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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APRIL MEETING
TUESDAY THE 14th 7:30 p.m.

Lynn will be giving a talk on the upcoming Philadelphia Science Fair.
Hank will be giving a demonstration on the various types of Planisphere's.

OBSERVATIONS FROM THE CONFORTABLE CHAIR
Hank Bouchelle Co-Chair MCAG

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.

Antiparticles - Corresponding to most kinds of particles, there is an associated antimatter antiparticle with the same mass and opposite charge (including electric charge). For example, the antiparticle of the electron is the positively charged electron, or positron, which is produced naturally in certain types of radioactive decay.

The laws of nature are very nearly symmetrical with respect to particles and antiparticles. For example, an antiproton and a positron can form an antihydrogen atom, which is believed to have the same properties as a hydrogen atom. This leads to the question of why the formation of matter after the Big Bang resulted in a universe consisting almost entirely of matter, rather than being a half-and-half mixture of matter and antimatter. The discovery of Charge Parity violation helped to shed light on this problem by showing that this symmetry, originally thought to be perfect, was only approximate.

Particle-antiparticle pairs can annihilate each other, producing photons; since the charges of the particle and antiparticle are opposite, total charge is conserved. For example, the positrons produced in natural radioactive decay quickly annihilate themselves with electrons, producing pairs of gamma rays, a process exploited in positron emission tomography.

Matter particles - In particle physics, an elementary particle or fundamental particle is a particle whose substructure(domain of the bigger structure which shares the similar characteristics of the domain) is unknown, thus it is unknown whether it is composed of other particles.[1] Known elementary particles include the fundamental fermions (quarks, leptons, antiquarks, and antileptons), which generally are "matter particles" and "antimatter particles", as well as the fundamental bosons (gauge bosons and Higgs

boson), which generally are "force particles" that mediate interactions among fermions. A particle containing two or more elementary particles is a composite particle.

Everyday matter is composed of atoms, once presumed to be matter's elementary particles—atom meaning "indivisible" in Greek—although the atom's existence remained controversial until about 1910, as some leading physicists regarded molecules as mathematical illusions, and matter as ultimately composed of energy. Soon, subatomic constituents of the atom were identified. As the 1930s opened, the electron and the proton had been observed, along with the photon, the particle of electromagnetic radiation. At that time, the recent advent of quantum mechanics was radically altering the conception of particles, as a single particle could seemingly span a field as would a wave, a paradox still eluding satisfactory explanation.

Torus - In geometry, a torus **(plural** tori**) is a surface of revolution generated by revolving a circle in three-dimensional space about an axis coplanar with the circle. If the axis of revolution does not touch the circle, the surface has a ring shape and is called a** ring torus **or simply torus if the ring shape is implicit.**

MCAG PUBLIC OUTREACH:

As soon as I get the dates for the STAR Parties to be held at the Creamery, I'll get them to everyone.

FROM THE WORLD OF ASTRONOMY AND SCIENCE:

Physicists offer a solution to the puzzle of the origin of matter in the Universe.

Most of the laws of nature treat particles and antiparticles equally, but stars and planets are made of particles, or matter, and not antiparticles, or antimatter. That asymmetry, which favors matter to a very small degree, has puzzled scientists for many years.

New research by UCLA physicists, published in the journal Physical Review Letters, offers a possible solution to the mystery of the origin of matter in the universe.

Alexander Kusenko, a professor of physics and astronomy in the UCLA College, and colleagues propose that the matter-antimatter asymmetry could be related to the Higgs boson particle, which was the subject of prominent news coverage when it was discovered at Switzerland's Large Hadron Collider in 2012.

Specifically, the UCLA researchers write, the asymmetry may have been produced as a result of the motion of the Higgs field, which is associated with the Higgs boson, and which could have made the masses of particles and antiparticles in the universe temporarily unequal, allowing for a small excess of matter particles over antiparticles.

If a particle and an antiparticle meet, they disappear by emitting two photons or a pair of some other particles. In the "primordial soup" that existed after the Big Bang, there were almost equal amounts of particles of antiparticles, except for a tiny asymmetry: one particle per 10 billion. As the universe cooled, the particles and antiparticles annihilated each other in equal numbers, and only a tiny number of particles remained; this tiny amount is all the stars and planets, and gas in today's universe, said Kusenko, who is also a senior scientist with the Kavli Institute for the Physics and Mathematics of the Universe.

The research also is highlighted by Physical Review Letters in a commentary in the current issue.

The 2012 discovery of the Higgs boson particle was hailed as one of the great scientific accomplishments of recent decades. The Higgs boson was first postulated some 50 years ago as a crucial element of the modern theory of the forces of nature, and is, physicists say, what gives everything in the universe mass. Physicists at the LHC measured the particle's mass and found its value to be peculiar; it is consistent with the possibility that the Higgs field in the first moments of the Big Bang was much larger than its "equilibrium value" observed today. The Higgs field "had to descend to the equilibrium, in a process of 'Higgs relaxation,'" said Kusenko, the lead author of the UCLA research.

Explore further: Hypothetical new cosmological model known as Higgsogenesis

Astronomers Witness Star Formation Over 18 Years

Over the last 18 years, astronomers have observed the formation of a massive new star, dubbed W75N(B)-VLA 2. A pair of images of a young star, taken 18 years apart, has

revealed dramatic differences providing astronomers with a one of a kind "real time" look at how massive stars develop during the earliest stages of their formation.

Astronomers used the National Science Foundation's Karl G Jansky Very Large Array to study the massive young star, located approximately 4200 light years from Earth. The astronomers compared an image taken in 1996 with one taken in 2014 to see the dramatic differences. The images were then published this week in the journal Science.

"The comparison is remarkable," lead author of the study from the National Autonomous University of Mexico, Carlos Carrasco-Gonzalez says. The compact, rounded wind indicated by data from 1996 transforms - just 18 years later in 2014 - into a "distinctly elongated outflow".

Scientists believe that the new star formed in a dense, gaseous environment surrounded by a doughnut shaped, dusty torus.

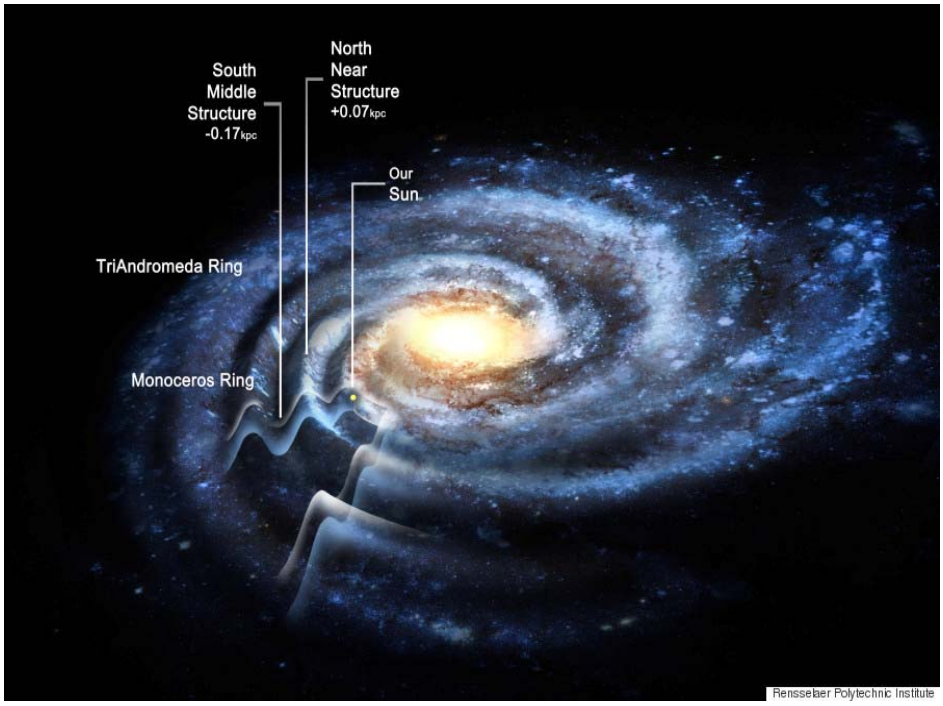
Thanks to the study, scientists have discovered that during the star's birth it experienced episodes in which it ejected a hot, ionized wind for several years. The wind expanded in all directions, forming a spherical shell around the star until it hit the dusty torus, slowing its progression. Wind expansion, outward along the poles of the torus where there was less resistance, moved far more quickly, resulting in an elongated shape of the outflow.

Professor Huib van Langevelde from Leiden University in the Netherlands, who was also involved in penning the journal, said that, "this object is providing us an exciting opportunity to watch the developments over the next few years, as this very young star develops the characteristic bipolar outflow morphology."

The star in question is estimated to be about 8 times more massive and 300 times brighter than the Earth's Sun. Being able to observe its dramatic growing pains in real time is unique, according to Langevelde. One of the major findings that has already emerged relates to a 2009 study performed by JIVE scientists who traced the magnetic field in that region of space and found that the field surrounding the young star was neatly aligned with it.

The team hopes to watch and learn more, as the "protostar" continues its turbulent development. Dr Gabriele Surcis, who is working on the study, says that "our understanding of how massive young stars develop is much less complete than our understanding of how Sun-like stars develop."

The Milky Way May Be More Enormous Than We Ever Imagined



The above illustration showing how regions of low density may actually be evidence of a corrugated structure.

"In essence, what we found is that the disk of the Milky Way isn't just a disk of stars in a flat plane--it's corrugated," Newberg, the leader of the international team of scientists who conducted the research, said in a written statement, adding that the corrugations seemed consistent with previous theoretical research suggesting that a dwarf galaxy or dark matter passing through the Milky Way would produce galactic rippling.

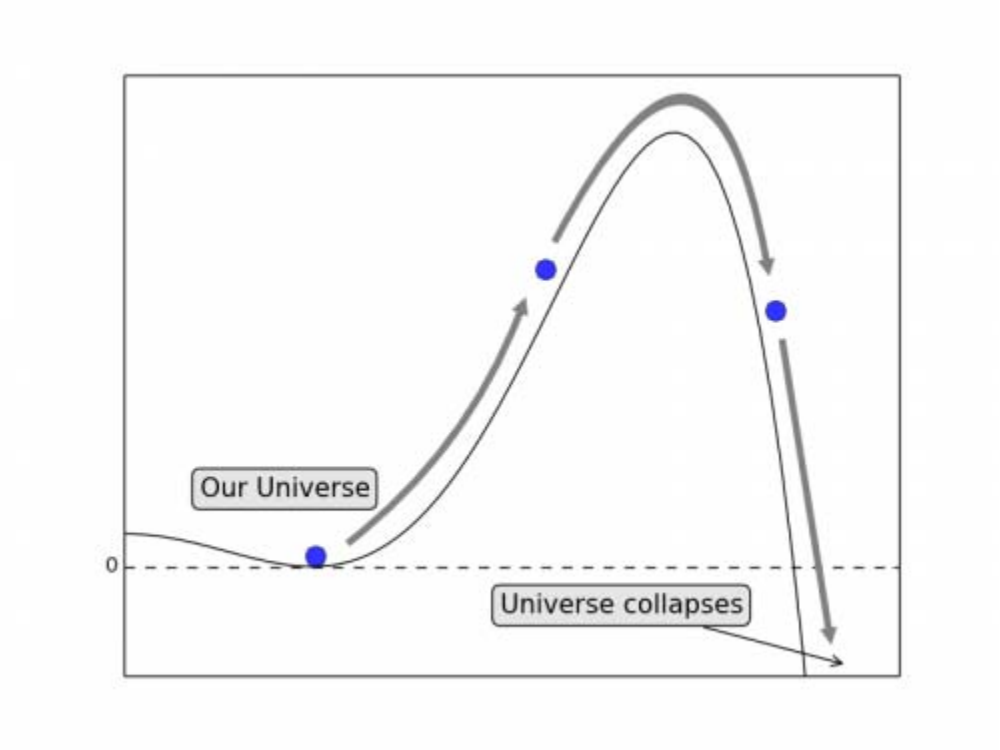
The new research--published March 11 in The Astrophysical Journal--was based on a careful analysis of data from the Sloan Digital Sky Survey, a collection of astronomical observations made by the Apache Point Observatory in Sunspot, N.M. The survey has created the most detailed three-dimensional maps of the universe ever made, according to its website.

What do other astronomers make of the finding?

In an email to The Huffington Post, Dr. Jay M. Pasachoff, professor of astronomy at Williams College in Williamstown, Mass., called it "exciting" and offered his own interpretation:

Credit David Freeman. Huff Post Science.

Should the Higgs boson have caused our Universe to collapse?



Our Universe lies in a ‘valley’, which sets the behavior of the Higgs boson. A deeper valley also exists, but our Universe is prevented from entering it by a large ‘hill’. During the early period of cosmic inflation, the BICEP2 results imply that the Universe would have received a ‘kick’ into the other valley, causing it to collapse in less than a second. Credit: Robert Hogan, Kings College London

(Phys.org) —British cosmologists are puzzled: they predict that the Universe should not have lasted for more than a second. This startling conclusion is the result of combining the latest observations of the sky with the recent discovery of the Higgs boson. Robert Hogan of King's College London (KCL) will present the new research on 24 June at the Royal Astronomical Society's National Astronomy Meeting in Portsmouth.

After the Universe began in the Big Bang, it is thought to have gone through a short period of rapid expansion known as 'cosmic inflation'. Although the details of this process are not yet fully understood, cosmologists have been able to make predictions of how this would affect the Universe we see today.

In March 2014, researchers from the BICEP2 collaboration claimed to have detected one of these predicted effects. If true, their results are a major advance in our understanding of cosmology and a confirmation of the inflation theory, but they have proven controversial and are not yet fully accepted by cosmologists.

In the new research, scientists from KCL have investigated what the BICEP2 observations mean for the stability of the Universe. To do this, they combined the results with recent advances in particle physics. The detection of the Higgs boson by the Large Hadron Collider was announced in July 2012; since then, much has been learnt about its properties.

Measurements of the Higgs boson have allowed particle physicists to show that our universe sits in a valley of the 'Higgs field', which describes the way that other particles have mass. However, there is a different valley which is much deeper, but our universe is preventing from falling into it by a large energy barrier.

The problem is that the BICEP2 results predict that the universe would have received large 'kicks' during the cosmic inflation phase, pushing it into the other valley of the Higgs field within a fraction of a second. If that had happened, the universe would have quickly collapsed in a Big Crunch.

"This is an unacceptable prediction of the theory because if this had happened we wouldn't be around to discuss it" said Hogan, who is a PhD student at KCL and led the study.

Perhaps the BICEP2 results contain an error. If not, there must be some other, as yet unknown, process which prevented the universe from collapsing.

"If BICEP2 is shown to be correct, it tells us that there has to be interesting new particle physics beyond the standard model" Hogan said.

POINTS OF INTEREST:

Public: Help Name Pluto & Charon Surface Features, New U.S. Rocket
On July 14, 2015, NASA's New Horizons spacecraft will fly past Pluto, snapping the first-ever high resolution pictures of that small, distant world and its largest moon, Charon. As the surface features of these two worlds are revealed – craters, rifts, valleys – they'll need names. You can help decide what labels will go on the images and maps coming from the flyby.Eagle? Freedom? GalaxyOne? United Launch Alliance wants public input in the naming of a next-generation launcher designed to replace the historic Atlas and Delta rocket lines in the 2020s.
More: http://spacewatchtower.blogspot.com/2015/03/public-help-name-pluto-charon-surface.html

More below

Nova Returns

This sky chart shows the location of the new nova in the "teapot" stellar pattern within the constellation Sagittarius.

Nova returns. Backyard astronomers are reporting that an exploding star is quickly coming back to life and brightening again in the southern constellation of Sagittarius the Archer.

First spotted by Australian sky-watcher John Seach on Sunday, March 15, the exploding star shot up in brightness a couple of weeks ago, then faded back down to magnitude 6, just past the limit for viewing by the unaided eye from a dark location. But in the past week and half, new observations show that the star has brightened again to magnitude 4.5—making it just barely visible to the naked eye from city suburbs and an easy target from dark locations.

Discoveries of new nova stars are exciting for astronomers, as stars that are literally blowing their stack!

When we see a nova, we are witnessing the violent explosion of the outer atmosphere of a tiny white dwarf star. White dwarfs are the hot cores of long-dead stars about the size of Earth, and they can gravitationally siphon off gases from a companion star. Over time, this matter accumulates on the white dwarf's surface until it reaches critical temperatures and ignites in a massive thermonuclear explosion that can be seen thousands of light-years away.

Credit Starstruck

PUBLIC NIGHTS AT MCAO:
6-April – 15 Greg Lee The pleasure of naked eye observing.

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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