

Where Do the Laws of Nature Come From?: Steven Weinberg

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Transcript - Short

Robert Lawrence Kuhn:

Steve, when you think about the laws of nature, laws of physics, how do you characterize them or categorize them?

Steven Weinberg:

That's great discovery that nature is governed by laws. This is something that wasn't apparent for a long time. In fact, the idea of laws of nature was rejected by a Muslim philosopher Al-Ghazali in the 13th Century on the grounds that the very concept put god in chains. You know, that things happen not because there are laws of nature, but because god wants them to happen that way. Of course, that attitude make science difficult. We have all kinds of laws and the engineering student learns various laws, Ohm's law, which tells you how current and resistance and voltage are related and electric circuit and so on. Many of these laws are derived from deeper laws. In fact, that's true of most of the laws we learn as, as students. Some of them are purely empirical; we don't know why they work. But most of the ones that have been well tested, have then been understood on the basis of deeper laws. We keep peeling away deeper laws and deeper laws. The deepest laws that we have at present, the laws from which all other laws can be deduced insofar as they can be deduced from anything, are the laws of the standard model, a set of equations governing quantum fields which manifest themselves as various particles, electrons and quarks and photons. And the next big step is to say why is the standard model the way it is. That's not a final law. What is underneath that, we don't know.

Robert Lawrence Kuhn:

Einstein had another phrase that said that one of his questions was, did God, however he used the term, have a choice in creating the universe as he did?

Steven Weinberg:

Einstein explained that when he used the word god, he meant the principle of order and harmony in nature. He didn't mean a personal god that concerned himself with human beings. So, if you take what Einstein said and replaced the word god by whatever fundamental principle governs the universe, then you could understand what he's saying. He's saying is there any freedom in the laws of nature that govern the universe, is only one set of laws of nature possible or are there other possibilities? The only way in which Einstein, it seems to me might have made some sense in, in asking that question is, are there any other possible rich universes? Is there any choice of a universe complicated enough to include us or to look vaguely like our universe?