# Atom smasher will help reveal 'the beginning'

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In this March 22, 2007 file photo, the magnet core of the world's largest superconducting solenoid magnet (CMS, Compact Muon Solenoid) is shown in Geneva, Switzerland. The world's largest atom smasher set a record for high-energy collisions on Tuesday, March 30, 2010 by crashing proton beams into each other at three times more force than ever before. In a milestone in the $10 billion Large Hadron Collider's ambitious bid to reveal details about theoretical particles and microforces, scientists at the European Organization for Nuclear Research, or CERN, collided the beams and took measurements at a combined energy level of 7 trillion electron volts. (AP Photo/Keystone, Martial Trezzini)

The world's largest atom smasher threw together minuscule particles racing at unheard of speeds in conditions simulating those just after the

Big Bang - a success that kick-started a megabillion-dollar experiment that could one day explain how the universe began.

Scientists cheered Tuesday's historic crash of two proton beams, which produced three times more energy than researchers had created before and marked a milestone for the $10 billion Large Hadron Collider.

"This is a huge step toward unraveling Genesis Chapter 1, Verse 1 - what happened in the beginning," physicist Michio Kaku told The Associated Press.

"This is a Genesis machine. It'll help to recreate the most glorious event in the history of the universe."

Tuesday's smashup transforms the 15-year-old collider from an engineering project in test phase to the world's largest ongoing experiment, experts say. The crash that occurred on a subatomic scale is more about shaping our understanding of how the universe was created than immediate improvements to technology in our daily lives.

The power produced will ramp up even more in the future as scientists at the European Organization for Nuclear Research, or CERN, watch for elusive particles that have been more theorized than seen on Earth.

The consequences of finding those mysterious particles could "affect our conception of who we are in the universe," said Kaku, co-founder of string field theory and author of the book "Physics of the Impossible."

Physicists, usually prone to caution and nuance, tripped over themselves in superlatives praising the importance of the Large Hadron Collider and the significance of its generating regular science experiments.

"This is the Jurassic Park for particle physicists," said Phil Schewe, a

spokesman for the American Institute of Physics. He called the collider a time machine. "Some of the particles they are making now or are about to make haven't been around for 14 billion years."

The first step in simulating the moments after the Big Bang nearly 14 billion years ago was to produce a tiny bang. The most potent force on the tiny atomic level that man has ever created came Tuesday.

Two beams of protons were sent hurtling in opposite directions toward each other in a 17-mile (27-kilometer) tunnel below the Swiss-French border - the coldest place in the universe at slightly above absolute zero. CERN used powerful superconducting magnets to force the two beams to cross; two of the protons collided, producing 7 trillion electron volts.

It's bizarrely both a record high and a small amount of energy.

It's a record on the atom-by-atom basis that physicists use to measure pure energy, Schewe said. By comparison, burning wood or any other chemical reaction on an atom scale produces one electron volt. Splitting a single uranium atom in a nuclear reaction produces 1 million electron volts. This produces - on an atom-by-atom scale - 7 million times more power than a single atom in a nuclear reaction, Schewe said.

The reason this is safe has to do with the amount of particles in the collider. Tuesday's success involved just two protons making energy, instead of pounds of uranium, Schewe said.

Kaku, a professor at City College of New York, described the amount of energy produced as less than the total energy made by two mosquitoes crashing.

The successful collision was viewed by scientists watching monitors, who cheered the results.

"That's it! They've had a collision," said Oliver Buchmueller of Imperial College in London.

Across the world at the California Institute of Technology in Los Angeles, researchers and students watched reports from Switzerland.

"It marks the beginning of a new era of exploration in a new range of energy," said physics professor Harvey Newman.

"Experiments are collecting their first physics data - historic moment here!" a scientist tweeted on CERN's official Twitter account.

"Nature does it all the time with cosmic rays (and with higher energy), but this is the first time this is done in Laboratory!" said another tweet.

Now the beams will become stronger, more densely packed with hundreds of billions of protons, and run daily for two years to give scientists many more chances to find elusive particles. Even then, the particles are so tiny that relatively few protons will collide at each point where the beams cross in front of cathedral-sized detectors.

The data generated is expected to reveal even more about the unanswered questions of particle physics, such as the existence of antimatter and the search for the Higgs boson, a hypothetical particle - often called the God particle - that scientists theorize gives mass to other particles and thus to other objects and creatures in the universe.

The collider also may help scientists see dark matter, the strange stuff that makes up more of the universe than normal matter but has not been seen on Earth.

Those particles are the missing piece from a "jigsaw puzzle with thousands of pieces" that explain the physics of the universe, Kaku said.

It could help in the elusive theory that explains everything.

"In the past, every time we unraveled a force (of physics) it changed human history," Kaku said. "Now we're talking about all forces."

He compared it to events such as the Industrial Revolution, the electric and the nuclear age. Such events followed breakthroughs made by Isaac Newton, Thomas Edison and Albert Einstein.

It won't happen immediately, maybe centuries down the line, but it could answer questions about the Big Bang, alternate universes and whether time travel is possible, Kaku said.

"It would change people's philosophy," he said.

The atmosphere at CERN was tense considering the collider's launch with great fanfare on Sept. 10, 2008. Nine days after its inauguration, the project was sidetracked when a badly soldered electrical splice overheated, causing extensive damage to the massive magnets and other parts of the collider some 300 feet (100 meters) below the ground.

It cost $40 million to repair and improve the machine. Since its restart in November 2009, the collider has performed almost flawlessly and given scientists valuable data. It quickly eclipsed the next largest accelerator - the Tevatron at Fermilab near Chicago.

Future experiments will follow over the objections of some who fear they could eventually imperil Earth by creating micro black holes - subatomic versions of collapsed stars whose gravity is so strong they can suck in planets and other stars.

CERN and many scientists dismiss any threat to Earth or people, saying that any such holes would be so weak that they would vanish almost

instantly. In the universe, where black holes collide, this is nothing, Kaku said.

"From Nature's point of view, she laughs and says 'this is a peashooter'," Kaku said.

Bivek Sharma, a professor at the University of California at San Diego, said the images of the first crashed proton beams were beautiful.

"It's taken us 25 years to build," he said. "This is what it's for. Finally the baby is delivered. Now it has to grow."