Honeywell Nobel Initiative

Thiagarajar College of Engineering, Madurai, India, 22-24 September 2009

Professor Eric Cornell,
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Boulder, United States

General Lecture

Stone Cold Science: Bose-Einstein Condensation and the Weird World of Physics a Millionth of a Degree Above Absolute Zero

As atoms get colder and colder, they become more and more like waves, and less like particles. When a gas of atoms gets so cold that the "waviness" of one atom overlaps the waviness of another, the result is a sort of quantum mechanical identity crisis, a "condensation" predicted 80 years ago by Albert Einstein. Eric Cornell will discuss how one reaches the necessary record-low temperatures, and explain why one goes to all the trouble to make this bizarre state of matter.

Extraordinary low temperatures have an appeal of their own, but the implications are much broader: the domain of quantum mechanics is the physics not only the ultra-cold, but the ultra-small. For nanotechnology to reach its ultimate scientific and commercial potential, one must confront the Quantum in his lair. Low temperatures can be our ally as we enter that treacherous cave.

Colloquium

"Is Warm Glass Stickier than Cold Glass?"

What we think of as "empty" space is really filled with a fluctuating electric field. These tiny electric fields are spooky-seeming but entirely real. They give rise to the stickiness of a perfectly clean glass surface, and a related effect gives rise to frictional forces between the microscopic parts of nanomachines. I'll talk about a set of experiments we did on this so-called Casimir-Polder force; the audience may be surprised to learn that the seemingly minor technical effect may have profound eschatological implications as well.