

What's in a theory?

I know I am going to get into trouble here. Each time I write about string theory I manage to offend some young researchers in that field. On a popular physics blog (<http://cosmicvariance.com>), having been asked to defend my views, I raised an issue that prompted some thoughtful discussion, so I present it here for a broader audience.

There is no denying that the string enterprise involves an impressive body of theoretical work. However, it is equally clear that what we normally call string theory is not a 'theory' in the conventional scientific sense. String theory does not yet make sharp quantitative assertions about specific phenomena (as electroweak theory does), nor does it make falsifiable qualitative

predictions about observable phenomena (as evolutionary theory does). The term 'string theory' is in fact a historical anachronism, created to distinguish it from another formalism developed to deal with the relativistic quantum mechanics of point particles — field theory.

This would be mere nitpicking except for the fact that, as I described in an earlier column, we are currently fighting a battle against those who wish to water down the science we teach in high schools. Part of the argument of those pushing intelligent design is that evolution is "just a theory", referring to the common parlance and not the more restrictive sense in which the term is usually discussed in science.

Labelling as theories ideas



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that have yet to pass the necessary empirical tests or develop a highly constrained logical formalism — strings in particle physics, or inflation in cosmology — opens us up to otherwise avoidable attacks, particularly from those who would include religious ideas in high-school science curricula.

If, instead, we train ourselves to refer to ideas such as strings and inflation as hypotheses or paradigms — just as Eugenie Scott of the US National Center for Science Education has said, we should avoid the term 'believe' in a scientific context — we might save ourselves grief down the line. Even if I might get grief now for suggesting it.

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