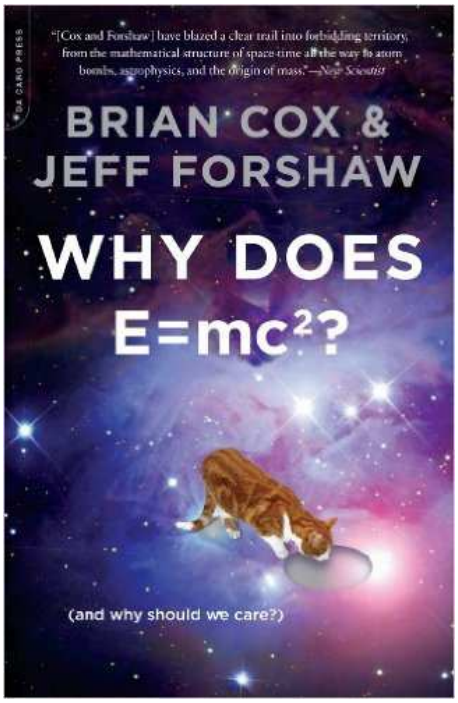
Book Review

by Nalayini Davies, 30 July 2016

Why Does E=mc²? (and why should we care?)

Brian Cox and **Jeff Forshaw**
2010
Da Capo Press (Boston, USA)
242 pages, UK ISBN: 978-0-306-81911-7
US$14.64 (Audio CD US$11.20) from Amazon,
Pdf version available at http://www.pdf-archive.com/2014/07/25/why-does-e-mc/why-does-e-mc.pdf



The authors have used the world's most well-known equation as a framework within which to explore concepts such as space-time, the origin of mass, special and general relativity, to trace their historic scientific context (discussing contributions of Galileo, Newton, Maxwell, Faraday etc.) and to discuss the resultant cutting edge astrophysics that is being practiced currently. Intended as a popular science book for the general reader, it successfully achieves the aim of taking one on a journey to understand Einstein's iconic equation using mathematics accessible to a lay person. Through this process, the reader is taken on a tour that includes CERN's Large Hadron Collider (of Higgs boson fame), iconic Feynman diagrams and a very clear explanation of what science is about and how big science works.

The narrative style and the use of metaphors adopted by Professors Brian Cox and Jeff Forshaw, both respected physicists and educators, would engage and improve access for even a general reader new to these topics. Rather than shy away from the complex mathematics associated with the subject matter as many popular science books tend to do, this book aims to lead the reader by the hand through the mathematics step-by-step in a simple and clear fashion. This approach is designed to achieve the authors' desire to share their belief that "t*here are indeed laws of nature, regularities in the way things behave, and these laws are best expressed using the language of mathematics. Mathematical consistency might be used to guide us, along with experimental observation, to the laws that describe physical reality."*

The book illustrates how science seeks to explain nature; how it builds in incremental steps from what has gone on before; the critical importance of abstract thought for scientific progress *("the capacity for abstract thought is what gives science its power"*); how scientific laws continue to be revised as something better comes along etc.; and helps one appreciate how scientists have helped understand and shape our modern world.

The handling of the mathematics could leave readers with greater mathematical ability wanting more and those averse to mathematics wanting less. Some sections of the book may require re-reading to be fully understood while the narrative prose runs the risk of being seen as somewhat

patronising at times. But these are minor negatives compared to what the book delivers i.e. a basic and solid understanding of these key concepts central to current physics thought. It is not surprising then that in 2010 it was one of six titles shortlisted for the Winton Prize of the Royal Society for outstanding popular science books from around the world.

This book should appeal to anyone wishing to understand what lies behind the much-venerated theories of Einstein and his iconic equation (i.e. the core concepts of modern physics) and to appreciate why they are important. Given the critical importance of Relativity in explaining the universe as never before (e.g. black holes, neutron stars, pulsars, 'big bang', gravitational waves etc.), I plan to read the 2015 100th anniversary reprint of Einstein's 1916 book, *Relativity,* to better understand first-hand his great paradigm shifting theory that has revolutionised scientific thinking especially in astronomy. Cox & Forshaw's book has been the perfect lead-up resource in preparing me for this new challenge.