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Research Highlights

Nobel Prize 2011: Perlmutter, Schmidt & Riess

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The 2011 Nobel Prize in Physics has been awarded to Saul Perlmutter, Brian Schmidt and Adam Riess, "for the discovery of the accelerating expansion of the Universe through observations of distant supernovae".

Isn't it annoying when that happens? You set out to prove something and find that, in fact, the opposite is true.

That's what happened to Adam Riess — who shares this year's Nobel Prize with Saul Perlmutter and Brian Schmidt — in the autumn of 1997. He was using data collected by the High-z Supernova Search Team, led by Schmidt, to calculate the mass of the Universe and thence determine whether the Universe would expand forever or eventually collapse. Riess assumed, as everyone always had, that the rate of expansion of the matter-dominated Universe must be gradually slowing under the effect of gravity. But his calculations gave the Universe a nonsensical negative mass[1].

Riess and the High-z Supernova Search Team realized that the unexpected dimness of their sample of distant type-Ia supernovae signalled instead that the expansion of the Universe is accelerating[2] — as did Perlmutter's Supernova Cosmology Project[3], which had begun its painstaking collection of similar supernova data earlier, in 1988. More recently, data on the cosmic microwave background radiation and baryon acoustic oscillations have given further support to the notion of accelerating expansion.

Something is driving the acceleration, and that something is usually referred to as 'dark energy'[4]. It could be attributed to the cosmological constant, Einstein's much-regretted fudge factor in his field equations of general relativity, or a scalar field that varies in time and space, such as quintessence. Either way, it is now thought to constitute 73% of the stuff of the Universe, dwarfing the 23% that is dark matter and the 4% that is ordinary matter.

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