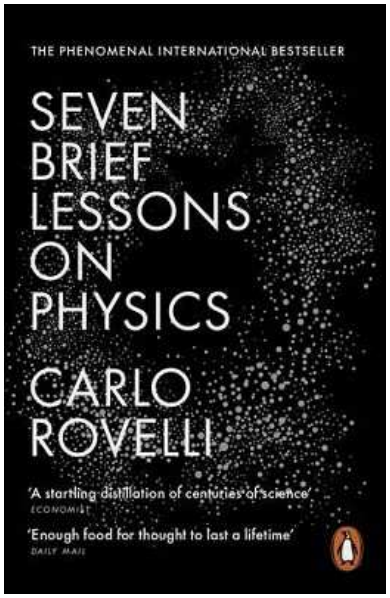
Book Review

by Nalayini Davies, 28 August 2016

Seven Brief Lessons on Physics

Carlo Rovelli

2016
Penguin Books, Penguin Random House, UK
79 pages, UK ISBN: 978-0-141-98172-7
US$3.54 for paperback (Audio CD US$11.49) from Amazon



In seventy eight succinct pages of elegant, eloquent and enchanting prose, Rovelli (a leading theoretical physicist at the University of Aix-Marseille specialising in quantum gravity) takes us on a philosophical journey comprising of seven distinct steps to trace three key contemporary science topics (viz. space-time, quantum mechanics and thermodynamics), to illustrate to the general reader through creatively chosen and lyrically illustrated analogies what we know, how much we don't know and compellingly demonstrates how and why we are an integral part of nature.

On my recent travels in Europe, *Seven Brief Lessons on Physics* was to be found in every bookshop I visited. Regarded a 'phenomenal bestseller', a 'new cult book', on various bestseller list including on Amazon's at 65+ weeks and the recipient of rave reviews from a wide range of general and science media, it more than lives up to the hype. This book is a 2016 English translation of a 2014 Italian book which was in turn a collection of a series of articles that build on each other that Rovelli wrote for the cultural pages of an Italian Sunday newspaper, *Il Sol 24 Ore.* They were written as "*lessons for those who know little or nothing about modern science".* The author appears to have been very mindful of his audience – general public readers of the cultural pages of weekend newspapers because there is much to enjoy in the graceful and engaging writing style in which the author has distilled and presented cutting-edge science ideas developed over centuries making them deceptively simple and accessible to the common reader. Rovelli takes the view in the book that *"the reality of which we are part, there exist countless filters: our ignorance, the limitations of our senses and of our intelligence*" and appears to have set about showing how scientists set about lifting the veil on these filters and in the process helps the readers to do the same.

The topics covered include general theory of relativity, quantum mechanics, the architecture of the cosmos, elementary particles and the standard model, quantum gravity, thermodynamics and human existence. The works of Einstein, Reimann, Plank, Heisenberg, Bohr, Anaximander, Aristotle, Copernicus, Hubble Telescope team, Gell-Mann, CERN's Large Hadron Collider team, Galileo, Kepler, Newton, Laplace, Feynman, Dirac, Faraday, Maxwell, Boltzmann and Hawking are all touched on very briefly throwing light on them, clarifying concepts and science jargon that has become part of the common lexicon but without belabouring the message.

Here are a few lyrical passages (the poetic nature of Rovelli's writing had led to a poet being engaged to do joint translation into English) extracted from the book illustrate how it entices the

reader and takes them on a journey of enlightenment "*of the world depicted by contemporary physics* ":

> General Theory of Relativity: *"In short, the theory describes a colourful and amazing world where the universe explodes, space collapses into bottomless holes, time sags and slows near a planet, and the unbounded extensions of interstellar space ripple and sway like the surface of the sea……..All this is a result of an elementary intuition* (of Einstein)*: that space and gravitational field are the same thing."*
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> How science gets done*: "Here, in the vanguard, beyond the borders of knowledge, science becomes even more beautiful – incandescent in the forge of nascent ideas, of intuitions, of attempts. Of roads taken and then abandoned, of enthusiasms. In the effort to imagine what has not yet been imagined."*
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> Time: "*At the minute scale of the grains of space, the dance of nature does not take place to the rhythm of the baton of a single tempo; each process dances independently of its neighbours, to its own rhythm. The passage of time is internal to the world, is born in the world itself in the relationship between quantum events that comprise the world and are themselves the source of time…… The heat of black holes* (demonstrated by Hawking) *is like the Rosetta Stone of physics, written in a combination of three languages – Quantum, Gravitational, and Thermodynamic – still awaiting decipherment in order to reveal the true nature of time."*
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> Human species*: "That which makes us specifically human does not signify our separation from nature: it is part of that self-same nature. It's a form which nature has taken here on our planet, in the infinite play of its combinations, through the reciprocal influencing and exchanging of correlations and information between its parts. Who knows how many and which other extraordinary complexities exist, in forms perhaps impossible for us to imagine, in the endless spaces of the cosmos……..I believe that our species will not last long. It does not seem to be made of the stuff that has allowed the turtle, for example, to continue to exist for hundreds of millions of years…… We belong to a short-lived genus of species. All of our cousins are already extinct. What's more, we do damage. The brutal climate and environmental changes which we have triggered are unlikely to spare us……Nature is our home, and in nature we are at home.*

The book explores cutting-edge issues relating to our quest to understand nature in a broad but holistic manner and there is food for thought for everyone - either a new way of looking at something one already knows or a new concept altogether. For me, it was the concepts of loop quantum gravity (Rovelli is one of its founders), Plank star and the possibility that black hole is a rebounding star seen by us in extremely slow motion and that Big Bang could have been a Big Bounce passing through an intermediate phase in which there was neither space nor time.

Rovelli's writing style makes this a work of art and I believe the book is well on its way to becoming a classic although it does not comprehensively explain the science/concepts in the manner of the other engaging and accessible classic, Richard Feynman's *Six Easy Pieces.* Some ideas (e.g. Reimann's curvature, Einstein's formula R_ab – ½ Rg_ab = T_ab, Einstein's 'light filled box' that Weinberg never ceased to contemplate on, the intermediate phase after the Big Bounce without space or time) are mentioned in passing leaving the reader wanting more and feeling frustrated but then one cannot expect that and also brevity and poetry (which appear to be the key reasons for the book's impressive success).

The science in the book could have been written by any number of science communicators but Rovelli's style makes it special. Werner Heisenberg is reported to have said 'If I had never lived, someone else would have probably formulated the principle of determinacy. If Beethovan had never lived, no one would have written Opus 111' which illustrates why this book has been an unexpected popular science hit.

The book can be read at one sitting or savoured chapter by chapter (I did both by reading it a second time) and is a delightful read for anyone interested in science or nature or simply curious about life and the universe. An inspiring book with the required brevity, vitality and clarity to help the reader comprehend contemporary science and gain a fresh perspective on how nature behaves, it is an ideal gift book for young and old alike whether or not they are scientifically minded.