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U.S. Kavli Frontiers of Science

19th Annual Kavli Frontiers of Science Symposium

U.S. National Academy of Sciences
Arnold and Mabel Beckman Center
November 8-10, 2007
Irvine, CA

The Accelerating Universe: Enigmas and Nostrums [-Presentation](#)

Sean Carroll, California Institute of Technology

Please click on the above link to watch the presentation - both slides and audio. This presentation file is in [Adobe Flash player](#) format, available free online.

The universe is accelerating, and we don't know why. The simplest possibility goes back to Einstein: the possibility of a cosmological constant, or "vacuum energy." This is simply the idea that empty space itself has an inherent energy density, which remains absolutely constant throughout space and time. It's an idea that fits the data, but introduces a number of fine-tuning problems, which encourage cosmologists to look further. Another possibility is dynamical dark energy -- a source which is almost constant, but not quite, through space and time.

Finally, we have the possibility that there isn't any new energy source of any kind; rather, our accepted notions of how gravity works (Einstein's general relativity) break down on cosmological scales. All of these ideas have their advantages and their drawbacks; the good news is that they make different predictions for cosmological observables. The next generation of experiments should go a long way towards pinning down the reason why the universe is accelerating.

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