SPACE

Record-breaking star explosion outshines Milky Way

At 570 times brighter than sun, supernova is 'most powerful' seen in human history

By Marcia Dunn
ASSOCIATED PRESS

CAPE CANAVERAL, Fla. — Astronomers have discovered the brightest star explosion ever, a super supernova that easily outshines our entire Milky Way.

An international team revealed "the most powerful supernova observed in human history" last week in the latest Science journal.

The astronomers used a network of telescopes around the world to spot the record-breaking supernova last year.

Jin Ma / Beijing Planetarium

An artist's impression of the superluminous supernova ASASSN-15lh portrays it as it would appear from an exoplanet located about 10,000 light years away in the host galaxy of the supernova. Astronomers on Thursday announced the discovery of the brightest star explosion ever, which easily outshines the entire Milky Way galaxy.

'Surreal' discovery

Super luminous supernovas — extra bright stellar explosions — are believed to be rare.

The newly discovered supernova is especially rare: It is more than twice as luminous as any supernova observed to date, including the previous record-holders.

At its peak intensity, it is believed to be 20 times more luminous than the entire Milky Way. Some estimates put it at 50 times brighter.

And try this statistic on for size: It is 570 billion times brighter at its peak than our sun.

Lead author Subo Dong of China's Peking University said when he learned the magnitude of the discovery last summer, he was "too excited to sleep the rest of the night."

Fellow researcher Benjamin Shappee of the Carnegie Institution for Science in Pasadena, Calif., didn't believe the results at first, which seemed "surreal."

"Discoveries like this are the reason I am an astronomer," Shappee said in an email.

"Nature is extremely clever and it is often more imaginative than we can be."

Labeled ASASSN-15lh for the All-Sky Automated Survey for SuperNovae and pronounced "assassin," the mega blast is located in a galaxy perhaps 3.8 billion light years away.

'May lead to new thinking'

The precise galaxy is unknown. There are other puzzles as well.

"The explosion's mechanism and power source remain shrouded in mystery because all known theories meet serious challenges in explaining the immense amount of energy ASASSN-15lh has radiated," Dong said in a statement.

The next step for scientists is to figure out its incredible power source.

Other super supernovas, like this one, could be out there.

More observatories are on the case, including some NASA spacecraft.

The Hubble Space Telescope will be pressed into service this year as well.

SCIENCE

Moon may be chip off the old block — Earth

Scientists find same oxygen-isotope ratio in lunar rocks and volcanic materials

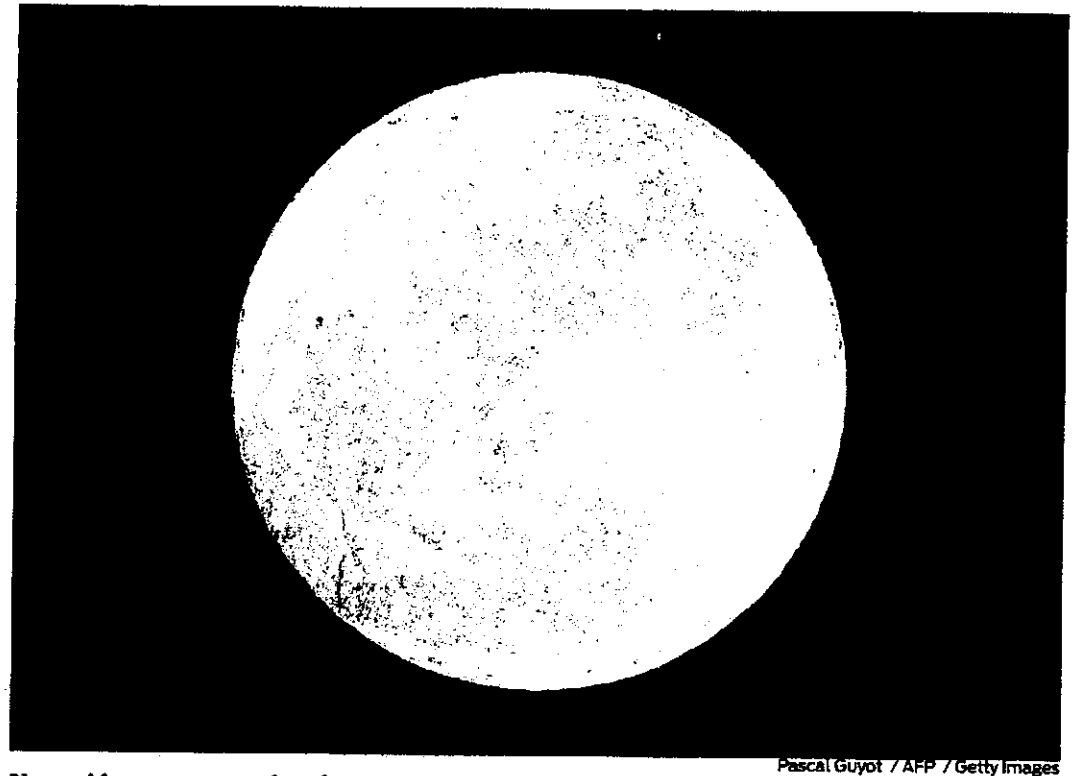
By Deborah Netburn
LOS ANGELES TIMES

The moon may be the closest object to us in space, but scientists are still struggling to understand how it got there.

Most planetary researchers think the moon was created as the result of a collision between the Earth and a long-hypothesized protoplanet called Theia about 100 million years after the birth of the solar system.

But whether that impact was a glancing blow or a full, head-on crash is still up for debate.

Last week, researchers at the University of California, Los Angeles provided new evidence in the journal Science that the collision was head-on, and so powerful that materials from both bodies mixed completely before settling into the Earth-moon system we know today.



Pascal Guyot / AFP / Getty Images

New evidence suggests that the moon, photographed last week from the south of France, started orbiting the Earth after a spectacular head-on collision that intermingled their materials.

An unlikely coincidence

To come to that conclusion, the researchers analyzed seven lunar rocks collected by the Apollo 12, 15 and 17 missions, as well as six volcanic rocks that include material from Earth's mantle. Specifically, they wanted to see if the ratio of oxygen isotopes in lunar rocks was the same as that in the terrestrial rocks.

More than 99.9 percent of Earth's oxygen is O-16, which means each atom has eight protons and eight neutrons, but there are also small amounts of the heavier isotopes O-17 and O-18 in our planet's oxygen mix.

"Every rock in the solar system we've ever found has a unique fingerprint of oxygen isotopes," said Edward Young, a geochemist at UCLA and the first author on the study.

And yet, his analysis shows that the moon and Earth have the exact same oxygen-isotope profile. The only way to explain this finding is if Earth and the moon are made of the exact same material.

Different fingerprints

And herein lies the challenge.

The easiest way for computer modelers to explain the physics of the Earth-moon system, such as how fast our planet spins on its axis and how fast the moon orbits Earth, is to have Theia giving Earth a glancing blow strong enough for both bodies to become molten. In this scenario, most of the Theia material mixes with the Earth's, but a small portion of it forms the moon.

If that's the case, the moon and Earth should have different chemical fingerprints. Although scientists expect Theia and Earth to have a similar oxygen-isotope ratio, they would not expect it to be identical, Young said.

"Even if the proto-Earth and Theia were very similar, they couldn't possibly be this similar," he said.

'Too special'

Back in 2012, two groups of scientists presented computer models that showed an alternative story of Earth-moon formation. In their simulations, the two bodies collide head-on, allowing for extensive mixing between Earth and Theia.

Those models have since been dismissed as "too special," said Sarah T. Stewart of the University of California, Davis, who was a co-author on one of those studies.

"The odds of getting one of these perfectly mixing impacts is so low that it is probably not the best solution," she said.

But Young thinks the team was on the right track. "The collision must have been very energetic for everything to melt together," he said.

Stewart, who was not involved in the new study, said the work by Young and his colleagues provides the best measurement yet of the oxygen isotope ratio in the two bodies and provides a challenge to her and her colleagues.

"We have a very big science problem of, How did our neighbor form?" she said. "The geochemists have told us the answer, but the physicists have not been able to get us there."