Nobel laureate Burton Richter to speak about future of particle physics

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[摘要] 16-Feb-2007，Particle physics is about to transform our thinking once again. Experiments of the last 15 years suggest new forms of matter, new forces of nature and perhaps even new dimensions of space and time. Pinning down the new ideas will require more data from larger and more expensive machines-at a time when funding is more difficult than ever to secure.
[关键词] Particle physics

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"As Dickens wrote, it is the best of times and the worst of times," says Nobel laureate Burton Richter, the Paul Pigott Professor in the Physical Sciences, Emeritus, at the Stanford Linear Accelerator Center and a pioneer of the particle colliders that now dominate high

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energy physics. "We are in the midst of a revolution in understanding, but accelerator facilities are shutting down before new ones can open, and there is great uncertainty about future funding."

On Feb. 16, at the annual meeting of the American Association for the Advancement of Science in San Francisco, Richter will speak about the future course for elementary particle physics. He will offer a short overview of current research and explain his view of the most important opportunities for the field today.

Over the last 15 years, physicists discovered that they understand much less of the universe than they thought. No longer do they believe that luminous matter alone fills up the vacuum of space. Instead, two mysterious substances

-dark matter and dark energy-

comprise 96 percent of the universe. Neutrinos, very light elementary particles that stream from the sun, change from one type of matter to another as they travel close to the speed of light. And the Standard Model

-the theory once believed to describe all fundamental interactions-no longer describes all that we observe.

The next 15 years are likely to answer some questions and raise new ones, Richter says. Physicists hope to find what is beyond the Standard Model, what at least some of the dark matter is made of and what is driving the accelerating expansion of the universe. The next few years may even see an experimental test of theories that posit more dimensions than just three of space

Yet none of this can happen without new experiments and new machinery, Richter says. In choosing which experiments to fund, the particle physics community must make choices that will severely limit the pace of discovery in some areas.

"This is a time where we cannot afford the merely good, but must focus on the really important if we are to continue our quest to learn what the universe is made of and how it works," Richter says.

In the lecture, Richter will present his views on which experiments must be funded and which will have to wait. Specifically, he will discuss the Large Hadron Collider (LHC), the proposed International Linear Collider (ILC), the need for accelerator research and development, the Joint Dark Energy Mission (JDEM) and Large Synoptic Survey Telescope (LSST) astroparticle expe

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