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# The Lightness Of Being: Mass, Ether, And The Unification Of Forces

THE LIGHTNESS OF BEING  
FRANK WILCZEK

MASS, ETHER, AND THE UNIFICATION OF FORCES



## Synopsis

Our understanding of nature's deepest reality has changed radically, but almost without our noticing, over the past 25 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, 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.

## Book Information

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## Customer Reviews

The book is entertaining and describes what some physicists think today of reality. But we must take care, for along history many persons have proposed "final", "true" theories of reality, only to see them superseded by other theories. There is a big, big defect in the book: all the text is built around the concept of "energy", but the author does not care, or can, define that concept. There is "energy" but, what "is-- energy? Further on, in many pages, the author speaks of infinite number of bodies, infinite space, infinite " ". But there is no infinite. This is a mathematical concept, not a physical one because by definition we cannot measure infinite concepts. In the third place, the book is rather mystic: Equations are not more that symbolic ways of describing reality, as symbolic as scores of musical pieces or pictures of

the three-dimensional world on a two-dimensional plane. However, the book treats equations as the ultimate reality from which this last derives. We come back to the old medieval idea that the Universe was made for man, as the equations are actually only a product of the mind. The author proposes "The Grid" as a description of space. This Grid is filled up with fields. But he does not explain where do the fields originate, or how some fields can measure other fields, or how do different fields interact with each other. He bases his Grid on the uncertainty idea of quantum mechanics, but that idea should be derived from reality, not to be a starting point of that reality, because if so, why are there uncertainty laws? The Grid is the weakest point of the book. The author is, however, very honest, in that he explicitly says, at the end of the book, that we have no idea of why the electron has mass and why it has the value it has, nor why the neutrinos have mass. On the other hand, he accepts the idea of a  $\Lambda$  dark energy  $\Lambda$  that he is not able to determine what it can be, or the idea of a dark undetectable matter. In physics, when we have measurements that we cannot incorporate into the theory, we must change the theory, instead of looking for impossible things. Worth reading.

I liked the way the author develops his discussion of his main goal (the unification of forces - qcd), he begins relatively easy and gradually progress to less familiar and for (I would think) his target audience less comfortable topics. His writing style is great to read, he is concise and humorous and he presents quantum physics as being much less daunting to understand than most other writers I have read, his argument being that anyone can understand it if they try. The book also sequesters nicely right into current research. I had 2 downsides. First, there were times, especially in the second half of the book where I would suddenly pause and say, huh, didn't I just read that paragraph? The more I read it, the more I wondered, did he just cobble parts of this book together from separate sources (and indeed he did. I discovered at the end, parts of this book are from a series of lectures). I don't say this to discourage you from reading it, again, his writing style is very approachable and with this topic a little reinforcement doesn't hurt, but you will notice it and a little more careful editing might have been an advantage here. The second is that I wondered sometime if the author isn't a little too in love with his personal favorite theory (QCD). I'm not arguing whether his theory is right or wrong, that's definitely beyond my knowledge, but there were a lot of pros and not a lot of cons. I like to read physics books, so I know he is in no means alone in this, but everyone seems to have their favorite theory that they are sure is the one that will work, and I seldom find that it is put in perspective with possible competing alternatives. I don't really expect anyone to cover all the alternatives, but maybe a little more frank look at possible drawbacks to the theory. The author does

attempt to do this, but it doesn't seem like he really believes them. Which may be because he is right, I don't know, I'll have to keep reading until someone discovers the answer. Finally, one point I don't quite agree. The author argues that if we try understanding all the elements of particle physics it really shouldn't be so hard. And I agree in principle, I have no problem with atoms or electron or protons or neutrons, but when people start talking colors and flavors and strange and charmed quarks I start to feel a bit unfocused. I don't know if it's because I studied the one set in school and not the other, or if it has something to do with all the silly names that particle physicists seem to prefer.

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