



The Fabric of Reality:

The Science of Parallel Universes - and Its Implications

By David Deutsch

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Starting out with his childhood question “can one person understand everything that was understood” (so far), the theoretical physicist and author David Deutsch wants to approach a “Theory of Everything” based on accepted theories which have been established up to day. “We now possess some extremely deep theories about the structure of reality, if we are to understand the world on more than a superficial level, it must be through those theories. We must take them seriously, not merely as pragmatic foundations for their respective fields but as explanations of the world. And I believe that we can achieve the greatest understanding if we consider them not singly but jointly, for they are inextricably related. But each of these theories has, when it is taken seriously, very counterintuitive implications.”

This book is not primarily a defense of these theories: it is an investigation of what the fabric of reality would be like if they were true.

However, even the unification of the three forces: nuclear forces, electromagnetism and gravity together with the initial state at the Big Bang would not be adequate for a Theory of Everything because it might predict everything that can be predicted, because prediction is not explanation i.e., a statement about the nature of things and the reasons for things.

David Deutsch has identified four strands for the fabric of reality: (1) quantum physics as the most important strand (2) epistemology, the study of the nature of knowledge and the processes that create it (3) the theory of computation (4) the theory of evolution.

Based on the individual photon two- and four-slit interference experiments, interpreting the results step by step, Dave Deutsch comes to the “multiverse”- conclusion, which in his definition is the whole of physical reality containing many parallel universes. They are ‘parallel’ in the sense that **within each** universe particles interact with each other just as they do in the tangible universe, but each universe affects the others only weakly, through interference phenomena. By introducing “shadow photons” and his postulation that the “understanding the multiverse is a precondition for understanding reality as best we can” (...as of the date the book was written in 1997), David Deutsch’s conclusion is:

“In interference experiments there can be places in a shadow-pattern that go dark when new openings are made in the barrier casting the shadow. This remains true even when the experiment is performed with individual particles. A chain of reasoning based on this fact rules out the possibility

that the universe we see around us constitutes the whole of reality. In fact the whole of physical reality, the multiverse, contains vast numbers of parallel universes.”

The author describes in a thorough, learned and very sophisticated fashion the other three strands by putting them under his magnifying scientific microscope dissecting each strand down to quantum level detail and interweaving those four strands in very thorough and logical detail.

You might not be familiar with the complete scientific terminology and definitions David Deutsch is using, however he provides a “terminology” list and a summary at the end of each chapter which I appreciated very much and helps you along the way.

In the end you might not follow David Deutsch’s universal world view’s approach all the way e.g., I got intrigued by sentences like “...of an infinite number of possibilities we only experience an infinitesimal portion” (Chapter 6, Universality and the limits of computation), but this book is a mind opener and you might be longing for more science information after having finished it [1].

A summary example (Virtual reality chapter) might illustrate the all-encompassing approach of Deutsch’s argumentation:

“There is nevertheless a comprehensive self-similarity in physical reality that is expressed in the Turing principle: it is possible to build a virtual-reality generator whose repertoire includes every physically possible environment. So a single, buildable physical object can mimic all the behaviors and responses of any other physically possible object or process. This is what makes reality comprehensible. It also makes possible the evolution of living organisms, the fourth strand of explanation of the fabric of reality. Reality is virtual reality in action.”

Although I have to admit that I did not grasp the four strands in their totality, in particular the evolution and quantum computer chapters, I worked my way through the book to the end and found many fascinating issues I was not aware of and started thinking about them looking through David Deutsch’s quantum - glasses”.

A typical example of Deutsch’s world of thoughts is the warning in front of chapter 10 (The nature of mathematics): “The next chapter is likely to provoke many mathematicians. This can’t be helped. Mathematics is not what they think it is”, I would like to add that you first should jump to the terminology section at the end of chapter 10 (page 176) – if you are getting confused there, the chapter will not help you very much.

Chapter 11 deals with “time”, an example: “We do not experience time flowing, or passing. What we experience are differences between our present perceptions and our present memories of past perceptions. We interpret those differences, correctly, as evidence that the universe changes with time. We also interpret them, incorrectly, as evidence that our consciousness, or the present, or something, moves through time.”

This picture of “stacked snapshots” of moments is carried over into chapter 12, Time travel. Having worked my way through Deutsch’s time machine thought experiment I could not help being reminded to the movie “Groundhog Day” which appear to me to bear some similarities with Deutsch’s time machine...?

Chapter 13 (The four strands) concludes with: “Taken individually, each of the four theories has explanatory gaps, and seems cold and pessimistic. To base a world-view on any of them individually is, in a generalized sense, reductionist. But when they are taken together as a unified explanation of the fabric of reality, this is no longer so”.

The last chapter (The ends of the universe) exposes us to Frank Tipler's Omega-Point theory which according to Deutsch is "an excellent example of a theory which is, in the sense of this book, about the fabric of reality as a whole."

The author David Deutsch concludes his book: "I have been advocating a particular unified world-view based on the four strands: the quantum physics of the multiverse, Popperian epistemology, the Darwin-Dawkins theory of evolution and a strengthened version of Turing's theory of universal computation. It seems to me that at the current state of our scientific knowledge, this is the 'natural' view to hold. But we can move to better theories only if we take our best existing theories seriously, as explanations of the world".

As said before many of Deutsch's substantiations are complex and hard to follow without the deep background of the four strands theories e.g., there are too many singularities to my taste, nevertheless, I highly recommend this book as a heavy intellectual challenge. If you are prepared and willing to embark and plow through this demanding wealth of science knowledge which literally was accumulated throughout human existence – the book definitely is more than a "value added" experience, it is a mind opener for getting a glimpse of "deep" reality.

To paraphrase one of the author's expressions: "it kicks back".

Born in Haifa, Israel, David Deutsch was educated at Cambridge University and Oxford University. He is a member of the Quantum Computation and Cryptography Research Group at the Clarendon Laboratory, Oxford University. His papers on quantum computation laid the foundations for that field, and he is an authority on the theory of parallel universes.

Reference:

[1] For more reading refer to: Adam Becker "What is real, The Unfinished Quest for the Meaning of Quantum Physics", March 20, 2018