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Nobelist Weinberg Ponders Higgs Boson, Dark Matter: Interview

By Zinta Lundborg - Jun 28, 2011

Nobel Prize-winning physicist Steven Weinberg was in New York to talk about the future of big science.

Making new discoveries is expensive. The Large Hadron Collider built by CERN, the European Organization for Nuclear Research, lies in a circular tunnel 17 miles in circumference under the Franco-Swiss border. It cost more than $10 billion, and required a global army of scientists and engineers to create.

As funding for basic research is cut, Weinberg worries that the current “heroic period” of physics will come to an end, leaving us ignorant of the fundamental laws of the universe.

Weinberg earned his 1979 Nobel Prize for work on the unified theory of weak and electromagnetic interactions and is widely regarded as the preeminent theoretical physicist in the world.

He currently holds the Jack S. Josey-Welch Foundation Chair in Science and is director of the Theory Research Group at the University of Texas at Austin.

We spoke at New York University during the World Science Festival.

Lundborg: What’s the best thing that can come out of the Large Hadron Collider?

Weinberg: The most exciting thing that has a good chance of happening is to discover particles of dark matter, which we know makes up five-sixths of the matter of the universe.

It’s not any of the particles described by the standard model. We can imagine various possibilities of what it might be, and many of those possibilities are things that would be created at the Large Hadron Collider.

Lundborg: What about the particle everyone’s looking for -- the Higgs boson?

Weinberg: Because the Higgs boson is really required by the simplest version of the theory that unifies the weak and electromagnetic forces, it’s very likely to be discovered.

The theory has other versions which would lead to the discovery of other kinds of particles, the so-called technicolor particles.

We have a fair degree of certainty that one or the other of those, and very likely the Higgs boson, will be discovered. In fact, it's so likely that we already anticipate it, so it probably won't get us anything new. What we really need is something that we don't anticipate.

Lundborg: Just before he died, Victor Weisskopf said he'd had a great life: "I've lived between the time penicillin was discovered and before the oil ran out."

How would you characterize your own life?

Weinberg: In the fields I've worked in, cosmology and elementary particle physics, lots of the pieces of the puzzle that nature presents have fallen into place.

When I was a student, we had to learn about lots and lots of different particles and forces and everything seemed mysterious, and now we teach physics as a deductive consequence of a simple theory, the standard model.

Lundborg: What are you working on now?

Weinberg: I'm trying to finish a treatise on quantum mechanics. I'm trying to understand some things that I've never understood, particularly the question of what you mean when you make a measurement in quantum mechanics.

Lundborg: Richard Feynman famously said, "If you think you understand quantum mechanics, you don't."

Weinberg: I think he's right. There's something deeply disturbing about any of the various candidate interpretations of quantum mechanics, and I think what may be required is a new rethinking of quantum mechanics, but I'm getting nowhere so far.

Lundborg: Is string theory still the best game in town?

Weinberg: It's the best game in town, but it may not be the right game.

Lundborg: You're disappointed that it hasn't actually led anywhere?

Weinberg: Since the 1980s string theory has not come up with a prediction of anything new that we could then verify in the laboratory in a way that could convince us that string theory is right.

Although there may be one fundamental string theory, it has many, many solutions. And finding the

one that describes our world may be impossibly hard.

Lundborg: Lots of physicists went to Wall Street, so is there a brain drain?

Weinberg: My experience is that the students who really are so good that they can feel they are going to be part of the effort of discovering the fundamental principles of nature or answering deep questions about cosmology, those students stay in the field.

It's the students who are not so sure of that who migrate into Wall Street. I don't know of any cases where a student was doing really first-rate work who then moved into Wall Street.

I mean, all they can offer is money.

(Zinta Lundborg is an editor for Muse, the arts and leisure section of Bloomberg News. The opinions expressed are her own. This interview was adapted from a longer conversation.)

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