



Cosmology for the Curious 1st ed. 2017 Edition

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The authors Alex Vilenkin and Delia Perlov are right on the subject and start with the „Big Questions” of the origin, nature and evolution of our universe – i.e., questions you might have asked yourself at one or the other time when your mind started wandering. That raised my immediate interest and expectations.

As the introduction explains, the book is based on an undergraduate course taught by A. Vilenkin at Tufts University. The book is nicely structured and provides the right level of detail to satisfy the “curiosity” of an interested reader or allows you to dig into the details on your own choice by expanding your knowledge or by plowing through the questions which are attached at the end of each chapter helping you to test and improve the learnt. What I also liked was a catalogue of exhaustive questions at the end of the first chapter asking you to answer them right now and after you have read the book, like the first question: “is the universe infinite or finite...?”, etc. The only question I was missing was: “where does the expanding universe expand into?” – However, this question was answered by the author in response to a private inquiry “The space of the universe is being stretched, but it does not expand into anything, because there is no space outside the universe”.

But let us go back to the book. It is structured into two parts, part one gives a concise overview starting with the Greece philosopher Thales with his suggestion that all of Nature’s variety could be understood using a view basic principles, the primary element being water. Democritus advocated that all matter was made up of tiny, eternal, indivisible particles called atoms and Epicurus asserted that atoms occasionally experience small random “swerves” from their rectilinear motion. These were amazing thoughts for 6th -3rd centuries B.C.

Contributions by Pythagoras, Plato and Aristotle were summarized by Ptolomey in his *Almagest*. Then came Coperincus, Kepler and Isaac Newton who summarized his own ideas how the laws of Nature operate in his “*Principia*” opening the way to the modern cosmology.

Special Relativity, the “Expanding Universe”, the fate of the Universe, the “Quantum World”, the hot Big Bang and the early Universe are addressed and the thoughts and achievements of the contributing luminaries are described in detail and in an straightforward, scientific, but easy to understand style.

As a side-effect the book answered one of my life-long questions about “special relativity”: how come, Einstein started thinking about relativity – out of the blue? Of course it was not out of the blue, and it was very interesting to learn that Galileo Galilei formulated the first ideas about relativity in his “*Dialogue*” (1632) by observing the phenomena that if you would locate yourself in a windowless cabin below deck in a ship you would not be able to tell whether the ship was stationary or moving (as long as the motion is uniform).

Part two lays the foundation for understanding the second part of the book which is addressing the “Big Picture”

Prepared by the previous twenty two chapters, chapter 23 “creation of universes from nothing” describes the pre-conditions for the initialization and formation of a quantum tunneling process for creating universes “out of nothing” the author admits that even this elaborated physical-mathematical

explanation leaves room to “meet metaphysics”: “Yet if the universe quantum tunneled as described by the laws, then it seems that the laws must be more fundamental than the universe itself. One could become a “matheist” and assert that the laws of physics exist outside of space and time, much like a theist assigns the ultimate first cause to God. Or perhaps the fundamental laws and space and time emerged together?”.... [However] “we will press on with the optimistic hope that as boundaries of scientific enquiry expand, what is currently unknowable might be one day known.”

Thus the book also gives testimony how far we have come from “Turtles all the way down” ([William James](#)) to “Quantum tunneling from nothing”.

If you bring the required curiosity the book is widening your horizon, it brings you up to the current state of the art of cosmology, it is educational and you even more appreciate the work of the genius scientists laying the foundations to solve the riddle of humankind: where did we come from and where are we going – and is our universe as we know it pure coincidental or are there forces out there we don’t know (yet)?

It is not a book you read for entertainment and having read it, it will not rest on my bookshelf. I am sure I will consult it for reference and understanding of any new discoveries – a “must” have for the curious. The mathematical appendix and the index are flawless.

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