Thaxted Astronomical Society

News
Features
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Giant Supernova TWICE As Bright As Ever Seen

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https://www.dailymail.co.uk/sciencetech/article-8214079/Giant-supernova-discovered-scientists-TWICE-bright-previously-found.html`/

Astronomers discover a giant supernova TWICE as bright as ever seen before - and say it was caused by the merger of two stars in a galaxy 4.6billion light years away

Daily Mail 13th April 2020 >

- Astronomers say the explosion was so bright it eclipsed its entire parent galaxy
- Researchers had to wait two years for the light to dim enough to see the galaxy
- It was caused by two giant stars coming together when one is about to explode

A massive supernova discovered 'in the middle of nowhere' is twice as bright as anything previously found in the universe, according to astronomers.

Dying stars are found every night but most are in vast galaxies - while this one appeared to stand alone, according to a team from the University of Birmingham.

Astronomers believe the explosion was caused by two giant stars merging in an event known as 'pulsational pair-instability' and is the first time it's been seen by astronomers.

The team found the explosion, named SN2016aps, had five times the blast power of a normal supernova and was nearly ten times as large.

It wasn't until the lights had dimmed that researchers were able to pinpoint it to a very faint and previously undetected galaxy 4.6 billion light years away.

This type of supernova - caused by the merger of massive stars - had previously only existed as a theory, but these observations show it is a real phenomenon.

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Lead study author Dr Matt Nicholl, from the University of Birmingham, said supernovae are measured using two scales - total energy of the explosion and the amount of energy emitted as observable light or radiation.

'In a typical supernova, the radiation is less than one per cent of the total energy,' the author said. 'But in SN2016aps, we found the radiation was five times the explosion energy of a normal-sized supernova.

'This is the most light we have ever seen emitted by a supernova.'

In order to become this bright, experts say the explosion must have been much more energetic than would normally be seen from an exploding star.

The team discovered the explosion was powered by a collision between the supernova and a massive shell of gas, shed by a star in the years before it exploded.

The explosion was so bright it eclipsed anything else around - making it appear to be standing alone in the universe - rather than from a massive galaxy.

Study co-author Dr Peter Blanchard, from Northwestern University, US, said: 'We weren't able to see the galaxy where this star was born until after the light faded.'

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Astronomers observed the explosion for two years until the dying star faded to one per cent of its peak brightness.

Using these measurements, they calculated the mass of the supernova was between 50 to 100 times greater than our sun.

While supernovae typically have masses of between 8 and 15 solar masses.

'Stars with extremely large mass undergo violent pulsations before they die, shaking off a giant gas shell,' said Nicholl.

'This can be powered by a process called the pair instability, which has been a topic of speculation for physicists for the last 50 years.

'If the supernova gets the timing right, it can catch up to this shell and release a huge amount of energy in the collision.

'We think this is one of the most compelling candidates for this process yet observed, and probably the most massive.'

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Researchers said SN2016aps contained another puzzle - the fact the gas detected was mostly hydrogen when a massive star would normally have lost its hydrogen long before it started pulsating ahead of a supernova explosion.

'One explanation is that two slightly less massive stars of around, say 60 solar masses, had merged before the explosion,' Nicholls said.

'The lower mass stars hold onto their hydrogen for longer, while their combined mass is high enough to trigger the pair instability.'

Harvard University Professor Edo Berger said the discovery could not have come at a better time with the unveiling of NASA's new orbiting infrared observatory enabling them to look back in time.

'Now that we know such energetic explosions occur in nature, NASA's new James Webb Space Telescope will be able to see similar events so far away that we can look back in time to the deaths of the very first stars in the Universe,' he said.

Supernova 2016aps was first detected in data from the Panoramic Survey Telescope and Rapid Response System, a large-scale astronomical survey programme.

The team also used data from the Hubble Space Telescope, the Keck and Gemini Observatories, in Hawaii, and the MDM and MMT Observatories in Arizona.

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WHAT IS A SUPERNOVA AND HOW DOES IT FORM?

A supernova occurs when a star explodes, shooting debris and particles into space.

A supernova burns for only a short period of time, but it can tell scientists a lot about how the universe began.

One kind of supernova has shown scientists that we live in an expanding universe, one that is growing at an ever increasing rate.

Scientists have also determined that supernovas play a key role in distributing elements throughout the universe.

There are two known types of supernova.

The first type occurs in binary star systems when one of the two stars, a carbon-oxygen white dwarf, steals matter from its companion star.

Eventually, the white dwarf accumulates too much matter, causing the star to explode, resulting in a supernova.

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The second type of supernova occurs at the end of a single star's lifetime.

As the star runs out of nuclear fuel, some of its mass flows into its core.

Eventually, the core is so heavy it can't stand its own gravitational force and the core collapses, resulting in another giant explosion.

Many elements found on Earth are made in the core of stars and these elements travel on to form new stars, planets and everything else in the universe.