Strange Matter
Physicists May Bring About the End
Of the Universe — But Probably Not

By Amanda Onion  FOX NEWS

NEW YORK — Scientists in Brookhaven, Long Island, have built a 2.4-mile underground tunnel where they hope to recreate nothing less than what they believe was the biggest event in the history of the universe.

"Each collision will be like a mini big bang," said Brookhaven physicist Thomas Ludlam, referring to the "Big Bang" theory that many scientists believe led to the creation of the universe. "We also expect to be a little bit surprised, since this has never been done before."

To many scientists, the possibility of being surprised is extremely exciting.

"We'll be able to peek into a new dimension," explained Miklos Gyulassy, a Columbia University physicist who will be using the facility to study how released quarks and gluons behave in a group.

But not everyone seems so impressed. Some are quite unnerved by the prospect of encountering scientific surprises when it comes to recreating the creation of the universe.

"Big Bang Machine Could Destroy Earth," blared one headline in London's *Sunday Times* last month. "Physicists are boldly going where it may be unsafe to go," a worried reader recently wrote to *Scientific American*.

Most unsettling for some is the fact that the Brookhaven physicists themselves have not excluded the possibility that the subject of all this controversy, the Relativistic Heavy Ion
Collider (or RHIC machine), could create something that might destroy the universe. One of the biggest thinkers in the field of physics today, Frank Wilczek of the Institute for Advanced Learning, qualified the possibility as "very speculative."

But Ludlam explained people like Wilczek are hedging only because responsible scientists never say never.

"This is the way good scientists think," he said. "In all probability nothing bad will happen, and in a practical sense it won't happen. But it's not a zero probability."

**Soup of the Universe**

Physicists can't rule out the possibility that the RHIC (pronounced "Rick") won't produce a new phase of matter that is so stable, it causes all less stable matter around it to collapse into its own state. To understand how this highly unlikely event could occur, however, one must first understand the mechanics of RHIC.

The real purpose of RHIC is not to create a matter-eating monster, but to zero in on some of the smallest particles in the universe.

Everything as we know it is made up of miniscule components known as atoms. In fact, the word atom comes from ancient Greek and means something that cannot be further broken down.

But subatomic particles in the form of neutrons and protons exist inside the atom. And under intense heat and pressure, bits and pieces of neutrons and protons, called quarks and gluons, can be released. Scientists believe the universe began as a soup of these free-floating particles in a mixture known as the Quark-Gluon Plasma, or QGP.

As David Hertzog, a physicist at the University of Illinois, says, the "Holy Grail of this business" is to produce samples of QGP in the Brookhaven tunnels. Even though the plasma would most likely decay and re-settle into normal protons and neutrons, observing its traces could reveal much about
the state of the universe just before the big bang.

**Atom-Smashing**

To release quarks and gluons from their stable setting inside the atom, scientists have installed nearly 2,000 superconducting magnets in a long, underground racetrack. Inside the tunnel, the magnetic fields cause the positively charged gold ions (atoms stripped of their electrons) to race along, nearly reaching the speed of light.

The ions will travel along one of two interlaced tracks that are aligned so ions speeding in opposite directions will collide six times over the course of the 2.4-mile-loop. The collisions will be extremely brief and miniature, but are expected to produce temperatures 10,000 times greater than the heat of the sun.

Scientists predict the combination of the heat and pressure produced in each collision will be enough to melt quarks and gluons from their places inside the atoms. That may mean that, for at least a brief instant, the machine will produce the original stuff of the universe—the quark-gluon plasma.

The question is what else it may produce.

**Strange and Sinister**

Atoms contain "up" and "down" quarks. But astronomers have observed traces of different, heavier quarks, forming in cosmic collisions. They also suspect these so-called strange quarks may exist in the high-pressure cores of neutron stars.

Strange quarks have a history of being very unstable. But
physicists like Wilczek speculate that if conditions were ripe and if a collection of strange quarks were created and aligned in just the right way, ("and those are big 'ifs,'" Wilczek adds) they could stick together to form a new stable matter, ominously called strange matter or strangelets.

"It would be very very interesting if this new form of matter were stable at zero pressure," said Wilczek. "But unfortunately or fortunately, there’s no evidence for it, and quite a bit of evidence against it."

The only way this new matter could be a threat is if (another big "if") the universe’s atoms are now in an unstable state. For example, introducing a drop of water in a tank of steam that has been produced at low temperatures causes the steam to instantly transform into liquid water. Likewise, by introducing a new, more stable form of matter, all other matter may instantly collapse into the stable strange matter.

The difference is rather than influencing a single element like water, stable strange matter could cause all matter in the universe to collapse.

"It’s a neat little fun thing to think about," said Hertzog, "but it’s not really a serious possibility. In fact, I bet if we called strangelets something more boring, no one would even notice."

But people have noticed.

The RHIC experiment has even inspired a 1998 science fiction novel, *Cosm*, by Gregory Benford, in which a young physicist accidentally creates a new universe. Meanwhile, physicists have been busy listing the evidence of why the worst — most probably, almost assuredly, nearly definitely — won't happen.

**Why We’re (Probably) Safe**

The biggest evidence against the possibility of a matter-eating strangelet forming is the fact that heavy ion collisions happen all the time in the universe. "There have been constant cosmic ray collisions in space over the whole 10-billion-year history of the universe," Ludlam said, "and we're still here."

Workers finished construction of the RHIC tunnel last June, but last-minute tweaks have delayed experiments. The first ions are due to crash by late November or early December.
Although Wilczek understands why the machinery may make people nervous, he’s convinced everyone will still be around when they finally pull the switch.

"It’s legitimate for the public to expect scientists to worry about possible catastrophes and not be so blinded by curiosity," he said. "But I think in this case, it’s a bum rap."