2011 Nobel Prize in Physics

Curious Cat Science and Engineering Blog

Photo: Roy Kaltschmidt. Courtesy: Lawrence Berkeley National Laboratory

Saul Perlmutter

Photo: Belinda Pratten, Australian National University

Brian P. Schmidt

Photo: Homewood Photography

Adam G. Riess

Photos of the 2011 Physics Nobel Prize Winners.

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Physics for 2011 with one half to

Saul Perlmutter
The Supernova Cosmology Project, Lawrence Berkeley National Laboratory and University of California, Berkeley, CA, USA

and the other half jointly to

Brian P. Schmidt
The High-z Supernova Search Team, Australian National University, Weston Creek, Australia

and

Adam G. Riess
The High-z Supernova Search Team, Johns Hopkins University and Space Telescope Science Institute, Baltimore, MD, USA

“for the discovery of the accelerating expansion of the Universe through observations of distant supernovae”

Once again the USA dominates the physics category, Brian Schmidt is a USA and Australian citizen. It will be interesting to see if this starts to change in the next decade. I believe it will at some point fairly soon, the question is at what point.

"Some say the world will end in fire, some say in ice…" Robert Frost [1], Fire and Ice, 1920

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.

As usually the Nobel committee does a great job of providing the public open scientific information [2]. Others that claim to promote science can learn from them. They do a great job of making the science understandable to a lay person. The discovery came as a complete surprise even to the Nobel Laureates themselves. What they saw would be like throwing a ball up in the air, and instead

of having it come back down, watching as it disappears more and more rapidly into the sky, as if gravity could not manage to reverse the ball's trajectory. Something similar seemed to be happening across the entire Universe.
The growing rate of the expansion implies that the Universe is being pushed apart by an unknown form of energy embedded in the fabric of space. This dark energy makes up a large part of the Universe, more than 70 %, and it is an enigma, perhaps the greatest in physics today. No wonder, then, that cosmology was shaken at its foundations when two different research groups presented similar results in 1998.
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Saul Perlmutter [8], U.S. citizen. Born 1959 in Champaign-Urbana, IL, USA. Ph.D. 1986 from University of California, Berkeley, USA. Head of the Supernova Cosmology Project, Professor of Astrophysics, Lawrence Berkeley National Laboratory and University of California, Berkeley, CA, USA.

Brian P. Schmidt [9], U.S. and Australian citizen. Born 1967 in Missoula, MT, USA. Ph.D. 1993 from Harvard University, Cambridge, MA, USA. Head of the High-z Supernova Search Team, Distinguished Professor, Australian National University, Weston Creek, Australia.

Adam G. Riess [10], U.S. citizen. Born 1969 in Washington, DC, USA. Ph.D. 1996 from Harvard University, Cambridge, MA, USA. Professor of Astronomy and Physics, Johns Hopkins University and Space Telescope Science Institute, Baltimore, MD, USA.

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