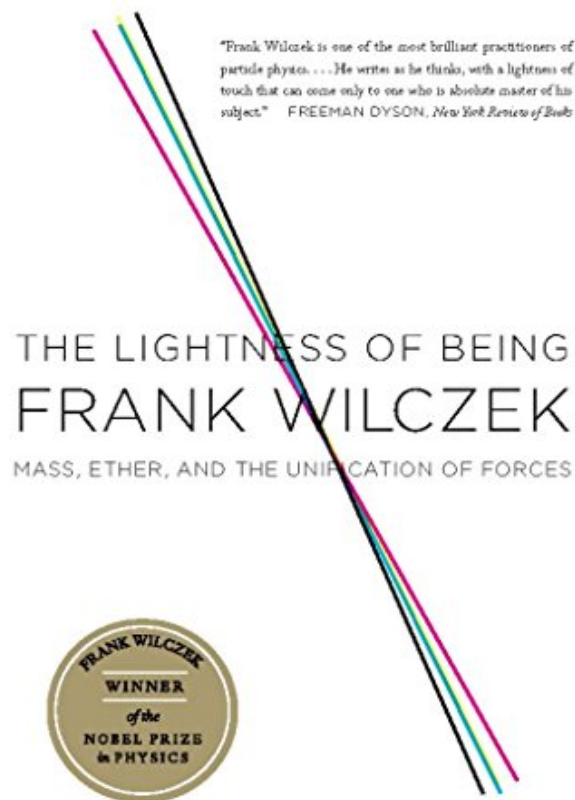
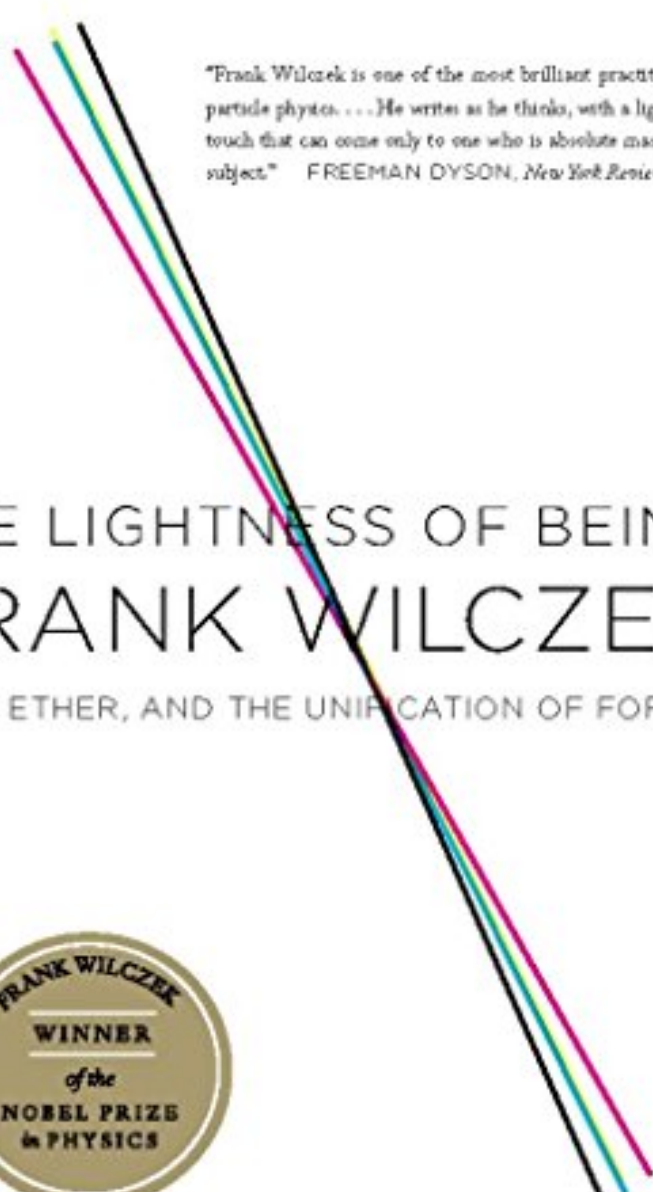


THE LIGHTNESS OF BEING: MASS, ETHER, AND THE UNIFICATION OF FORCES BY FRANK WILCZEK



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"Frank Wilczek is one of the most brilliant practitioners of particle physics. . . . He writes as he thinks, with a lightness of touch that can come only to one who is absolute master of his subject." FREEMAN DYSON, *New York Review of Books*

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Our understanding of nature's deepest reality has changed radically, but almost without our noticing, over the past twenty-five years. Transcending the clash of older ideas about matter and space, acclaimed physicist Frank Wilczek explains a remarkable new discovery: matter is built from almost weightless units, and pure energy is the ultimate source of mass. He calls it "The Lightness of Being." Space is no mere container, empty and passive. It is a dynamic Grid—a modern ether—and its spontaneous activity creates and destroys particles. This new understanding of mass explains the puzzling feebleness of gravity, and a gorgeous unification of all the forces comes sharply into focus.

The Lightness of Being is the first book to explore the implications of these revolutionary ideas about mass, energy, and the nature of "empty space." In it, Wilczek masterfully presents new perspectives on our incredible universe and envisions a new golden age of fundamental physics.

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113 of 115 people found the following review helpful.

A must read for physics buffs

By Paul McCord

Anyone with more than just a passive interest in physics and the nature of the universe will enjoy this book. The title caught my attention, and the first chapter drew me in. Before I realized an afternoon had passed, I had finished the book in a single sitting and found myself eagerly flipping back to previous chapters!

Frank Wilczek may be a Nobel Prize winner (2004), but you don't have to be a physicist to read his book. He writes clearly (and occasionally humorously), with only minimal use of numbers and equations, allowing the text to have a smooth flow so the reader can absorb the complexity of it all. (He even provides a glossary for clearer understanding of the topics discussed.)

Almost from the first page, this is a fascinating read, offering insights that literally contradict past theories that were once thought to be irrefutable. For example, perfectly "empty" space is unstable and can actually spawn tiny particles, so we really can get something from nothing!

And then there's what Wilczek calls the Grid, a sort of upgrade over the old ether idea, although it's really something entirely different. The Grid offers an explanation for, among many other things, the spontaneous activity in what appears to be empty space.

The Lightness of Being is about more than just particle physics. It's about connecting theories old and new, from particle physics to cosmology, to bring us many steps closer not only to understanding how the forces of nature work together to form a life-sustaining universe, but also to understanding what "nature" really is.

47 of 48 people found the following review helpful.

Mass and QCD explained

By Jaume Puigbo Vila

This book continues the themes of "Fantastic Realities" (which was more a collection of articles than a real book), but it is much more intelligible. The title corresponds to the fact that a human being is 95% pure energy. The reason: proton's and neutron's masses are very much larger than the rest masses of their constituent quarks, i.e. most of these baryons' mass is pure ($m = E/c^2$) energy.

If you are not familiar with Quantum Chromodynamics (QCD), the theory of the strong interaction, you will get a good grasp of it by reading this book and you will understand quark confinement. QCD is an exceptionally rigid theory depending only on three parameters. The author won a Nobel Prize for the development of QCD based on asymptotic freedom together with David Gross, although this work, as a graduate student, was not recognized until 20 years later.

By reading the book you will also discover why gravity is so weak compared to other forces (a magnet lifts a clip against Earth's gravitational pull) and you will learn about the theoretical framework to extend the Standard Model group of symmetries to Supersymmetry, a theory that suggests a unification of all

interactions, including gravity, at high energies. Predicted superpartners of the standard particles may be discovered at the LHC in Geneva. On the way you will also come to accept that empty space is a most complex structure: a multilayered, multicolored superconductor.

The author questions Popper's falsifiability dogma to which all scientific theories must obey. Part 3 is titled: Is Beauty Truth? It reminds me of Sir Michael Atiyah's presentation at Cosmocaixa in Barcelona with a similar argument and the author presents historical evidence (Dirac's prediction of the positron, for example). Wilczek argues that a good beautiful theory (SUSY) is worth keeping even if some things do not really fit in. He adopts the Jesuit credo: "It is more blessed to ask forgiveness than permission". Nature is, of course, the last judge.

I will quote a beautiful description he makes of the LHC: "In sheer size, the LHC is our civilization's answer to the pyramids of ancient Egypt. But it is a nobler monument in many ways. It is born out of curiosity, not of superstition. It is a product of cooperation, not command". Blessed are we to live in such exciting times in science!

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Making Advanced Nuclear Particle Physics Fun and Accessible

By Brad VanAuken

I am not a physicist but I have been fascinated by cosmology, general relativity, quantum mechanics, string theory, multi-dimensional theories, black holes, grand unified theory (GUT), etc. since my college days in the mid-to-late seventies. I have read many books on these topics and many are very difficult reads given that I am not grounded in the advanced mathematical models and approaches that underpin the theories. Having said that, this book is a very easy read for the layman (as easy as a book on this topic can be) and is written in a highly entertaining way. Frank Wilczek has a wonderful sense of humor. I find that I don't have to read any sentence twice to understand the concept. I get it the first time around. It takes true brilliance to convey very complicated concepts simply and with great clarity. I sat down and read this book from cover to cover without putting it down. It covers the evolution of thinking on matter and space from the earliest thinking to today's speculation and theories. The concept of space as a dynamic grid is fascinating. Dr. Wilczek even includes a glossary of terms in the back of the book in case you don't understand the meaning of a particular word or phrase. I highly recommend this book to people who want to keep abreast of the latest thinking on this area of physics. It is an informative and engaging read.

See all 87 customer reviews...

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