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“Want to know what it’s all about? Here’s a book that candidly tells you what ‘it’ is. And just about everything you thought about ‘it’ is wrong. Accessible, charming and cheeky, *The Lightness of Being* reveals a universe where matter is the hum of strange music, mass doesn’t weigh, and empty space is a multilayered, multicolored superconductor.” —K.C. Cole, author of *Mind Over Matter: Conversations with the Cosmos*

## **THE LIGHTNESS OF BEING**

### **Mass, Ether, and the Unification of Forces**

**By Frank Wilczek, Winner of the 2004 Nobel Prize® in Physics**

The quest for a Grand Unification theory—a single theoretical framework that accounts for the fundamental forces of the universe—has challenged the world’s most renowned scientists for decades. To this day it remains nearly as illusive as the search for the Holy Grail.

Nobelist in physics and acclaimed author Frank Wilczek guides readers into the once-rarified realm of electrons, protons, neutrinos, and other celestial matter in his new book, **THE LIGHTNESS OF BEING: Mass, Ether, and the Unification of Forces (Basic Books; September 2, 2008)**, a lively and accessible review of the structure of physical reality, the nature of space, the contents of the universe and the future of human inquiry.

Wilczek begins his journey with a brief summary of the once-immutable laws formulated by Newton and Einstein. Evaluating and explaining their failed assumptions, he makes it clear how much he and his colleagues are indebted to these two giants of science and how their work has provided vital links to their nascent research.

Trumpeting a new “Golden Age of fundamental physics,” he credits the new regime of scientists with making exciting discoveries through new techniques that have altered the fundamental teachings of physical science. With the help of giant accelerators, colliders, and exotic new instruments, scientists have detected new forms of matter, have photographed quarks, and have realized a new definition of empty space (which, Wilczek explains, “is in reality a dynamic medium

full of structure and activity”) – all of which could not have been known by earlier explorers of the cosmos. The largest of these machines, the Large Hadron Collider (LHC) at the CERN laboratory near Geneva, is scheduled to start up in early September 2008. “We all eagerly await operation of the LHC where,” notes Wilczek, “if these ideas are correct, the new particles of supersymmetry – or, you might say, the new dimensions of superspace – must make their appearance.”

In sharing the extraordinary advances in our knowledge of the universe, Wilczek walks readers through a vast array of forces and objects that scientists are studying, explaining the theories based on observations and equations that have withstood the questions of skeptics, those that are still being debated, and those that have passed into oblivion. With wit and clarity, Wilczek describes and defines virtually everything that concerns and excites the scientists who are unlocking the secrets of our physical world. Here, he explains the origin of mass, the structure and behavior of quarks, the powers of symmetry, how gravity is measured, why the all-important Core theory is one of humankind’s greatest achievements – and why it is still referred to as a “working” theory – as well as dark matter and dark energy, which are invisible and have been detected indirectly through their gravitational influence on stars and galaxies.

Wilczek concludes that, “Through the patchy clouds, off in the distance, we seem to glimpse a mathematical Paradise, where the elements that build reality shed their dross. Correcting for the distortions of our everyday vision, we create in our minds a vision of what they might really be: pure and ideal, symmetric, equal and perfect. Or have our imaginations made too much of a wispy chimera? We point our telescope, and wait for the clouds to clear.” **THE LIGHTNESS OF BEING** gives readers a rare glimpse of the wonder of our world, and the exciting revelations to come.

### **ABOUT THE AUTHOR**

**Frank Wilczek** won the Nobel Prize in Physics in 2004 for work that he did as a twenty-one-year-old graduate student. His 1989 book, *Longing for the Harmonies*, was a *New York Times* Notable Book of the Year. A regular contributor to *Nature* and *Physics Today*, Wilczek’s work has also been anthologized in *Best American Science Writing* and *The Norton Anthology of Light Verse*. He lives in Cambridge, Massachusetts, where he is currently the Herman Feshbach Professor of Physics at MIT.

### **ABOUT THE BOOK**

**THE LIGHTNESS OF BEING: Mass, Ether and the Unification of Forces**

**By Frank Wilczek**

**Published by Basic Books**

**Publication date: September 2, 2008**

**ISBN: 978-0-465-00321-1 • Price: \$26.95/Hardcover • Pages: 270**

**Diagrams and full color photographs; Appendices; Glossary Notes; Index**

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**Advance praise for**  
**THE LIGHTNESS OF BEING: Mass, Ether, and the Unification of Forces**  
**By Frank Wilczek**  
**(Basic Books; September 2, 2008)**

“Don’t worry, the chapters are short, fun and larded with historical points that offer readers the payoff of understanding all the excitement in the scientific world over Europe’s Large Hadron Collider, just getting warmed up in its operations.” — *USAToday.com*

“Wilczek delivers an approachable verbal picture of what quarks and gluons are doing inside a proton that gives rise to mass and, hence, gravity. Casting the light-speed lives of quarks against ‘the Grid,’ Wilczek’s term for the vacuum that theoretically seethes with quantum activity, Wilczek exudes a contagious excitement for discovery. A near-obligatory acquisition for circulating physics collections.” — *Booklist*

“Want to know what it’s all about? Here’s a book that candidly tells you what ‘it’ is. And just about everything you thought about ‘it’ is wrong. Accessible, charming and cheeky, *The Lightness of Being* reveals a universe where matter is the hum of strange music, mass doesn’t weigh, and empty space is a multilayered, multicolored superconductor.” —K.C. Cole, author of *Mind Over Matter: Conversations with the Cosmos*

“Vintage Wilczek—fun, simple and right.” —Robert Laughlin, author of *A Different Universe* and *The Crime of Reason*

“This book is deep, simple and incredibly well-written. Starting from the nature of mass, Professor Wilczek leads the reader to an understanding of the most profound ideas and accomplishments in physics today.” —T. D. Lee, Nobel Laureate in Physics, Columbia University

“*The Lightness of Being* is a delightful celebration of the wonders of physics, told by one who has helped define the current frontiers. Wilczek’s lightness of touch and wry humour make this book a joy to read.” —Frank Close, author of *The Void*

“*The Lightness of Being* takes the reader on a mind-stretching journey, providing a revolutionary new vision of the universe. Frank Wilczek is an extraordinarily accomplished and creative scientist who has the rare ability to communicate scientific ideas and insights with exceptional clarity—but also with a delightful playfulness.” —Jerome I. Friedman, Nobel Laureate, MIT

“*The Lightness of Being* is a lively, playful, and inventive tour de force, written by a lively, playful, and inventive key mover in the field. Few creative popular expositors of physics are also brilliant physicists. It is rarer still to find a creative expositor of physics who is not only brilliant but has personally helped change the way we think about nature.” —Lawrence Krauss, author of *Hiding in the Mirror: The Mysterious Allure of Extra Dimensions*

“Frank Wilczek takes readers on an enjoyable and enlightening voyage that starts with the deep insights that won him a Nobel Prize, and moves on to the more speculative realms that physicists are now investigating. This is a colorful and masterful treatment of recent developments in fundamental physics.” —Peter Woit, author of *Not Even Wrong*

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