

## “The Fabric of Reality” by David Deutsch

What the book gains in readability is lost in believability. The starting premise is that interference patterns caused by individual photons can only be explained by the existence of the multiverse – parallel universes that interact with ours to cause the patterns.

David Deutsch quotes Hugh Everett as the author of this hypothesis to explain aspects of quantum theory, but there do seem to be key differences between Everett’s interpretation and Deutsch’s. Often misunderstood, Everett’s many world’s theory requires the splitting of the universe at each quantum measurement, but this is “universe” with a small “u” which isn’t quite the same as the Universe as a whole. It would seem ludicrous to postulate that an “insignificant” measurement requires the splitting of stars billions of light years away. In fact the splitting is a local effect.

Deutsch’s multiverse is never clearly described but the impression is that the infinitude of universes exists from the moment of the big bang, and thereafter diverge. Starting with infinity ensures that there are always an infinity of universes exactly paralleling ours at each quantum

event. That seems to put the cart before the horse over Everett’s theory. Everett starts with one universe that splits, Deutsch starts with an infinity that diverges. Further the nature and agencies of the interactions between parallel universes is never even the subject of the slightest speculation. Deutsch assumes that the interference patterns must be caused by something interfering with something else – and if the something else isn’t in our universe then it must be in another.

What is often omitted though in any work that quotes Everett is that he never intended his many-worlds theory to be interpreted as a likely explanation of quantum effects. It was a convenient topic for a Ph.D. thesis identifying a possible explanation not a probable explanation. Certainly a more extreme example of ignoring Occam’s razor would be hard to imagine.

But let’s take a step back. Imagine that God is designing the Universe. Although an omnipotent being, He still likes to delegate the task, and one group of angels is given the brief to design “wave-mechanics”. The interference patterns are

duly produced and a prototype demonstration is given to God. “Have you met my original specification?” asks God. “The interference patterns are not dependent upon light intensity, are they?” “Absolutely not” replies Gabriel.

However another group has been designing the quantum and that project is also brought to a successful conclusion. It's only at a project co-ordination stage that someone asks the awkward question “Hold on a minute, how can we get an interference pattern when there is only one quanta passing through the slit?” Everyone throws up their hands (or wings) in horror but God just smiles and says “Don't worry, it'll work alright in the end”.

Put it another way, the very nature of wave-particle duality, which seems central to the design of our universe, immediately requires this paradox to arise. Interference patterns are not intensity related but individual quanta will have nothing to interfere with. The Copenhagen interpretation, derided by Deutsch, is still the one most accepted by the “ordinary” scientist if pushed – don't worry about what you don't know and can never know.

There are other explanations of the quantum problem. “Many worlds” relates to the failure of contrafactual definitiveness – could things have been other than what they were? But the contrafactual aspect can fail as well as the definitiveness aspect which leads us to superdeterminism – everything including the initial conditions are absolutely fixed and free will is a myth. Mind you that sounds about as depressing as the multiverse theory. Suppose I just miss running over a child in my car. No point being elated – just be miserable thinking about all the other realities where the child actually did get knocked down.

Deutsch has a lot to say about inductive reasoning but curiously omits Peano's fifth axiom on page 223 which is the basis of mathematical induction. That is induction cannot be proved and many mathematicians will not accept proofs based on induction. Further Deutsch on the one hand renounces the excluded middle on page 133, but gives perceptive insight into the work of Godel. You can always add another axiom or its negation to any consistent system – basic arithmetic being the usual candidate. So the excluded middle is required in both mathematics and quantum mechanics.

Deutsch is rather dismissive of “life” calling it an incidental scum. Yet Barrow and Tipler’s monumental work “The Cosmic Anthropic Principle” gives testimony how the entire universe seems designed specifically for carbon-based life to exist. The universe is such an incredibly unlikely structure and even having “produced” the backcloth, the emergence first of life and then intelligent life (which offers no evolutionary advantage) are both extremely improbable events. Multiply three vanishingly small probabilities together and you have the biggest mystery of all.

Mind you, having all said and done, “The Fabric of Reality” is an absolutely fascinating book, to be read in one or two sittings at most.

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