

Scientists claim breakthrough in antimatter hunt

The Associated Press

GENEVA (AP) -- Scientists claimed a breakthrough Thursday in solving one of the biggest riddles of physics, successfully trapping the first "anti-atom" in a quest to understand what happened to all the antimatter that has vanished since the Big Bang.

An international team of physicists at the European Organization for Nuclear Research, or CERN, managed to create an atom of anti-hydrogen and then hold onto it for long enough to demonstrate that it can be studied in the lab.

"For us it's a big breakthrough because it means we can take the next step, which is to try to compare matter and antimatter," the team's spokesman, American scientist Jeffrey Hangst, told The Associated Press.

"This field is 20 years old and has been making incremental progress toward exactly this all along the way," he added. "We really think that this was the most difficult step."

For decades, researchers have puzzled over why antimatter seems to have disappeared from the universe.

Theory posits that matter and antimatter were created in equal amounts at the moment of the Big Bang, which spawned the universe some 13.7 billion years ago. But while matter - defined as having mass and taking up space - went on to become the building block of everything that exists, antimatter has all but disappeared except in the lab.

Hangst and his colleagues, who included scientists from Britain, Brazil, Canada, Israel and the United States, trapped 38 anti-hydrogen for about one tenth of a second, according to a paper submitted to the respected science journal Nature.

Since their first success, the team has managed to hold the anti-atoms even longer.

"Unfortunately I can't tell you how long, because we haven't published the number yet," Hangst told the AP. "But I can tell you that it's much, much longer than a tenth of a second. Within human comprehension on a real clock."

Scientists have long been able to create individual particles of antimatter such as anti-protons, anti-neutrons and positrons - the opposite of electrons. Since 2002, they have also managed to lump these particles together to form anti-atoms, but until recently none could be trapped for long enough to study them, because atoms made of antimatter and matter annihilate each other in a burst of energy upon contact.

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"It doesn't help if they disappear immediately upon their creation," said Hangst. "So the big goal has been to hold onto them."

Two teams had been competing for that goal at CERN, the world's largest physics lab best known for its \$10 billion smasher, the Large Hadron Collider. The collider, built deep under the Swiss-French border, wasn't used for this experiment.

Hangst's ALPHA team got there first, beating the rival ATRAP team led by Harvard physicist Gerald Gabrielse, who nevertheless welcomed the result.

"The atoms that were trapped were not yet trapped very long and in a very usable number, but one has to crawl before you sprint," he told the AP.

Many new techniques painstakingly developed over five years of experimental trial and error preceded the successful capture of anti-hydrogen.

To trap the anti-atoms inside an electromagnetic field and to stop them from annihilating atoms, researchers had to create anti-hydrogen at temperatures less than half a degree above absolute zero.

"Think of it as a marble rolling back and forth in a bowl," said Hangst. "If the marble is rolling too fast (i.e. the anti-atom is too hot) it just goes over the edge."

Next, scientists plan to conduct basic experiments on the anti-atom, such as shining a laser onto it and seeing how it behaves, he said.

"We have a chance to make a really precise comparison between a matter system and an antimatter system," he said, "That's unique, that's never been done. That's where we're headed now."

Hangst downplayed speculation that antimatter might someday be harnessed as a source of energy, or to create a powerful weapon, an idea popularized in Dan Brown's best-selling novel "Angels and Demons."

"It would take longer than the age of the universe to make one gram of antimatter," he said, calling the process "a losing proposition because it takes much more energy to make antimatter than you get out of it."

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