

Studies of universe's expansion win physics Nobel (Update 3)

4 October 2011



Saul Perlmutter and Adam Riess of the United States and US-Australian Brian Schmidt won the 2011 Nobel Physics Prize Tuesday for their research on supernovae, the Nobel jury said.

Three U.S.-born scientists won the Nobel Prize in physics on Tuesday for overturning a fundamental assumption in their field by showing that the expansion of the universe is constantly accelerating.

Their discovery created a new portrait of the eventual fate of the universe: a place of super-low temperatures and black skies unbroken by the light of galaxies moving away from each other at incredible speed.

Physicists had assumed for decades that the expansion of the universe was getting ever-slower, meaning that in billions of years it would resemble today's universe in many important ways.

Then, working in separate research teams during the 1990s, Saul Perlmutter, Brian Schmidt and Adam Riess found that the light from more than 50 distant exploding stars was far weaker than they expected, meaning that galaxies had to be racing away from each other at increasing speed.

The acceleration is driven by what scientists call dark energy, a cosmic force that is one of the great mysteries of the universe.

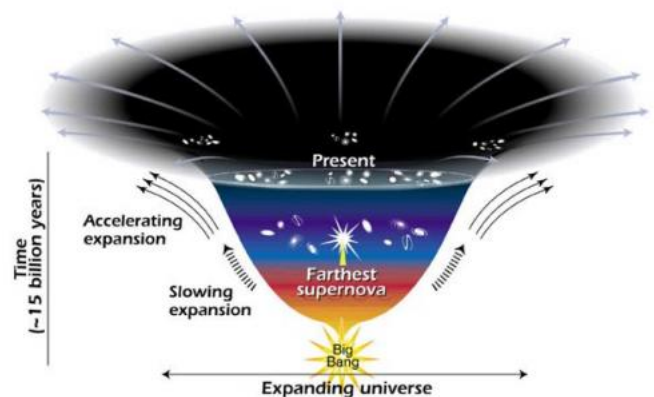
The Nobel-winning discovery implies instead that the universe will get increasingly colder as matter spreads across ever-vaster distances in space, said Lars Bergstrom, secretary of the Nobel physics committee.

He said galaxies that are 3 million light years away from Earth move at a speed of around 44 miles per second (70 kilometers per second). Galaxies that are 6 million light years away move twice as fast.

The research implies that billions of years from now, the universe will become "a very, very large, but very cold and lonely place," said Charles Blue, spokesman for the American Institute of Physics.

In contrast to the big bang, that fate has been called the "big rip" to indicate how galaxies would be torn apart, he said.

Galaxies will be flying away so quickly that their light could not travel across the universe to distant observers as it does today, making the sky appear black, he said.



"For almost a century the universe has been known to be expanding as a consequence of the Big Bang about 14 billion years ago," the citation said.

"However the discovery that this expansion is accelerating is astounding. If the expansion will continue to speed up the universe will end in ice."

The Royal Swedish Academy of Sciences said Perlmutter would receive half of the 10 million kronor (\$1.5 million) award, with Riess and Schmidt, a U.S.-born Australian, splitting the other half.

Perlmutter, 52, heads the Supernova Cosmology Project at the Lawrence Berkeley National Laboratory and University of California, Berkeley.

Schmidt, 44, is the head of the High-z Supernova Search Team at the Australian National University in Weston Creek, Australia.

Riess, 41, is an astronomy professor at Johns Hopkins University and Space Telescope Science Institute in Baltimore, Maryland.

Schmidt said he was just sitting down to have dinner with his family in Canberra, Australia, when the phone call came from the academy.

"I was somewhat suspicious when the Swedish voice came on," Schmidt told The Associated Press. "My knees sort of went weak and I had to walk around and sort my senses out."

Riess said his "jaw dropped" when he received an early-morning call at his home in Baltimore from a bunch of Swedish men and realized "it wasn't Ikea," the Swedish furniture retailer. "I'm dazed," he told AP.

The discovery was "the biggest shakeup in physics, in my opinion, in the last 30 years," said Phillip Schewe, a physicist and spokesman at the Joint Quantum Institute, which is operated by the University of Maryland and the federal government.

"I remember everyone thinking at the time (that) there was some mistake," Schewe said. But there was no mistake, and in fact the basic finding was confirmed later by other measurements. For example, other scientists found evidence for it when they analyzed the microwave radiation left over from the big bang that still bathes the universe, he said.

Perlmutter told AP his team made the discovery in steps, analyzing the data and assuming it was wrong.

"And after months, you finally believe it," he said. "It's not quite a surprise anymore. I tell people it's the longest "aha!" experience that you've ever had."

Fred Dylla, executive director of the American Institute of Physics, said the prize confirmed an idea from Albert Einstein, called the cosmological constant, that Einstein inserted in his general theory of relativity, a cornerstone of modern physics.

Einstein later repudiated that idea as his "biggest blunder," but it did lead to a lot of theoretical and experimental studies, Dylla said.

The physics prize was the second Nobel to be announced this year. On Monday the medicine prize went to American Bruce Beutler and French scientist Jules Hoffmann who shared it with Canadian-born Ralph Steinman for their discoveries about the immune system. Steinman died three days before the announcement but since his death was not known to the committee, they decided he should keep the Nobel. Since 1974, Nobels have been awarded only to living scientists.

The Nobel Prizes were established in the will of Swedish industrialist Alfred Nobel, and have been handed out since 1901.

Last year's physics award went to Russian-born scientists Andre Geim and Konstantin Novoselov for groundbreaking experiments with graphene, the strongest and thinnest material known to mankind.

The prizes are handed out every year on Dec. 10, on the anniversary of Nobel's death in 1896.

More information: *Here is some information from nobelprize.org website:*

Written in the stars

"Some say the world will end in fire, some say in ice..."

What will be the final destiny of the Universe? Probably it will end in ice, if we are to believe this year's Nobel Laureates in Physics. They have studied several dozen exploding stars, called supernovae, and discovered that the Universe is expanding at an ever-accelerating rate. The discovery came as a complete surprise even to the Laureates themselves.

In 1998, cosmology was shaken at its foundations as two research teams presented their findings. Headed by Saul Perlmutter, one of the teams had set to work in 1988. Brian Schmidt headed another team, launched at the end of 1994, where Adam Riess was to play a crucial role.

The research teams raced to map the Universe by locating the most distant supernovae. More sophisticated telescopes on the ground and in space, as well as more powerful computers and new digital imaging sensors (CCD, Nobel Prize in Physics in 2009), opened the possibility in the 1990s to add more pieces to the cosmological puzzle.

The teams used a particular kind of supernova, called type Ia supernova. It is an explosion of an old compact star that is as heavy as the Sun but as small as the Earth. A single such supernova can emit as much light as a whole galaxy. All in all, the two research teams found over 50 distant supernovae whose light was weaker than expected - this was a sign that the expansion of the Universe was accelerating. The potential pitfalls had been numerous, and the scientists found reassurance in the fact that both groups had reached the same astonishing conclusion.

For almost a century, the Universe has been known to be expanding as a consequence of the Big Bang about 14 billion years ago. However, the discovery that this expansion is accelerating is astounding. If

the expansion will continue to speed up the Universe will end in ice.

The acceleration is thought to be driven by dark energy, but what that dark energy is remains an enigma - perhaps the greatest in physics today. What is known is that dark energy constitutes about three quarters of the Universe. Therefore the findings of the 2011 Nobel Laureates in Physics have helped to unveil a Universe that to a large extent is unknown to science. And everything is possible again.

www.nobelprize.org/nobel_prize...ates/2011/press.html

For advanced information, please read:

www.nobelprize.org/nobel_prize...sciback_fy_en_11.pdf

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