



# THE STAR

THE NEWSLETTER OF THE  
MOUNT CUBA ASTRONOMICAL GROUP  
SUMMER EDITION

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## **SURPRISE**

**THERE IS JUST TOO MUCH HAPPENING NOT TO PUT OUT A SUMMER EDITION OF THE STAR. I HOPE YOU ENJOY THE ARTICLES.**

### **Big Bang breakthrough team allows they may be wrong**



**A NASA image shows hundreds of thousands of stars crowded into the swirling core of the Milky Way galaxy (AFP Photo/)**

**Washington (AFP) - American astrophysicists who announced just months ago what they deemed a breakthrough in confirming how the universe was born now admit they may have got it wrong.**

**The team said it had identified gravitational waves that apparently rippled through space right after the Big Bang.**

**If proven to be correctly identified, these waves -- predicted in Albert Einstein's theory of relativity -- would confirm the rapid and violent growth spurt of the universe in the first fraction of a second marking its existence, 13.8 billion years ago.**

**The apparent first direct evidence of such so-called cosmic inflation -- a theory that the universe expanded by 100 trillion trillion times in barely the blink of an eye -- was announced in March by experts at the Harvard-Smithsonian Center for Astrophysics.**

**The detection was made with the help of a telescope called BICEP2, stationed at the South Pole.**

**After weeks in which they avoided the media, the team published its work Thursday in the US journal Physical Review Letters.**

**In a summary, the team said their models "are not sufficiently constrained by external public data to exclude the possibility of dust emission bright enough to explain the entire excess signal," as stated by other scientists who questioned their conclusion.**

**The team was led by astrophysicist John Kovac of Harvard.**

**BICEP2 stands for Background Imaging of Cosmic Extragalactic Polarization.**

**"Detecting this signal is one of the most important goals in cosmology today," Kovac, leader of the BICEP2 collaboration at the Harvard-Smithsonian Center for Astrophysics, said back in March.**

**By observing the cosmic microwave background, or a faint glow left over from the Big Bang, the scientists said small fluctuations gave them new clues about the conditions in the early universe.**

**The gravitational waves rippled through the universe 380,000 years after the Big Bang, and these images were captured by the telescope, they claimed.**

**For weeks, some scientists have expressed doubts about the findings of the BICEP2 team.**

**David Spergel, a theoretical astrophysicist at Princeton University, queried whether what the BICEP2 telescope picked up really came from the first moments of the universe's existence.**

**"We know that galactic dust emits polarized radiations. We see that in many areas of the sky, and what we pointed out in our paper is that pattern they have seen is just as consistent with the galactic dust radiations as with gravitational waves," Spergel told AFP last week.**

**He said the question will likely be settled in the coming months when another, competing group, working with the European Space Agency's Planck telescope, publishes its results.**

**That telescope observes a large part of the sky -- versus the BICEP2's two percent -- and carries out measurements in six frequencies, compared to just one for BICEP2, according to Spergel.**

**"I think in retrospect, they should have been more careful about making a big announcement," he said.**

## **NASA Funds 18 Creative Concepts for Bold Asteroid-Capture Plan**



**An illustration shows how a future astronaut might take samples from a captured asteroid moved to a stable orbit in relation to the Earth and moon.**

**NASA is getting some help in mapping out its ambitious asteroid-capture mission.**

**The space agency has awarded a total of \$4.9 million to 18 proposals that could advance and flesh out the asteroid-retrieval plan, which aims to drag a space rock into orbit around the moon for future visitation by astronauts, officials announced today (June 19).**

**"By investing in these studies, NASA will gain valuable insight into affordable ways to perform the Asteroid Redirect Mission while also advancing technologies needed to drive future exploration missions," James Reuther, deputy associate administrator for space technology at NASA headquarters in Washington, said in a statement. [NASA's Asteroid-Capture Mission in Pictures]**

**NASA received 108 submissions after announcing the request for proposals in March. The selected studies are a diverse lot; some seek to develop asteroid-capture systems, while others focus on rendezvous technology or adapting commercial spacecraft to meet the needs of the mission.**

The idea is a variant of the Planetary Society's Living Interplanetary Flight Experiment (LIFE), which aimed to hitch a ride to the Mars moon Phobos and back aboard Russia's Phobos-Grunt sample-return mission. But LIFE (and Phobos-Grunt) crashed into the Pacific Ocean in January 2012, the victim of a launch failure.

NASA has a complete list of the 18 selected proposals here:  
<http://www.nasa.gov/content/nasa-selects-studies-for-the-asteroid-redirect-mission/>

NASA is still figuring out exactly how to pull off the asteroid-capture mission. The agency is considering two major options — retrieving an entire small space rock (one less than 33 feet, or 10 meters, wide), or plucking a boulder off a bigger asteroid.

That initial phase of the mission would employ a robotic probe. But once the rock is in lunar orbit, the agency would send astronauts to visit it using the Orion capsule and Space Launch System mega-rocket, which are scheduled to fly together for the first time in 2021.

The goal is to execute a manned mission to the captured asteroid by 2025. Doing so would meet an exploration goal laid out for NASA by President Barack Obama in 2010. The asteroid-retrieval mission will also help develop the technology and techniques required by for a manned Mars trip, which is planned by the mid-2030s, agency officials have said.

Credit Mike Wall, Senior Writer Space.com

## Spectacular 'Whirlpool Galaxy' Swirls into Space Telescope's View.



Spectacular 'Whirlpool Galaxy' Swirls into Space Telescope's View (Photo)

**Hundreds of shimmering X-ray sources captured by a NASA telescope illuminate a distant spiral galaxy similar to Earth's own Milky Way.**

**NASA's Chandra X-ray Observatory captured this image of Messier 51, nicknamed the "Whirlpool Galaxy" for its swirling arms of stars and dust. It's about 30 million light-years from Earth and astronomers think it could be home to several black holes.**

**Over 250 hours of observation time, Chandra saw 500 X-ray sources in and around the galaxy — five times the number of sources that had been counted in previous studies. [Supernova Photos: Great Images of Star Explosions]**

**Most of the purple light in the image is thought to come from X-ray binaries — systems that contain a dense neutron star, or in more rare cases, a black hole, sucking up matter from a neighboring star. The strong gravitational pull from the neutron star or black hole heats the material flowing from the companion star to millions of degrees. The Chandra telescope can spot these hot streaks of stellar material.**

**Ten of the X-ray binaries in the Whirlpool Galaxy appear so bright astronomers think there is a chance they contain black holes with neighboring stars larger than the sun. That's because huge gusts of stellar wind would flow from the large stars into the black holes, generating massive amounts of energy and hot matter that produce X-rays.**

**While the hot X-ray emissions detected by Chandra are shown in purple, the image also combines visible light captured by the Hubble Space Telescope shown in red, green and blue. The purple areas that appear fuzzy are thought to be superheated gas left over from supernova explosions of giant stars.**

**The Whirlpool Galaxy is merging with another smaller galaxy in the top left corner of the image, and astronomers think the two galaxies slamming into each other is creating a wave of star formation. The largest newly formed stars will likely speed through their life cycles in just a few million years, and then collapse in on themselves to form black holes or neutron stars, and create more X-ray binaries.**

**The \$1.65 billion Chandra telescope is specifically designed to pick up superheated regions in space. Because Earth's atmosphere absorbs X-rays, the telescope must orbit 86,500 miles (139,000 kilometers) above the planet. Chandra launched in 1999 and will continue scanning the universe for hot regions like the remains of exploded stars, material surrounding black holes, and the separation of dark matter from normal matter during galaxy collisions**

**Credit Space.com By Kelly Dickerson, Staff Writer**

# Universe Shouldn't Be Here, According to Higgs Physics

The universe shouldn't exist — at least according to a new theory.

Modeling of conditions soon after the Big Bang suggests the universe should have collapsed just microseconds after its explosive birth, the new study suggests.

"During the early universe, we expected cosmic inflation — this is a rapid expansion of the universe right after the Big Bang," said study co-author Robert Hogan, a doctoral candidate in physics at King's College in London. "This expansion causes lots of stuff to shake around, and if we shake it too much, we could go into this new energy space, which could cause the universe to collapse."

Physicists draw that conclusion from a model that accounts for the properties of the newly discovered Higgs boson particle, which is thought to explain how other particles get their mass; faint traces of gravitational waves formed at the universe's origin also inform the conclusion. [Doomsday: The 9 Real Ways Earth Could End]

Of course, there must be something missing from these calculations.

"We are here talking about it," Hogan told Live Science. "That means we have to extend our theories to explain why this didn't happen."

**Bang!**

One possible explanation holds that during the fiery flash after the primordial Big Bang explosion, matter raced outward at breakneck speeds in a process known as cosmic inflation. This bent and squeezed space-time, creating ripples known as gravitational waves that also twisted the radiation that passed through the universe, Hogan said.

Though those events would have occurred 13.8 billion years ago, a telescope at the South Pole known as the Background Imaging of Cosmic Extragalactic Polarization (BICEP2) recently detected the faint traces of cosmic inflation in the background microwave radiation that pervades the universe: in particular, characteristic twisted or curled waves called the B-mode pattern. (Other scientists have already begun to question the findings, saying the results may just be from dust in the Milky Way.)

But gravity wasn't the only force at play in the early universe. A ubiquitous energy field, called the Higgs field, permeates the universe and gives mass to the particles that trudge through the field. Scientists found the telltale sign of that field in 2012, when they discovered the Higgs boson and then determined its mass. [6 Implications of Finding a Higgs Boson Particle]

With a greater understanding of cosmic inflation's properties and the Higgs boson mass, Hogan and his colleague, Malcolm Fairbairn, who is also a physicist at King's College London, tried to recreate the conditions of cosmic inflation after the Big Bang.

What they found was bad news for, well, everything. The newborn universe should have experienced an intense jittering in the energy field, known as quantum fluctuation. Those jitters, in turn, could have disrupted the Higgs field, in essence rolling the entire system into a much lower energy state that would make the collapse of the universe inevitable.

### Missing ingredient

So if the universe shouldn't exist, why is it here?

"The generic expectation is that there must be some new physics that we haven't put in our theories yet, because we haven't been able to discover them," Hogan said.

One leading possibility, known as the theory of supersymmetry, proposes that there are superpartner particles for all the currently known particles, and perhaps more-powerful particle accelerators could find these particles, Hogan said.

But the theory of cosmic inflation is still speculative, and some physicists hint that what looked like primordial gravitational waves to the BICEP2 telescope may actually be signals from cosmic dust in the galaxy, said Sean Carroll, a physicist at the California Institute of Technology and author of "The Particle at the End of the Universe: How the Hunt for the Higgs Boson Leads Us to the Edge of a New World" (Dutton Adult, 2012).

If the details of cosmic inflation change, then Hogan and Fairbairn's model would need to adapt as well, Carroll told Live Science. Carroll was not involved in the study.

Interestingly, this isn't the first time that physicists have said the Higgs boson spells doom for the universe. Others have calculated that the Higgs boson's mass would lead to a fundamentally unstable universe that could end apocalyptically in billions of years.

The mass of the Higgs boson, about 126 times that of the proton, turns out to be "right on the edge," in terms of the universe's stability, Carroll said. A little bit lighter, and the Higgs field would be much more easily perturbed; a little heavier, and the current Higgs field would be incredibly stable.

By Tia Ghose, Staff Writer, Life Science

**A reminder.**

**Woodside Creamery Date:**

**MCAG will once again be at the Creamery on July 5, August 2, and Sept 6. All are Saturdays with the 1<sup>st</sup> Quarter Moon well placed in the sky. We will start around 7:30pm and go until Woodside closes at 9:00pm.**

**Public Nights at MCAO**

**14 July 2014**

**Greg Lee      Stars that never set. The Circumpolar Sky**

**29 July 2014**

**Jack Fisher    Pluto and the Kuiper Belt.**

**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](http://www.yelp.com/biz/manor-used-books-New+Castle))**



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