Book Review

Time Reborn by Lee Smolin

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Abstract

The book itself covers many points and will be of interest to anyone working on quantum gravity who should be aware of all the different points of view and why people hold them, so I recommend to them, but probably not to the average lay person living next door. However, I disagree with Smolin. If he ever deigned to talk to an outsider like me I am sure we could have a lively and interesting discussion about it.

Key Words: time reborn, Smolin, string theory, loop quantum gravity.

Fill the blank in this sentence:

"The best studied approach to quantum gravity is _____ and it appears to allow for a wide range of choices of elementary particles and forces."

Did you answer "String Theory"? I did, but Lee Smolin thinks the answer is his own alternative theory "Loop Quantum Gravity" (page 98).This is one of many things he says in his new book that I completely disagree with. That's fine because while theoretical physicists agree rather well on matters of established physics such as general relativity and quantum mechanics you will be hard pushed to find two with the same philosophical ideas about how to proceed next. Comparing arguments is an important part of looking for a way forward.

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Here is another non-technical point I disagree with. In the preface he says that he will "gently introduce the material the lay reader needs" (page xxii) Trust me when I say that although this book is written without equations it is not for the "lay reader" (an awkward term that originally meant non-clergyman). If you are not already familiar with the basic ideas of general relativity, quantum mechanics etc and all the jargon that goes with them, then you will probably not get far into this book. Books like this are really written for physicists who are either working on similar areas or who at least have a basic understanding of the issues involved. Of course if the book were introduced as such it would not be published by Allen Lane. Instead it would be a monograph in one of those obscure vanity series by Wiley or Springer where they run off a few hundred copies and sell them at $150/£150/€150 (same number in any other currency) OK perhaps I took too many cynicism pills this morning.

The message Smolin wants to get across in that time is "real" and not an "illusion". Already I am having problems with the language. When people start to talk about whether time is real I hear in my brain the echo of Samuel Johnson's well quoted retort "I refute it thus!" OK, you can't kick time but you can kick a clock and time is real. The real question is "Is time fundamental or emergent?" and Smolin does get round to this more appropriate terminology in the end.

In the preface he tells us what he means when he says that time is real. This includes "The past was real but is no longer real" "The future does not yet exist and is therefore open" (page xiv) In other words he is taking our common language based intuitive notions of how we understand time and saying that this is fundamentally correct. The problem with this is that when Einstein invented relativity he taught me that my intuitive notions of time are just feature of my wetware program that evolved to help me get around at a few miles per hour, remembering things from the past so that I could learn to anticipate the future etc. It would be foolish to expect these things to be fundamental in realms where we move close to the speed of light, let alone at the centre of a black-hole where density and temperature reach unimaginable extremes. Of course Smolin is not denying the validity of relative time, but he wants me to accept that common notions of the continuous flow of time and causality are fundamental, even though the distinction between past and future is an emergent feature of thermodynamics that is purely statistical and already absent from known fundamental laws.

His case is even harder to buy given that he *does* accept the popular idea that space is emergent. Smolin has always billed himself as the relativitist (unlike those string theorists) who understands that the principles of general relativity must be applied to quantum gravity How then can he say that space and time need to be treated so differently?

This seems to be an idea that came to him in the last few years. There is no hint of it in a technical article he wrote in 2005 where he makes the case for background independence and argues that both space and time should be equally emergent. This new point of view seems to be a genuine change of mind and I bought the book because I was curious to know how this came about. The preface might have been a good place for him to tell me when and how he changed his mind but there is nothing about it (in fact the preface and introduction are similar and could have been stuck together into one section without any sign of discontinuity between them)

Smolin does however explain why he thinks time is not fundamental. The main argument is that he believes the laws of physics have evolved to become fine-tuned with changes accumulating each time a baby universe is born. This is his old idea that he wrote about at length in another book "Life of the Cosmos" If this theory is to be true he now thinks that time must be fundamentally similar to our intuitive notions of continuously flowing time. I would tend to argue the converse, that time is emergent so we should not take the cosmological evolution theory too seriously.

I don't think many physicists follow his evolution theory but the alternatives such as eternal inflation and anthropic landscapes are equally contentious and involve piling about twenty layers of speculation on top of each other without much to support them. I think this is a great exercise to indulge in but we should not seriously think we have much idea of what can be concluded from it just yet.

Smolin does have some other technical arguments to support his view of time, basically along the lines that the theories that work best so far for quantum gravity use continuous time even when they demonstrate emergent space. I don't buy this argument either. We still have not solved quantum gravity after all. He also cites lots of long gone philosophers especially Leibniz.

Apart from our views on string theory, time and who such books are aimed at I want to mention one other issue where I disagree with Smolin. He says that all symmetries and conservation laws are approximate (e.g. Pages 117-118). Here he seems to agree with Sean Carrol and even Motl (!). I have explained many times why energy, momentum and other gauge charges are conserved in general relativity in a non-trivial and experimentally confirmed way. Smolin says that "we see from the example of string theory that the more symmetry a theory has, the less its explanatory power" (page 280). He even discusses the preferred reference frame given by the cosmic background radiation and suggests that this is fundamental (page 167). I disagree and in fact I take the opposite (old fashioned) view that all the symmetries we have seen are part of a unified universal symmetry that is huge but hidden and that it is fundamental, exact, non-trivial and really important. Here I seem to be swimming against the direction the tide is now flowing but I will keep on going.

Ok so I disagree with Smolin but I have never met him and there is nothing personal about it. If he ever deigned to talk to an outsider like me I am sure we could have a lively and interesting discussion about it. The book itself covers many points and will be of interest to anyone working on quantum gravity who should be aware of all the different points of view and why people hold them, so I recommend to them, but probably not to the average lay person living next door.

See also Not Even Wrong for another review, and The Reference Framefor yet another. There is also a review with a long interview in The Independent.

References

1. http://blog.vixra.org/2013/04/24/book-review-time-reborn-by-lee-smolin/