

READERS' FORUM

four-dimensional curved twistor spaces¹ rather than strings play the role of fundamental objects.² This, I submit, is an even more beautiful idea than string theory.

References

1. R. S. Ward, R. O. Wells Jr, *Twistor Geometry and Field Theory*, Cambridge U. Press (1990).
2. G. Chapline, K. Yamagishi, *Phys. Rev. Lett.* **66**, 3064 (1991).

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Counting myself among “every physicist”—and an old one at that—who has been awestruck with the complexity and power of string theory but not having dabbled actively in field theory for some time, I had high hopes that the amazing Ed Witten would help me understand it better. Instead, I came away with a moderately stiff neck from straining to hear the “rhymes” of the theory. And I must confess that the references to “diffeomorphisms” reminded me of “sexual dimorphism,” something comparable to mathematical gender equality, if that’s possible.

More seriously, I was disappointed that Witten did not discuss what a lot of us would really like to know: Is string theory—can it ever be—falsifiable? What, if any, are its applications in the physical world? Who is working on these aspects of the problem? Is it really “not even wrong,” as Peter Woit’s book by that title (Basic Books, 2006) notes?

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► **Witten replies:** In my article I tried to explain in a succinct way some of the exciting highlights of string theory, and I assumed for readers only a basic comfort level with Feynman diagrams and general relativity. The points in question should be widely understandable, but I am not sure where they have been explained in quite as elementary yet substantive a way as I aimed for.

I certainly did not claim that everything has been understood; there are plenty of unsolved problems, as George Chapline points out, and that is one reason that the subject remains exciting. It was not possible in a short article to ex-

plain all the fascinating things that have been discovered and the many interesting ways that string theory interacts with other topics in physics and mathematics. Some of that has been covered in the past in other articles in *PHYSICS TODAY* (see, for example, the article by Steve Giddings, April 2012, page 30, and the Quick Study by Hong Liu, June 2013, page 68).

I have worked on the specific subject of twistor theory quite a lot, as Chapline probably realizes. Actually, one reason that I suspect string theory is on the right track is that when critics have had good ideas—whether involving black hole entropy, noncommutative geometry, or twistor theory—those ideas have tended to be absorbed into string theory.

I regret that Peter Hansen did not find my article compelling, and I hope other readers thought otherwise. Many circumstantial clues suggest that string theory is on the right track. If that is the case, it is reasonable to hope that it will become clear, probably through a combination of theoretical and observational progress.

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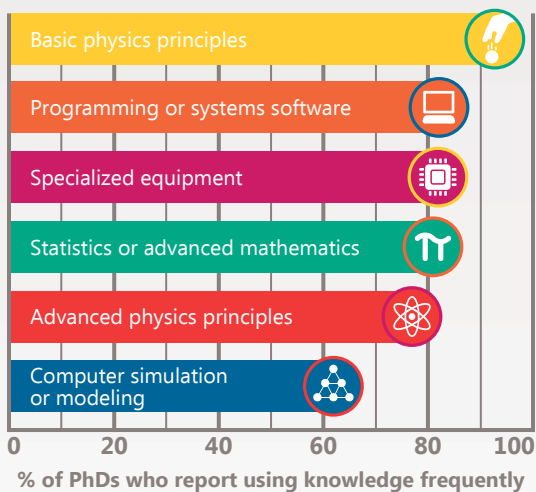
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