reversal! Rogue black holes! And on and on. The latest doomsday news to hit the press stems from a claim by Stephen Hawking that the existence of the Higgs boson means that the universe could spontaneously collapse at any moment. Game over, Man! Game over!

Like most such hype, the real story is both less sensational and more interesting. It all starts with a long-known property of quantum mechanics, that quantum systems don't always have to settle in their most stable configuration. They can instead find themselves in a locally stable state (known as a **metastable state**). We see this, for example, with electrons in an atom. The stable state of an electron in an atom is its lowest possible energy level, but an electron can be in a higher energy level for a while. Eventually it can drop to a lower energy level, which releases a photon. This effect is why we see line spectra in stars and interstellar clouds.

With the discovery of the Higgs field, one question we can ask is whether the universe as a quantum system it is in a stable, low-energy state, or in a **metastable** higher energy state. According to the standard model of particle physics, the answer depends upon the masses of the top quark and the Higgs boson. The more massive the Higgs boson, the more likely the universe is to be stable. The more massive the top quark, the more likely the universe is to be **metastable**, or even unstable. From our current measurements of the top and Higgs masses, it seems that our universe is **metastable**.



Measures of the top quark vs Higgs boson masses, compared to stability calculations.
Credit: Sean Carroll

If our understanding is correct, then the universe as a whole could be in a locally stable configuration, but it could also jump to a lower energy state through a process of quantum tunneling. If that happened, the universe would collapse and we'd all go bye bye. So to our best understanding, it is possible for the universe to collapse. Of course by the same process it is also possible that if you run toward a wall the atoms in your body will quantum tunnel through the wall and you'll find yourself on the other side. The chances of that actually happening is negligible at best.

Of course if the universe were too stable, that could lead to other problems, such as the idea that we are actually just Boltzmann brains. Being metastable could actually be a good thing rather than a sign of impending doom.

So there's no need to cancel your vacation plans, or stop saving for retirement. Even if there is a cosmic sword of Damocles, the quantum thread holding it is much stronger than you might suspect.

Exoplanet Planet Discovery

Drake Equation: Estimating the Odds of Finding E.T.

How often do we hear the question is there life on other planets? Perhaps we should ask what are the odds of finding life on other planets. The Drake equation takes into account several factors that may answer both questions. This should be a good read for all.

The Drake Equation is used to estimate the number of communicating civilizations in the cosmos, or more simply put, the odds of finding intelligent life in the universe.

First proposed by radio astronomer Frank Drake in 1961, the equation calculates the number of communicating civilizations by multiplying several variables. It's usually written, according to the Search for Extraterrestrial Intelligence (SETI), as

$$N = R^* \cdot f_p \cdot n_e \cdot f_l \cdot f_i \cdot f_c \cdot L$$

- **N = The number of civilizations in the Milky Way galaxy whose electromagnetic emissions are detectable.**
- **R* = The rate of formation of stars suitable for the development of intelligent life.**
- **f_p = The fraction of those stars with planetary systems.**
- **n_e = The number of planets, per solar system, with an environment suitable for life.**
- **f_l = The fraction of suitable planets on which life actually appears.**
- **f_i = The fraction of life bearing planets on which intelligent life emerges.**
- **f_c = The fraction of civilizations that develop a technology that releases detectable signs of their existence into space.**
- **L = The length of time such civilizations release detectable signals into space.**

The challenge (at least for now) is that astronomers don't have firm numbers on any of those variables, so any calculation of the Drake Equation remains a rough estimate for now. There have been, however, discoveries in some of these fields that give astronomers a better chance of finding the answer.

Exoplanet discoveries

Astronomers certainly could imagine the existence of other planets outside the solar system in 1961, but it took until 1995 until the first confirmed exoplanet was found. Called 51 Pegasi b, the discovery ushered in a new era where astronomers were able to track down first dozens, and then hundreds, of other planets across the universe.

Traditionally, planets have been found through two methods: watching them transit across a star (which causes a dimming that can be measured from Earth) or examining the gravitational wobbles the planets induce as they orbit around their parent star. More recently, a technique called "verification by multiplicity" allows astronomers to quickly identify multiple-planet systems.

Estimating the total number of planets in the universe is difficult, but one statistical study suggests that in the Milky Way, each star has an average of 1.6 planets – yielding 160 billion alien planets in our home galaxy. (The study used a technique called gravitational lensing that observes changes in light curves when a relatively nearby star passes in front of more distant objects.) [Related: 13 Ways to Hunt Intelligent Aliens]

As of March 2014, more than 1,700 exoplanets have been confirmed. The vast bulk of them were due to an observatory called the Kepler Space Telescope, which scrutinized a single spot in the Cygnus constellation between 2009 and 2013. Plumbing the data, astronomers continue to make discoveries from the information.

Suitable for life?

To date, most of the planets that have been discovered were Jupiter-sized or larger, but this may be because these gas giants are easier to spot in telescopes. A slew of Kepler discoveries announced in February 2014 mainly contained super-Earths, or planets that are slightly larger than Earth and are considered by many astronomers to be habitable under the right conditions.

Among the planets discovered by all telescopes, however, only a tiny fraction of them are likely to have an environment suitable for life. Astronomers can't measure this metric for sure yet, but a few factors likely come into play, such as how close a planet is to its parent star and what its atmosphere contains.

As of March 2014, the Habitable Exoplanets Catalog identified 20 confirmed planets that could be suitable for life, and 69 planets (yet to be confirmed) that could also be suitable. The project is a part of the Planetary Habitability Laboratory at the University of Puerto Rico at Arecibo.

"These are artistic representations of all the planets around other stars (exoplanets) with any potential to support surface life as we know it," the catalog states below an illustration of the planets. "All of them are larger than Earth and we are less certain about their composition and habitability, but they represent the best objects of interest for future observations." [Related: 5 Bold Claims of Alien Life]

Finding life outside of Earth — even microbial life — would be an important step toward better understanding the Drake Equation. Astronomers in fact have not given up on finding life within our own solar system. There are several areas that could host habitable environments now, or did in the past, such as the planet Mars or Jupiter's moon Europa.

A next step would be determining how to send a message to extraterrestrials and whether they could receive or understand it. On a small scale, astronomers have beamed messages to the stars and in a few cases, put discs on board spacecraft (such as Voyager) for anyone in the neighborhood to read and potentially find Earth for further for communications.

Time Travel is Possible, Latest Research

The mysteries of space are very abundant and fascinating. Who would have thought one day man would reach the stars. Today it is a reality. Time travel too is one such mystery science is trying to unravel.



A group of researchers has taken up the challenge. They have replicated how time traveling photons might behave. This could mean time travel is possible, busting the "grandfather's paradox".

To simulate quantum particles traveling back through time they used photons of single particles of light. Scientists were astounded, the behavior of these photons were peculiar aspects of modern physics.

Researchers observed two possible results of a time traveling photon; a photon traveling through time and interacting with its older self.

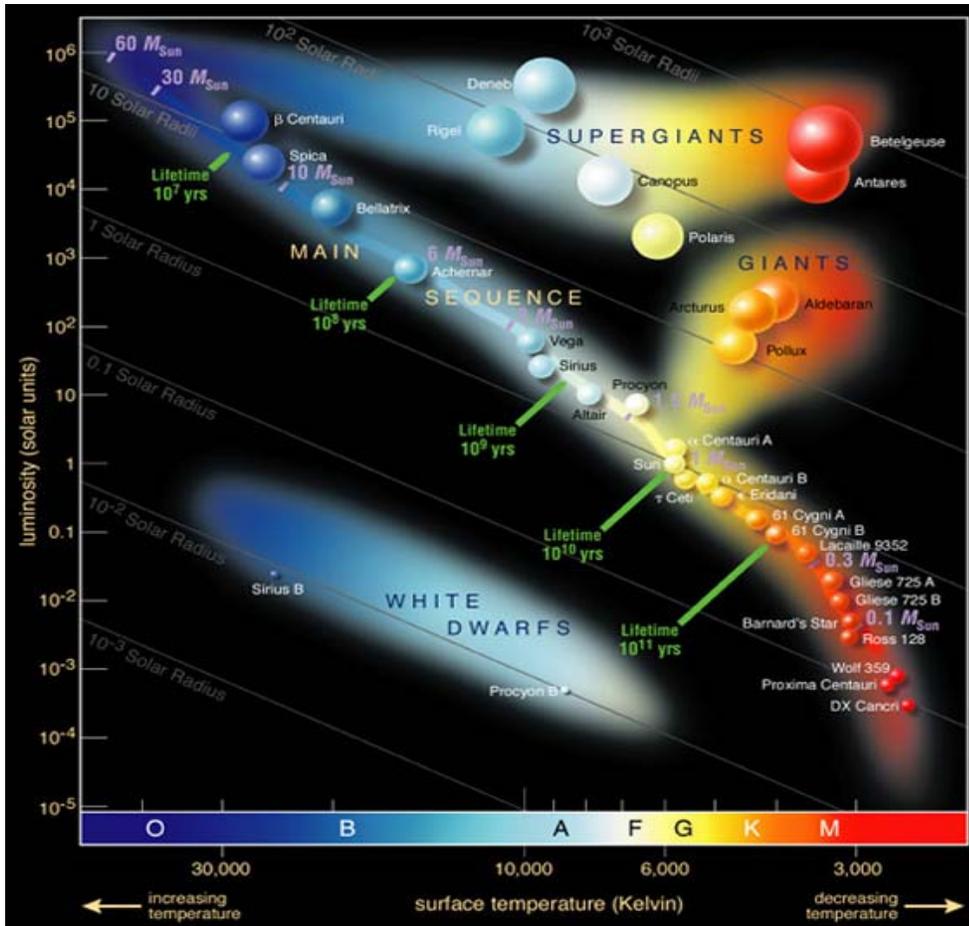
In the experiment, they used photons that travel through normal space and interact with another photon stuck in a time traveling loop through a wormhole. A wormhole is a space-time curvature which connects two distant locations or times.

Wormholes keep shutting in seconds. To keep a wormhole open, repulsive gravity should be used. The material that has repulsive gravity is called dark matter. It is invisible, fills all of space and has repulsive gravity. Dark matter is responsible for the expansion of the Universe.

To keep a wormhole open for a person to crawl through requires material with powerful energy.

Reproducing the behavior of the photon stuck in the wormhole, they studied the behavior of the photon that was moving in normal space time. They found that constant evolution life. could be achieved when the second photon was prepared in the right way.

The Hertzsprung-Russel Diagram:



The Hertzsprung–Russell diagram is a scatter graph of stars showing the relationship between the stars' absolute magnitudes or luminosities versus their spectral types or classifications and effective temperatures.

Hertzsprung–Russell diagrams are not maps of the locations of the stars. Rather, they plot each star on a graph measuring the star's absolute magnitude (brightness) against its temperature (color).

Hertzsprung–Russell diagrams are also referred to by the abbreviation H–R diagram or HRD. The diagram was created circa 1910 by Ejnar Hertzsprung and Henry Norris Russell and represents a major step towards an understanding of stellar evolution or "the lives of stars".

POINTS OF INTEREST:

2017: SpaceX, Boeing to Launch U.S. Astronauts to Space Station

U.S. astronauts once again will travel to and from the International Space Station from the United States on American spacecraft under groundbreaking contracts NASA announced Tuesday. The agency unveiled its selection of Boeing and SpaceX to transport U.S. crews to and from the space station using their CST-100 and Crew Dragon spacecraft, respectively, with a goal of ending the nation's sole reliance on Russia in 2017.

Breaking News via social media:

I thought you'd like to know--and possibly share--and apply.

Check out this new opportunity that Alan Ladwig and other "notables" are involved in. This info was just announced and went live this morning.

1) Twitter: [#FlyMeToSpace@SEGrants](#)

Using the power of space travel & the orbital perspective to inspire people to positively impact our planet. Spaceflight applications open
[#FlyMeToSpace](#)

2) Website: spaceshipearthgrants.com

3) Facebook: <https://www.facebook.com/SpaceshipEarthGrants>

Galaxy, aka Messier 82 (also known as NGC 3034, Cigar Galaxy or M82) is a starburst galaxy about 12 million light-years away in the constellation Ursa Major. It is about five times more luminous than the whole Milky Way and one hundred times more luminous than our galaxy's center.^[5] The starburst activity is thought to be triggered by interaction with neighboring galaxy M81, and M82 is a member of the M81 Group. As the closest starburst galaxy to our own, M82 is the prototypical example of this type of galaxy.^[5] SN 2014J, a **Type Ia supernova**, was observed in the galaxy on 21 January 2014



WEB SITES OF INTEREST:

Physics.org

TELESCOPE WORKSHOP:

If we are able to have a workshop, we will notify everyone by email.

OCTOBER SKY:

Look up to see planets parading across the sky this month.

A series of planets, big and small, will be visible to sky watchers on Earth, if weather permits. The planet Mercury begins October low and poorly placed in the evening sky and vanishes into the sun's glare during the month. However, the elusive planet will emerge in the morning sky, low in the eastern sky before dawn, by Halloween.

Venus does just the opposite, transitioning from the morning sky to the evening sky as it arrives at superior conjunction (when the planet is on the far side of the sun from Earth's perspective) on Oct. 25. Except for at the very beginning of the month, the bright planet is pretty much out of the loop for viewing all of this month. Saturn and Mars are early-evening objects, while Jupiter reigns supreme in the after-midnight hours.

Check out Space.com's planet-viewing guide for October below:

Mercury: The closest planet to the sun passes inferior conjunction on Oct. 16. Since it will go through the ascending node of its orbit on Oct. 21 and through perihelion (the point when it's closest to the sun) on Oct. 25, it withdraws rapidly northwestward from the sun and very quickly climbs into the morning sky. By Oct. 23 (only one week after conjunction), skywatchers may catch a glimpse at the magnitude-1.5 planet by standing 6 degrees above the east-southeast horizon a half-hour before local sunrise. Binoculars should help observers spot it. For reference, a fist held at arm's length covers about 10 degrees of the sky. A fattening crescent in telescopes, Mercury brightens rapidly to magnitude zero by Oct. 27.

Jupiter: Jupiter, which has just crossed over from Cancer into Leo, comes up above the east-northeast horizon shortly after 1:30 a.m. local daylight time on Oct. 18. The best time to look at Jupiter in the telescope, however, will be as dawn begins to break, when the huge gas giant stands about halfway up in the eastern sky. On the morning of Oct. 18, the waning crescent moon will rise about 30 minutes after Jupiter and can be found about 8 degrees below and to the right of the large planet.

Venus: At the very beginning of the month, intrepid observers might catch Venus barely above the eastern horizon before sunrise. After that, it's out of sight for the rest of October. The planet attains superior conjunction behind the sun on Oct. 25, and Venus will emerge into view as the bright evening star beginning in the winter.

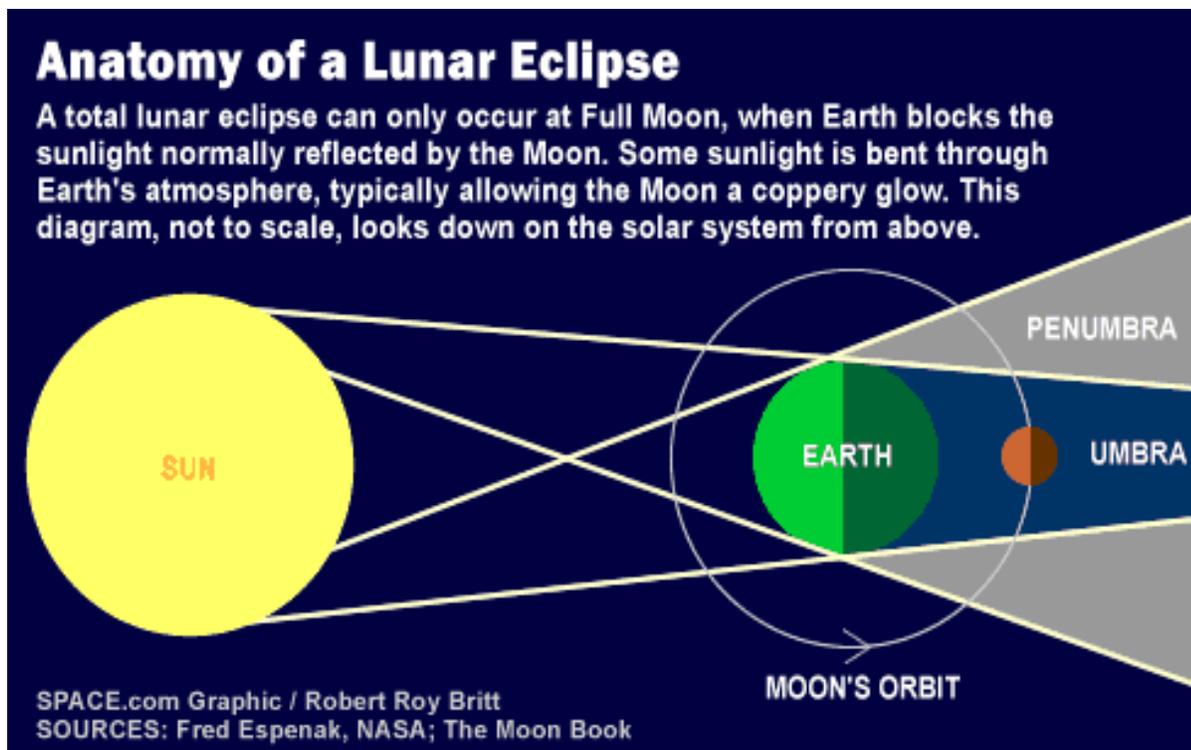
Saturn: Another planet about to vanish into the glare of the sun is Saturn. During early October, the ringed wonder will shine through the glow of evening twilight, low in the southwest sky. On Oct. 25, about 45 minutes after sunset, look very near to the horizon to see Saturn. Situated about 3 degrees to its upper left will be the delicately thin arc of a waxing crescent moon, just two days past new. Stargazers can increase their odds of seeing the planet by scanning the horizon with binoculars.

Mars: For stargazers looking up from parts of Europe and other latitude 40 degrees north locations in mid-twilight (about 45 minutes after sunset), Mars will be 17 degrees up in the southwest all month, staying above the horizon for more than 2 hours. On Oct. 28, a waxing crescent moon will hover high above and slightly to the left of Mars.

Heads up Oct. 8th now passed but still relevant.

There will be “Blood Moon” Total Lunar Eclipse.

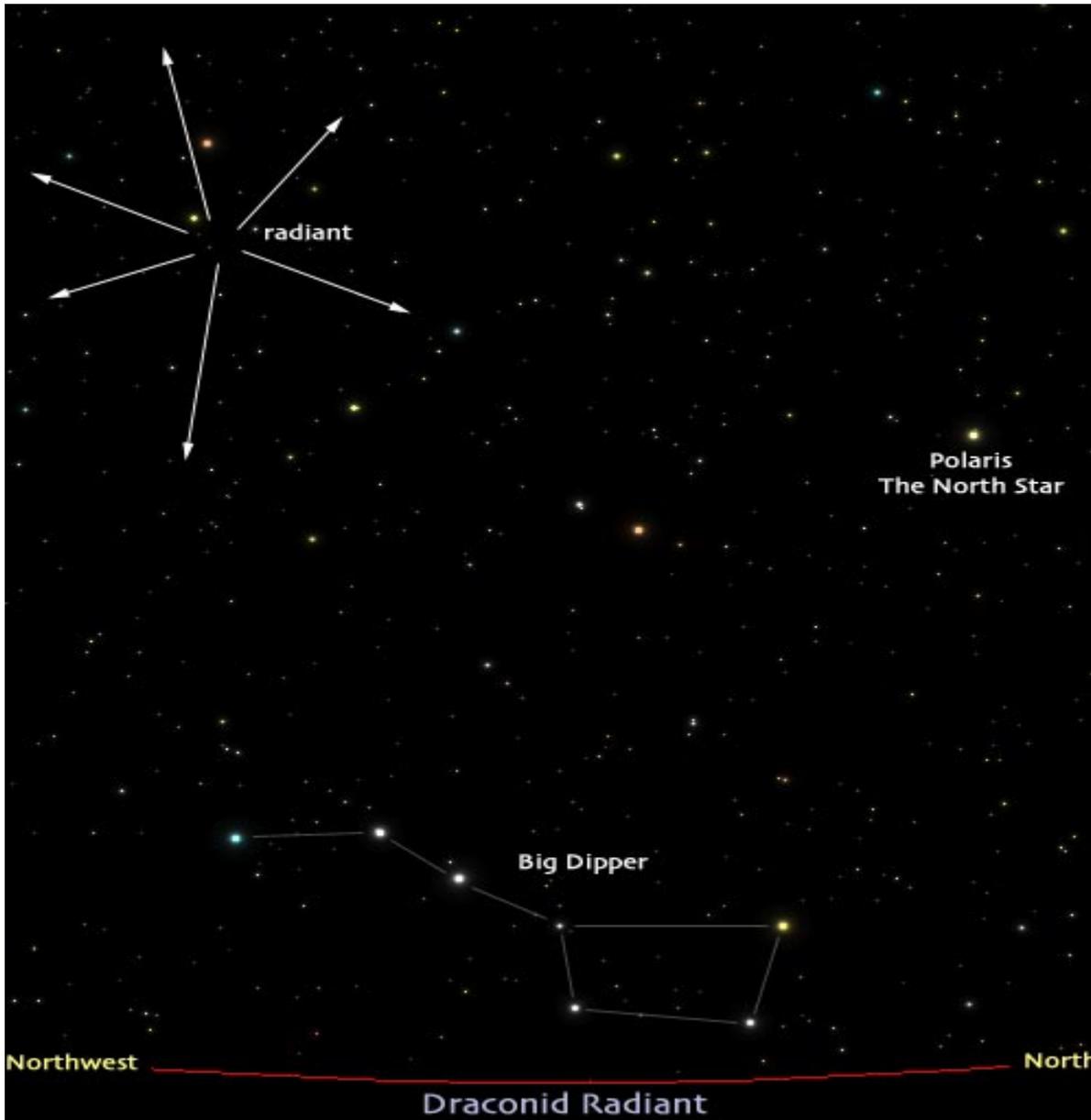
It will be visible though out most of North American. It will begin about 5:14 p. m. with a partial eclipse. About 70 minutes later a totality at about 6:24 p. m.



The Draconids Meteor Radiant has begun.

The duration of this meteor shower covers the period of October 6-10. Maximum currently occurs on October 9/10 ($\lambda=159.40^\circ$), from an average radiant of $\alpha=262^\circ$,

$\delta=+54^\circ$. The maximum rate typically reaches 1-2 per hour, but outbursts of hundreds or thousands per hour occurred several times during the 20th century.



This represents the view from mid-northern latitudes at about 9:00 p.m. local time around October 8. The graphic does not represent the view at the time of maximum, but is simply meant to help prospective observers to find the radiant location. The red line across the bottom of the image represents the horizon.

PHOTO OF THE MONTH



The Milky Way glows above Acadia National Park in Maine in this stunning night sky image by a veteran night sky photographer. Astrophotographer Adam Woodworth took this image from the Raven's Nest cliffs in Acadia National Park. Woodworth said the shot was a bit of a challenge.

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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