ECLIPSE NEWSLETTER

The Eclipse Newsletter is dedicated to increasing the knowledge of Astronomy, Astrophysics, Cosmology and related subjects.

VOLUMN 1 NUMBER 4
May – June 2017

PLEASE SEND ALL PHOTOS, QUESTIONS AND REQUST FOR ARTICLES TO
pestrattonmcag@gmail.com

MCAO PUBLIC NIGHTS AND FAMILY NIGHTS.

The general public and MCAO members are invited to visit the Observatory on select Monday evenings at 8PM for Public Night programs. These programs include discussions and illustrated talks on astronomy, planetarium programs and offer the opportunity to view the planets, moon and other objects through the telescope, weather permitting. Due to limited parking and seating at the observatory, admission is by reservation only.

Public Night attendance is limited to adults and students 5th grade and above. If you are interested in making reservations for a public night, you can contact us by calling 302-654-6407 between the hours of 9 am and 1 pm Monday through Friday. Or you can email us any time at KimGreenmcao@gmail.com or mtcuba@physics.udel.edu. The public nights will be presented even if the weather does not permit observation through the telescope. The admission fees are $3 for adults and $2 for children. There is no admission cost for MCAO members, but reservations are still required. If you are interested in becoming a MCAO member, please see the link for membership. We also offer family memberships.

Family Nights are scheduled from late spring to early fall on Friday nights at 8:30PM. These programs are opportunities for families with younger children to see and learn about astronomy by looking at and enjoying the sky and its wonders. It is meant to teach young children from ages 6-12 about astronomy in simple terms they can really understand. Reservations are required and admission fees are $3 for adults and $2 for children.

MCAO WEB SITE IS

mountcuba.org

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A NEARBY STAR COULD BE AMONG THE LARGEST EVER FOUND:

NASA: SATURN MOON, ENCELADUS, COULD SUPPORT LIFE:

ASTRONOMICAL TERMS DEFINED:

I offer this so those who are new to the subject matter offered will have a better chance of understand certain names as well as terms used in these articles.

quanta – Physics a discrete quantity of energy proportional in magnitude to the frequency of the radiation it represents.

uncertainty principle - also called the Heisenberg Uncertainty Principle, or Indeterminacy Principle, articulated (1927) by the German physicist Werner Heisenberg, that the position and the velocity of an object cannot both be measured exactly, at the same time, even in theory.

Schrodinger's Cat - A cat, with a Geiger counter, and a bit of poison in a sealed box. ... Depending on the light conditions, the cat appears either alive or dead. Schrödinger's cat is a thought experiment about quantum physics. Erwin Schrödinger suggested it in 1935, in reaction to the Copenhagen interpretation of quantum physics. Until the box is opened, an observer doesn't know whether the cat is alive or dead—because the cat's fate is intrinsically tied to whether or not the atom has decayed and the cat would, as Schrödinger put it, be "living and dead ... in equal parts" until it is observed.

quantum computing - studies theoretical computation systems (quantum computers) that make direct use of quantum-mechanical phenomena, such as superposition and entanglement, to perform operations on data.

quantum cryptography - Quantum cryptography is the science of exploiting quantum mechanical properties to perform cryptographic tasks. The best-known example of quantum cryptography is quantum key distribution which offers an information-theoretically secure solution to the key exchange problem.

Quarks - A quark is an elementary particle and a fundamental constituent of matter. Quarks combine to form composite particles called hadrons, the most stable of which are protons and neutrons, the components of atomic nuclei. Due to a phenomenon known as color confinement, quarks are never directly observed or

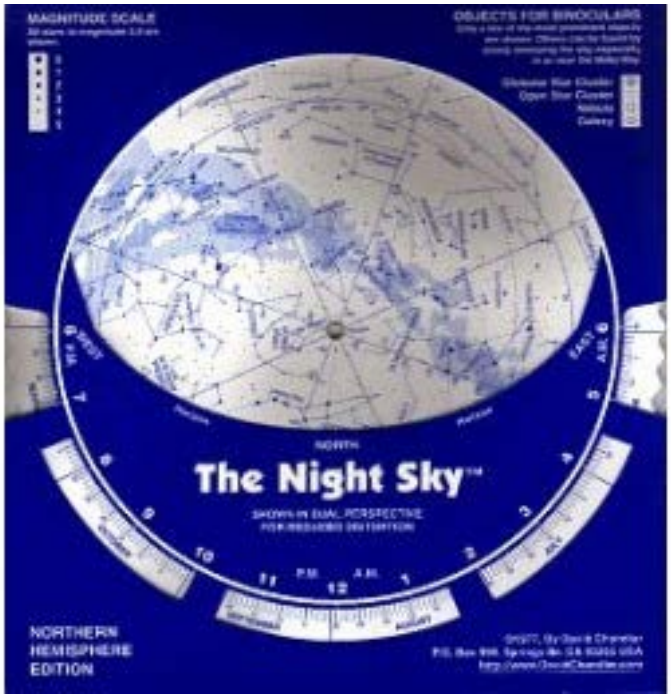
found in isolation; they can be found only within hadrons, such as baryons (of which protons and neutrons are examples) and mesons. For this reason, much of what is known about quarks has been drawn from observations of the hadrons themselves.

arXiv.org - Started in August 1991, arXiv.org (formerly xxx.lanl.gov) is a highly-automated electronic archive and distribution server for research articles. Covered areas include physics, mathematics, computer science, nonlinear sciences, quantitative biology, quantitative finance, and statistics. arXiv is maintained and operated by the Cornell University Library with guidance from the arXiv Scientific Advisory Board and the arXiv Member Advisory Board, and with the help of numerous subject moderators.

on the arXiv. - The arXiv (pronounced "archive" is a repository of electronic preprints, known as e-prints, of scientific papers in the fields of mathematics, physics, astronomy, computer science, quantitative biology, statistics, and quantitative finance, which can be accessed online. In many fields of mathematics and physics, almost all scientific papers are self-archived on the arXiv repository. Begun on August 14, 1991, arXiv.org passed the half-million article milestone on October 3, 2008, and hit a million by the end of 2014. By 2014 the submission rate had grown to more than 8,000 per month.

HOW TO FIND CONSTELLATIONS

Step 1. Purchase a Star Chart as shown below. Mt. Cuba Astronomical Observatory sells this one for $4.00.



Step 2. Orient the Star Chart. To use a Star Chart to identify star and constellations, you must first find the one appropriate

1. **Step 1: Orient the Star Chart. To use a star chart to identify stars and constellations, you must first find the one appropriate for the time of year you are observing. Face North to ...**
2. **Step 2: Compare. Compare the stars on the star chart and the stars you see in the night sky.**

CONSTELLATION VIRGO

Virgo - Lying between Leo to the west and Libra to the east, it is the second largest constellation in the sky (after Hydra). It can be easily found through its brightest star, Spica.

The bright Spica makes it easy to locate Virgo, as it can be found by following the curve of the Big Dipper/Plough to Arcturus in Boötes and continuing from there in the same curve ("follow the arc to Arcturus and speed on to Spica").[2]

Due to the effects of precession, the First Point of Libra, (also known as *the autumn equinox point*) lies within the boundaries of Virgo very close to β Virginis. This is one of the two points in the sky where the celestial equator crosses the ecliptic (the other being the First Point of Aries, now in the constellation of Pisces.) This point will pass into the neighboring constellation of Leo around the year 2440.

STARS

Besides Spica, other bright stars in Virgo include β Virginis (Zavijava), γ Vir (Porrima), δ Virginis (Auva) and ε Virginis (Vindemiatrix). Other fainter stars that were also given names are ζ Virginis (Heze), η Virginis (Zaniah), ι Virginis (Syrma) and μ Virginis (Rijl al Awwa).

The star 70 Virginis has one of the first known extrasolar planetary systems with one confirmed planet 7.5 times the mass of Jupiter.

The star Chi Virginis has one of the most massive planets ever detected, at a mass of 11.1 times that of Jupiter.

The sun-like star 61 Virginis has three planets: one is a super-Earth and two are Neptune-mass planets.

SS Virginis is a variable star with a noticeable red color. It varies in magnitude from a minimum of 9.6 to a maximum of 6.0 over a period of approximately one year.

Exoplanets

There are 35 verified exoplanets orbiting 29 stars in Virgo, including PSR B1257+12 (three planets), 70 Virginis (one planet), Chi Virginis (one planet), 61 Virginis (three planets), NY Virginis (two planets), and 59 Virginis (one planet).

NASA TELESCOPE REVEALS LARGEST BATCH OF EARTH-SIZE, HABITABLE-ZONE PLANETS AROUND A SINGLE STAR.

NASA's Spitzer Space Telescope has revealed the first known system of seven Earth-size planets around a single star. Three of these planets are firmly located in the habitable zone, the area around the parent star where a rocky planet is most likely to have liquid water.

The discovery sets a new record for greatest number of habitable-zone planets found around a single star outside our solar system. All of these seven planets could have liquid water – key to life as we know it – under the right atmospheric conditions, but the chances are highest with the three in the habitable zone.

“This discovery could be a significant piece in the puzzle of finding habitable environments, places that are conducive to life,” said Thomas Zurbuchen, associate administrator of the agency’s Science Mission Directorate in Washington. “Answering the question ‘are we alone’ is a top science priority and finding so many

planets like these for the first time in the habitable zone is a remarkable step forward toward that goal."

At about 40 light-years (235 trillion miles) from Earth, the system of planets is relatively close to us, in the constellation Aquarius. Because they are located outside of our solar system, these planets are scientifically known as exoplanets.

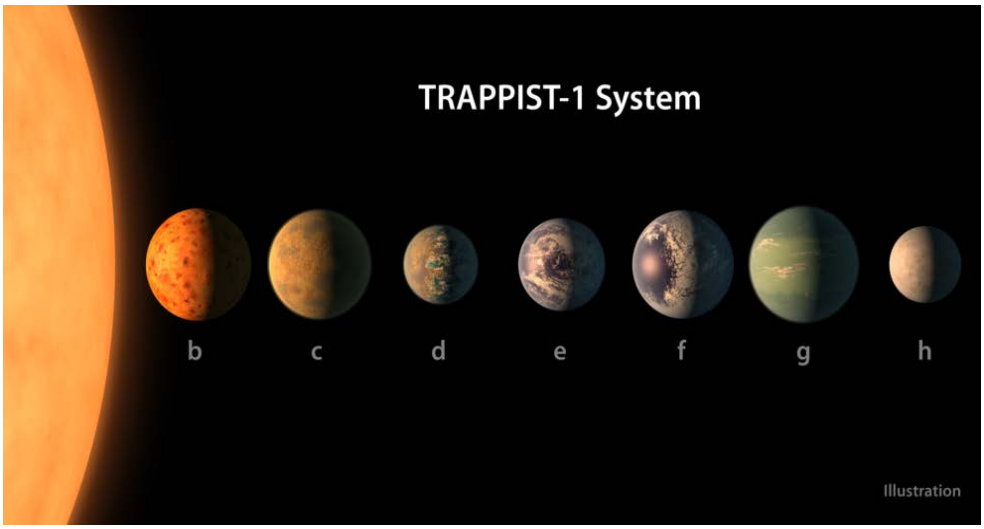
This exoplanet system is called TRAPPIST-1, named for The Transiting Planets and Planetesimals Small Telescope (TRAPPIST) in Chile. In May 2016, researchers using TRAPPIST announced they had discovered three planets in the system. Assisted by several ground-based telescopes, including the European Southern Observatory's Very Large Telescope, Spitzer confirmed the existence of two of these planets and discovered five additional ones, increasing the number of known planets in the system to seven.

The new results were published Wednesday in the journal Nature, and announced at a news briefing at NASA Headquarters in Washington.

Using Spitzer data, the team precisely measured the sizes of the seven planets and developed first estimates of the masses of six of them, allowing their density to be estimated.

Based on their densities, all of the TRAPPIST-1 planets are likely to be rocky. Further observations will not only help determine whether they are rich in water, but also possibly reveal whether any could have liquid water on their surfaces. The mass of the seventh and farthest exoplanet has not yet been estimated – scientists believe it could be an icy, "snowball-like" world, but further observations are needed.

"The seven wonders of TRAPPIST-1 are the first Earth-size planets that have been found orbiting this kind of star," said Michael Gillon, lead author of the paper and the principal investigator of the TRAPPIST exoplanet survey at the University of Liege, Belgium. "It is also the best target yet for studying the atmospheres of potentially habitable, Earth-size worlds."



In contrast to our sun, the TRAPPIST-1 star – classified as an ultra-cool dwarf – is so cool that liquid water could survive on planets orbiting very close to it, closer than is possible on planets in our solar system. All seven of the TRAPPIST-1 planetary orbits are closer to their host star than Mercury is to our sun. The planets also are very close to each other. If a person was standing on one of the planet's surface, they could gaze up and potentially see geological features or clouds of neighboring worlds, which would sometimes appear larger than the moon in Earth's sky.

The planets may also be tidally locked to their star, which means the same side of the planet is always facing the star, therefore each side is either perpetual day or night. This could mean they have weather patterns totally unlike those on Earth, such as strong winds blowing from the day side to the night side, and extreme temperature changes.

Spitzer, an infrared telescope that trails Earth as it orbits the sun, was well-suited for studying TRAPPIST-1 because the star glows brightest in infrared light, whose wavelengths are longer than the eye can see. In the fall of 2016, Spitzer observed TRAPPIST-1 nearly continuously for 500 hours. Spitzer is uniquely positioned in its orbit to observe enough crossing – transits – of the planets in front of the host star to reveal the complex architecture of the system. Engineers optimized Spitzer's ability to observe transiting planets during Spitzer's "warm mission," which began after the spacecraft's coolant ran out as planned after the first five years of operations.

"This is the most exciting result I have seen in the 14 years of Spitzer operations," said Sean Carey, manager of NASA's Spitzer Science Center at Caltech/IPAC in Pasadena, California. "Spitzer will follow up in the fall to further refine our

understanding of these planets so that the James Webb Space Telescope can follow up. More observations of the system are sure to reveal more secrets."

Following up on the Spitzer discovery, NASA's Hubble Space Telescope has initiated the screening of four of the planets, including the three inside the habitable zone. These observations aim at assessing the presence of puffy, hydrogen-dominated atmospheres, typical for gaseous worlds like Neptune, around these planets.

In May 2016, the Hubble team observed the two innermost planets, and found no evidence for such puffy atmospheres. This strengthened the case that the planets closest to the star are rocky in nature.

"The TRAPPIST-1 system provides one of the best opportunities in the next decade to study the atmospheres around Earth-size planets," said Nikole Lewis, co-leader of the Hubble study and astronomer at the Space Telescope Science Institute in Baltimore, Maryland. NASA's planet-hunting Kepler space telescope also is studying the TRAPPIST-1 system, making measurements of the star's minuscule changes in brightness due to transiting planets. Operating as the K2 mission, the spacecraft's observations will allow astronomers to refine the properties of the known planets, as well as search for additional planets in the system. The K2 observations conclude in early March and will be made available on the public archive.

A NOTE FROM ED.

This article is a bit steep in Theory. It's related to Quantum Mechanics. If you don't quite grasp the information covered, that is quite understandable. However, I do believe that even the novice beginner should try to understand the subject matter presented. There is a beginning for all knowledge. Shall we begin?

QUANTUM THEORY

Quantum theory is the theoretical basis of modern physics that explains the nature and behavior of matter and energy on the atomic and subatomic level. The nature and behavior of matter and energy at that level is sometimes referred to as quantum physics and quantum mechanics.

In 1900, physicist Max Planck presented his quantum theory to the German Physical Society. Planck had sought to discover the reason that radiation from a glowing body changes in color from red, to orange, and, finally, to blue as its temperature rises. He found that by making the assumption that energy existed in individual units in the same way that matter does, rather than just as a constant electromagnetic wave - as had been formerly assumed - and was therefore

quantifiable, he could find the answer to his question. The existence of these units became the first assumption of quantum theory.

Planck wrote a mathematical equation involving a figure to represent these individual units of energy, which he called quanta. The equation explained the phenomenon very well; Planck found that at certain discrete temperature levels (exact multiples of a basic minimum value), energy from a glowing body will occupy different areas of the color spectrum. Planck assumed there was a theory yet to emerge from the discovery of quanta, but, in fact, their very existence implied a completely new and fundamental understanding of the laws of nature. Planck won the Nobel Prize in Physics for his theory in 1918, but developments by various scientists over a thirty-year period all contributed to the modern understanding of quantum theory.

The Development of Quantum Theory

- **In 1900, Planck made the assumption that energy was made of individual units, or quanta.**
- **In 1905, Albert Einstein theorized that not just the energy, but the radiation itself was *quantized* in the same manner.**
- **In 1924, Louis de Broglie proposed that there is no fundamental difference in the makeup and behavior of energy and matter; on the atomic and subatomic level either may behave as if made of either particles or waves. This theory became known as the *principle of wave-particle duality*: elementary particles of both energy and matter behave, depending on the conditions, like either particles or waves.**
- **In 1927, Werner Heisenberg proposed that precise, simultaneous measurement of two complementary values - such as the position and momentum of a subatomic particle - is impossible. Contrary to the principles of classical physics, their simultaneous measurement is inescapably flawed; the more precisely one value is measured, the more flawed will be the measurement of the other value. This theory became known as the uncertainty principle, which prompted Albert Einstein's famous comment, "God does not play dice."**

The Copenhagen Interpretation and the Many-Worlds Theory

The two major interpretations of quantum theory's implications for the nature of reality are the Copenhagen interpretation and the many-worlds theory. Niels Bohr proposed the Copenhagen interpretation of quantum theory, which asserts that a particle is whatever it is measured to be (for example, a wave or a particle), but that it cannot be assumed to have specific properties, or even to exist, until it is measured. In short, Bohr was saying that objective reality does not exist. This translates to a principle called superposition that claims that while we do not

know what the state of any object is, it is actually in all possible states simultaneously, as long as we don't look to check.

To illustrate this theory, we can use the famous and somewhat cruel analogy of Schrodinger's Cat. First, we have a living cat and place it in a thick lead box. At this stage, there is no question that the cat is alive. We then throw in a vial of cyanide and seal the box. We do not know if the cat is alive or if the cyanide capsule has broken and the cat has died. Since we do not know, the cat is both dead and alive, according to quantum law - in a superposition of states. It is only when we break open the box and see what condition the cat is that the superposition is lost, and the cat must be either alive or dead.

The second interpretation of quantum theory is the *many-worlds* (or multiverse theory.) It holds that as soon as a potential exists for any object to be in any state, the universe of that object transmutes into a series of parallel universes equal to the number of possible states in which that the object can exist, with each universe containing a unique single possible state of that object. Furthermore, there is a mechanism for interaction between these universes that somehow permits all states to be accessible in some way and for all possible states to be affected in some manner. Stephen Hawking and the late Richard Feynman are among the scientists who have expressed a preference for the many-worlds theory.

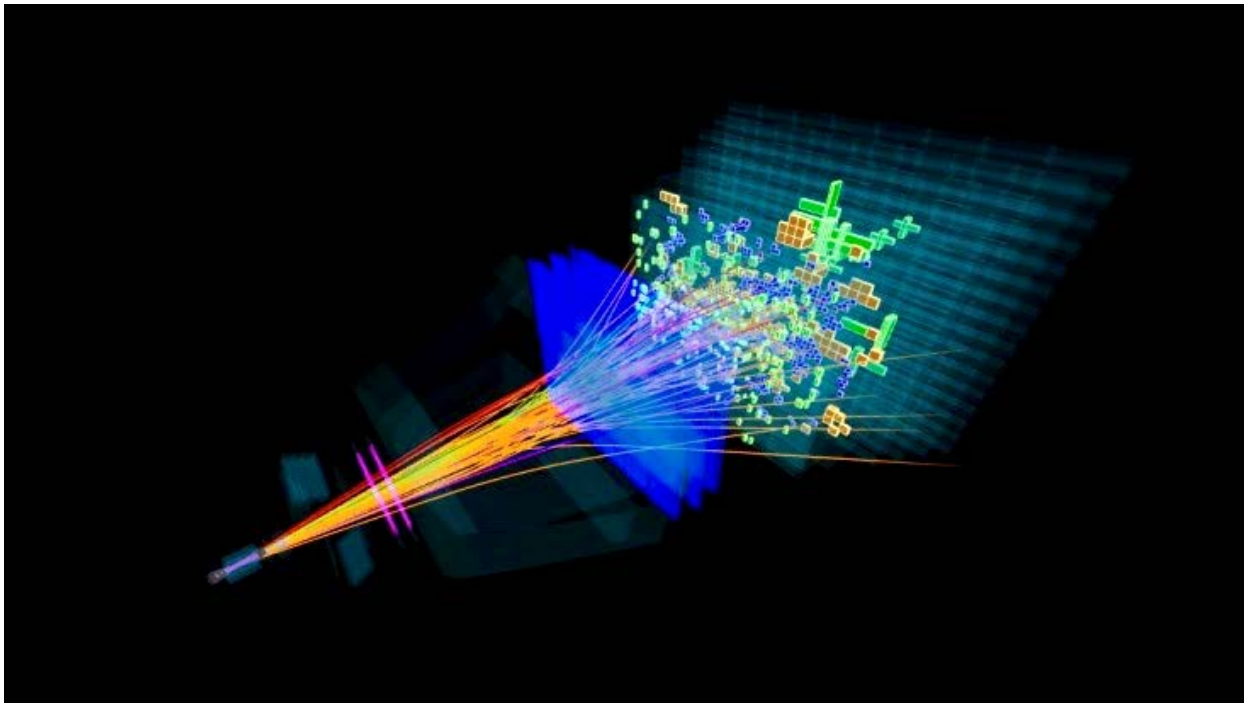
Quantum Theory's Influence

Although scientists throughout the past century have balked at the implications of quantum theory - Planck and Einstein among them - the theory's principles have repeatedly been supported by experimentation, even when the scientists were trying to disprove them. Quantum theory and Einstein's theory of relativity form the basis for modern physics. The principles of quantum physics are being applied in an increasing number of areas, including quantum optics, quantum chemistry, quantum computing, and quantum cryptography.

LHC DISCOVERS FIVE NEW PARTICLES AT THE SAME TIME:

Credit: Annette Choi
NOVANEXT

Physicists working at the Large Hadron Collider (LHC) have discovered five new subatomic particles that "have been hiding in plain sight for years," according to one of the researchers working at the world's largest and most powerful particle accelerator. By studying their properties, physicists may be able to develop a better understanding of how all matter is bound together.



The particles are varied, high-energy forms of the Omega-c baryon—a subatomic particle made up of three smaller building blocks called quarks. Until now, physicists suspected but had not been able to verify the existence of the different forms of the Omega-c baryon.

While the Omega-c baryon has been more mysterious, scientists know more about other baryons, the most common of which are neutrons and protons. These particles, along with their component quarks, are glued together by the nuclear "strong force," which keeps the atom in tact.

Quarks come in six "flavors": up, down, strange, charm, top, and bottom. Neutrons and protons contain up and down quarks.

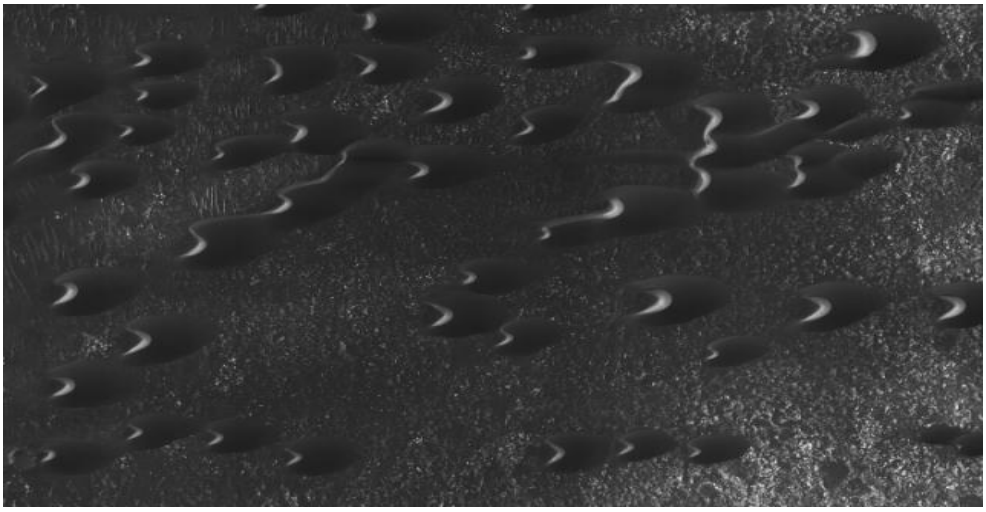
Here's Pallab Ghosh, reporting for BBC News:

The Omega-c baryon is in the same family of particles as the neutron and proton, but it can be thought of as a more exotic cousin. It too is made up of quarks but they are called "Charm" and "Strange", and they are heavier versions of the Up and Down quarks.

By studying how the two “strange” and one “charm” quark are bound together to make up the Omega-c baryon, physicists hope to shed more light on the strong force, which in turn will help us understand why neutrons and protons bind into the nuclei of atoms and not fly apart into space.

CERN, the organization that runs the LHC, notes that the observation of five new particles at the same time is “a rather unique event.” The team has published detailed results on the arXiv.

MARS BARCHAN DUNES REVEALED IN STUNNING NEW IMAGE:



Mars is a sandy place. So it is to be expected that the planet's russet terrain would be littered with numerous sand dunes, shaped and eroded by powerful winds blowing over millions of years.
One of the larger population of Martian sand dunes exists in the planet's southern hemisphere, near the Hellas impact basin — one of Mars' largest and most recognizable impact basin. On Friday, NASA released an image of a clump of dark, crescent-shaped dune formations located both within the region's craters and in the plains.
The images were captured using the High Resolution Imaging Science Experiment (HiRISE) camera on board the space agency's Mars Reconnaissance Orbiter (MRO).
"Here, the steep, sunlit side of the dune, called a slip face, indicates the down-wind side of the dune and direction of its migration. Other long, narrow linear dunes known as "seif" dunes are also here and in other locales to the east," NASA said in a statement accompanying the image.

The dunes seen in the image are primarily "barchan" dunes, which are crescent-shaped structures produced by action of wind from one direction. On Earth, these structures are widespread in open, inland desert regions.
The MRO has been orbiting the red planet since 2006, and has beamed back striking photos of Mars to Earth every month. Last August, NASA published its largest dump of images captured by the MRO's HiRise camera, releasing a cache of over 1,000 photos that show the Martian surface in all its glory — from dunes and craters to mountains and ice caps.
All the photos in the image dump were taken in May, when Mars experienced its equinox — a period during a planet's orbit when the sun shines directly on its equator, lighting up both its poles. Coincidentally, as Alfred McEwen, the director of the Planetary Image Research Laboratory, explained to Popular Science at the time, the equinox overlapped with the period when Mars and the sun were on the opposite sides of Earth — a phenomenon that facilitates unobstructed communication between the MRO and ground control.
As a result, the satellite could send a hefty amount of data in a brief period of time.

A NEARBY STAR COULD BE AMONG THE LARGEST EVER FOUND:

Credit Science.com

So far as telescopes in space go, the European Space Agency and NASA's Hubble Space Telescope is among the most prolific in sending back stunning images of distant stars and galaxies to Earth. And the latest image it sent back is of a nearby super star cluster which is home to one of the largest stars ever discovered.
Called Westerlund 1, the relatively young star cluster is called "super" for the fact that it has more mass and is more luminous than other young star clusters. A rarity in the Milky Way, the cluster lies about 15,000 light-years from Earth and on its outer fringes lives a star named Westerlund 1-26. With a radius of over 1,500 times that of the sun, according to a NASA statement, it is among the biggest stars ever observed in the known universe.
This beautiful Hubble image reveals a young super star cluster known as Westerlund 1, only 15,000 light-years away in our Milky Way neighborhood, yet home to one of the largest stars ever discovered. Photo: ESA/Hubble & NASA
For a perspective of size, if it was placed where the sun is in our solar system, it would engulf all the inner planets, as well as Jupiter. Classified as a red supergiant or hypergiant, it is over 300,000 times brighter than sun when seen in radio wavelengths, making it actually close to 380,000 times the sun's luminosity.
However, despite its size, Westerlund 1-26 is quite a ways from being the largest star discovered so far. At least three stars are considered to be larger —UY Scuti, about 9,500 light-years away; WHO G64, about 168,000 light-years away in the Large Magellanic Cloud; and RW Cephei, thought to be about 11,500 light-years away.
UY Scuti is the top contender for being the largest known star so far.
It must also be kept in mind the radii of the largest stars are not well-defined and there are large uncertainties in the determining their exact sizes.

Westerlund 1 was discovered in 1961. Most of its stars are thought to have originated in the same burst of activity about three million years ago, making them all much younger than the sun, which is over 4.5 billion years old. It also means all the stars in the cluster have roughly the same compositions.

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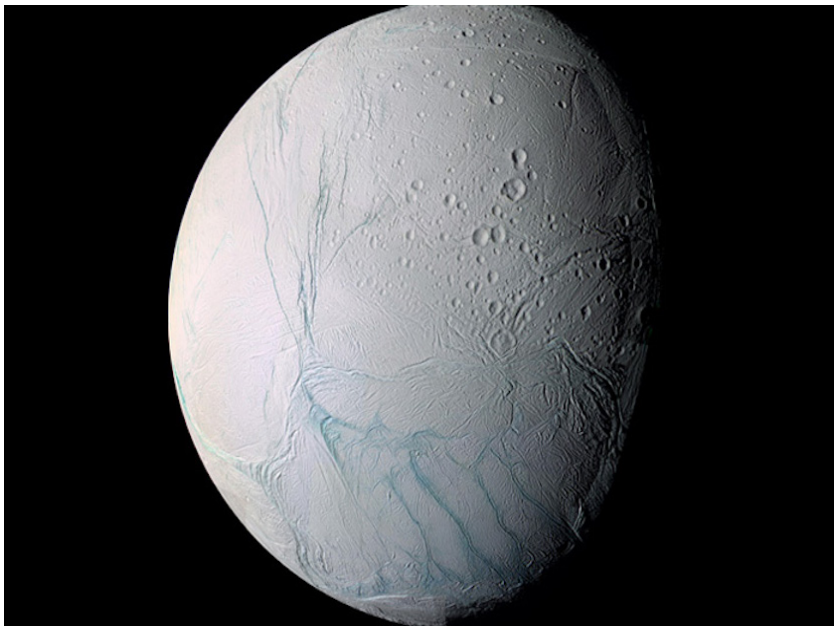
Related Articles

A Galaxy Far, Far Away Could Reveal How First Stars Formed
The Black Hole-Star Relationship Just Got Weirder

NASA: SATURNS MOON, ENCELADUS, COULD SUPPORT LIFE.

Credit Chris Ciaccia NASA

- **In a major press announcement, NASA announced Enceladus, Saturn's moon, could support life thanks to the presence of hydrogen discovered.**
- **Known as an "ocean-world," Enceladus has been spewing off hydrogen from a plume, said Linda Spilker Cassini project scientist at NASA's Jet Propulsion Laboratory in Pasadena, California during the press event.**

- 

- **The findings are the results of 12 years of investigation by the Cassini spacecraft and were released in a paper from researchers with the Cassini mission, published in the journal "Science."**

- **"It could be a potential source for energy from any microbes," Spilker noted. "We now know that Enceladus has almost all of the ingredients you would need for life here on Earth."**

- **So far, Enceladus has shown to have the existence of nearly all of the elements of habitability (primarily carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur), except for phosphorus and sulfur. Scientists expect they are present due to Enceladus' rocky core, which is thought to be chemically similar to meteorites, which contain both phosphorus and sulfur.**

- **"This is the closest we've come, so far, to identifying a place with some of the ingredients needed for a habitable environment," said Thomas Zurbuchen, associate administrator for NASA's Science Mission Directorate at Headquarters in Washington in a statement. " These results demonstrate the interconnected nature of NASA's science missions that are getting us closer to answering whether we are indeed alone or not."**

- **Chris Glein, Cassini INMS team associate at SwRI, noted that the team thinks hydrothermic fluids are circulating on the floor od Enceladus' ocean. The warm fluids, mixed with the ocean water, would cause mineral precipitates to form on the sea floor.**

- **"When Cassini was first built, you never thought you'd see an active ocean floor," Glein said. Spilker added that they don't currently have the**

instruments to look for life on the moon and that Cassini has gone as far as it can go.

- **In addition, the Hubble Telescope observed that there was a probably plume of hydrogen released from Europa, the smallest of the four Galilean moons orbiting Jupiter.**
- **Observations were made in 2016, as well as 2014, which "bolster[s] evidence that the Europa plumes could be a real phenomenon, flaring up intermittently in the same region on the moon's surface."**

UPCOMING STAR PARTIES

For more information on DAS STAR PARTIES, visit the mountcuba.org web site. Select Delaware Astronomical Society DAS.

Select Events at top and then STAR PARTIES.

May 19, 2017 8:00 pm - 11:30 pm
Mini Messier Marathon

At the Fair Hill Natural Resources Management Area. This is DAS's newest "dark" sky site and provides wide sky views without traveling too far. Directions will follow later via the DAS Yahoo Group

May 26, 2017 8:00 pm - 11:00 pm
Double Star Night at Mt. Cuba Astronomical Observatory

Here's an opportunity for side-by-side comparison of the capabilities of refractors vs reflectors on this kind of target. Join us at the MCAO for a night of extraordinary observing.

June 9, 2017 7:30 pm - 9:00 pm
Woodside Farm Creamery's Telescope Night

Explore the stars and enjoy some ice cream! (Rain date is the following day, same time.)

June 16, 2017 8:30 pm - 10:00 pm
Delaware Museum of Natural History

Saturn will be the focal point at tonight's event. Presentation in the lecture hall, followed by telescope observing on the back lawn.

Enjoy a family-friendly evening at the Museum in celebration of the summer sky! Visit our galleries, outdoor trails, nature nook and more from 6:30 – 8:30

p.m. At 8:30 p.m. the Delaware Astronomical Society will lead a discussion about Saturn at Opposition, followed by viewing the June night sky through telescopes.

Fee: $3/DMNH Members ages 3 and up; Non-members: $9/adults; $8/seniors; $7/children 3-12 years, Free for children under 3

June 17, 2017 8:30 pm - 10:00 pm
Introduction to the Night Sky at Bellevue State Park

DAS & MCAO present an introduction to observing the night sky for all ages. Equipment will be available or bring your own. Red-filtered lights only, please. Meet at the Hunter Barn parking lot. No fee.

When **Sat Jun 17, 2017 8:30pm – 9:30pm Eastern Time**

Where **Bellevue State Park, 800 Carr Rd, Wilmington, DE 19809, USA**

June 24, 2017 8:30 pm - 10:30 pm
Great American Campout @ Fair Hill Park

DAS shares views through their telescopes for overnight campers.

For more information on DAS STAR PARTIES, visit the mountcuba.org web site. Select Delaware Astronomical Society DAS.