



Frank Close

# PARTICLE PHYSICS

A Very Short Introduction

OXFORD

# Particle Physics A Very Short Introduction

**Frank Close**

## **Particle Physics A Very Short Introduction:**

*Particle Physics* Frank Close,2023 Very Short Introductions Brilliant Sharp Inspiring Following the discovery of the Higgs boson Frank Close has produced this major revision to his classic and compelling introduction to the fundamental particles that make up the universe Frank Close takes us on a journey into the atom to examine known particles such as quarks electrons and the ghostly neutrino and explains the key role and significance of the Higgs boson Along the way he provides fascinating insights into how discoveries in particle physics have actually been made and discusses how our picture of the world has been radically revised in the light of these developments He concludes by looking ahead to new ideas about the mystery of antimatter and massive neutrinos and to what the next 50 years of research might reveal about the nature of the Higgs field which moulds the fundamental particles and forces

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*Nuclear Physics: A Very Short Introduction* Frank Close,2015-07-23 Nuclear physics began long before the identification of fundamental particles with J J Thomson s discovery of the electron at the end of the 19th century which implied the existence of a positive charge in the atom to make it neutral In this Very Short Introduction

Frank Close gives an account of how this area of physics has progressed including the recognition of how heavy nuclei are built up in the cores of stars and in supernovae the identification of quarks and gluons and the development of quantum

chromodynamics QCD Exploring key concepts such as the stability of different configurations of protons and neutrons in nuclei Frank Close shows how nuclear physics brings the physics of the stars to Earth and provides us with important

applications particularly in medicine

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**Nothing** Frank Close,2009-06-25 What is nothing What remains when you take all the matter away Can empty space a void exist This Very Short Introduction explores the science and the history of the elusive

void from Aristotle who insisted that the vacuum was impossible via the theories of Newton and Einstein to our very latest

discoveries and why they can tell us extraordinary things about the cosmos Frank Close tells the story of how scientists have explored the elusive void and the rich discoveries that they have made there He takes the reader on a lively and accessible

history through ancient ideas and cultural superstitions to the frontiers of current research He describes how scientists discovered that the vacuum is filled with fields how Newton Mach and Einstein grappled with the nature of space and time

and how the mysterious aether that was long ago supposed to permeate the void may now be making a comeback with the latest research into the Higgs field We now know that the vacuum is far from being empty it seethes with virtual particles and antiparticles that erupt spontaneously into being and it also may contain hidden dimensions that we were previously unaware of These new discoveries may provide answers to some of cosmology s most fundamental questions what lies outside the universe and if there was once nothing then how did the universe begin **ABOUT THE SERIES** The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area These pocket sized books are the perfect way to get ahead in a new subject quickly Our expert authors combine facts analysis perspective new ideas and enthusiasm to make interesting and challenging topics highly readable [Physics](#) Sidney Perkowitz,2019-07-25

Physics the fundamental science of matter and energy encompasses all levels of nature from the subatomic to the cosmic and underlies much of the technology around us Understanding the physics of our universe is an essential aspect of humanity s quest to understand our environment and our place within it Doing physics enables us to explore the interaction between environment and human society and can help us to work towards the future sustainability of the planet This Very Short Introduction provides an overview of how this pervasive science came to be and how it works who funds it how physicists are trained and how they think and how physics supports the technology we all use Sidney Perkowitz presents the theories and outcomes of pure and applied physics from ideas of the Greek natural philosophers to modern quantum mechanics cosmology digital electronics and energy production Considering its most consequential experiments including recent results in elementary particles gravitational waves and materials science he also discusses outside the lab the effects of physics on society culture and humanity s vision of its place in the universe **ABOUT THE SERIES** The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area These pocket sized books are the perfect way to get ahead in a new subject quickly Our expert authors combine facts analysis perspective new ideas and enthusiasm to make interesting and challenging topics highly readable [Particle Physics](#) , [Quantum Theory](#) John

Polkinghorne,2002-05-30 Quantum Theory is the most revolutionary discovery in physics since Newton This book gives a lucid exciting and accessible account of the surprising and counterintuitive ideas that shape our understanding of the sub atomic world It does not disguise the problems of interpretation that still remain unsettled 75 years after the initial discoveries The main text makes no use of equations but there is a Mathematical Appendix for those desiring stronger fare Uncertainty probabilistic physics complementarity the problematic character of measurement and decoherence are among the many topics discussed **ABOUT THE SERIES** The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area These pocket sized books are the perfect way to get ahead in a new subject quickly Our expert authors combine facts analysis perspective new ideas and enthusiasm to make interesting and challenging topics highly readable [The New Cosmic Onion](#) Frank Close,2006-12-15 Not since Newton s apple has there been a

physics phenomenon as deliciously appealing to the masses as Frank Close's *Cosmic Onion* Widely embraced by scientists and laypersons alike the book quickly became an international bestseller Translated into seven languages it propelled the author to become a worldwide celebrity as well as an inspired **Astrophysics** James Binney, 2016-03-24 Astrophysics is the physics of the stars and more widely the physics of the Universe It enables us to understand the structure and evolution of planetary systems stars galaxies interstellar gas and the cosmos as a whole In this Very Short Introduction the leading astrophysicist James Binney shows how the field of astrophysics has expanded rapidly in the past century with vast quantities of data gathered by telescopes exploiting all parts of the electromagnetic spectrum combined with the rapid advance of computing power which has allowed increasingly effective mathematical modelling He illustrates how the application of fundamental principles of physics the consideration of energy and mass and momentum and the two pillars of relativity and quantum mechanics has provided insights into phenomena ranging from rapidly spinning millisecond pulsars to the collision of giant spiral galaxies This is a clear rigorous introduction to astrophysics for those keen to cut their teeth on a conceptual treatment involving some mathematics

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*Quantum Principles and Particles, Second Edition* Walter Wilcox, 2019-08-23 This textbook offers a unique introduction to quantum mechanics progressing gradually from elementary quantum mechanics to aspects of particle physics It presents the microscopic world by analysis of the simplest possible quantum mechanical system spin 1/2 A special feature is the author's use of visual aids known as process diagrams which show how amplitudes for

quantum mechanical processes are computed The second edition includes a new chapter and problems on time dependent processes in addition to new material on quantum computing and improved illustrations

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*The History of Physics: A Very Short Introduction* J. L. Heilbron, 2018-01-18 How does the physics we know today a highly professionalised enterprise inextricably linked to government and industry link back to its origins as a liberal art in Ancient Greece What is the path that leads from the old philosophy of nature and its concern with humankind's place in the universe to modern massive international projects that hunt down fundamental particles and industrial laboratories that manufacture marvels This Very Short Introduction introduces us to Islamic astronomers and mathematicians calculating the size of the earth whilst their caliphs conquered much of it to medieval scholar theologians investigating light to Galileo Copernicus Kepler and Newton measuring and trying to explain the universe We visit the House

of Wisdom in 9th century Baghdad Europe's first universities the courts of the Renaissance the Scientific Revolution and the academies of the 18th century and the increasingly specialised world of 20th and 21st century science Highlighting the shifting relationship between physics philosophy mathematics and technology and the implications for humankind's self understanding Heilbron explores the changing place and purpose of physics in the cultures and societies that have nurtured it over the centuries **ABOUT THE SERIES** The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area These pocket sized books are the perfect way to get ahead in a new subject quickly Our expert authors combine facts analysis perspective new ideas and enthusiasm to make interesting and challenging topics highly readable

**CERN and the Higgs Boson** James Gillies,2018-10-04 The Higgs boson is the rock star of fundamental particles catapulting CERN the laboratory where it was found into the global spotlight But what is it why does it matter and what exactly is CERN In the late 1940s a handful of visionaries were working to steer Europe towards a more peaceful future through science and CERN the European particle physics laboratory was duly born James Gillies tells the gripping story of particle physics from the original atomists of ancient Greece through the people who made the crucial breakthroughs to CERN itself one of the most ambitious scientific undertakings of our time and its eventual confirmation of the Higgs boson Weaving together the scientific and political stories of CERN's development the book reveals how particle physics has evolved from being the realm of solitary genius to a global field of human endeavour with CERN's Large Hadron Collider as its frontier research tool

**Theories of Everything: Ideas in Profile** Frank Close,2017-03-02 Physicist Frank Close takes the reader to the frontiers of science in a vividly told investigation of revolutionary science and enterprise from the seventeenth century to the present He looks at what has been meant by theories of everything explores the scientific breakthroughs they have allowed and shows the far reaching effects they have had on crucial aspects of life and belief Theories of everything he argues can be described as those which draw on all relevant branches of knowledge to explain everything known about the universe Such accounts may reign supreme for centuries Then often as a result of the advances they themselves have enabled a new discovery is made which the current theory cannot explain A new theory is needed which inspiration sometimes supplies Moving from Isaac Newton's work on gravity and motion in the seventeenth century to thermodynamics and James Clerk Maxwell's laws of electromagnetism in the nineteenth to Max Planck's and Paul Dirac's quantum physics in the twentieth Professor Close turns finally to contemporary physics and the power and limitations of the current theory of everything The cycle in which one theory of everything is first challenged and then replaced by another is continuing right now

**Causality** Jeaneane Fowler,2020-02-21 This book examines the concepts of cause and effect from two dimensions The first concerns the macrocosm of the Universe and how each belief system views creation The second dimension explores the ways in which beliefs about creation influence the microcosmic world in terms of the nature of the self the proximate goals within each system the answers each belief system offers to the presence of evil and suffering in

existence and ideas about the ultimate goal of release from them All these ideas inform and are fundamental to the understanding of the present day practices of different faiths presenting challenges for scriptural testimony balanced with existential living The final two chapters explore current research in physics concerning the beginnings of the cosmos and what implications such research might have for existence within it with the final chapter examining scientific views of the nature of the self Contents include Judaic and Christian Traditions Islam Hinduism Early Buddhism Sikhism Classical Taoism Recycled Stardust Ashes to Ashes and Dust to Atoms The Life and Death of the Self

*Elementary Particle Physics, Multiparticle Aspects* Paul Oskar Urban,1972 **Neutrino** Frank Close,2010-10-14 What are neutrinos Why does nature need them What use are they Neutrinos are perhaps the most enigmatic particles in the universe Formed in certain radioactive decays they pass through most matter with ease These tiny ghostly particles are formed in millions in the Sun and pass through us constantly For a long time they were thought to be massless and passing as they do like ghosts they were not regarded as significant Now we know they have a very small mass and there are strong indications that they are very important indeed It is speculated that a heavy form of neutrino that is both matter and antimatter may have shaped the balance of matter and antimatter in the early universe Here Frank Close gives an account of the discovery of neutrinos and our growing understanding of their significance also touching on some speculative ideas concerning the possible uses of neutrinos and their role in the early universe

*American Book Publishing Record ,2003* **Electrons, Atoms, and Molecules in Inorganic Chemistry** Joseph J. Stephanos,Anthony W. Addison,2017-06-01 Electrons Atoms and Molecules in Inorganic Chemistry A Worked Examples Approach builds from fundamental units into molecules to provide the reader with a full understanding of inorganic chemistry concepts through worked examples and full color illustrations The book uniquely discusses failures as well as research success stories Worked problems include a variety of types of chemical and physical data illustrating the interdependence of issues This text contains a bibliography providing access to important review articles and papers of relevance as well as summaries of leading articles and reviews at the end of each chapter so interested readers can readily consult the original literature Suitable as a professional reference for researchers in a variety of fields as well as course use and self study The book offers valuable information to fill an important gap in the field Incorporates questions and answers to assist readers in understanding a variety of problem types Includes detailed explanations and developed practical approaches for solving real chemical problems Includes a range of example levels from classic and simple for basic concepts to complex questions for more sophisticated topics Covers the full range of topics in inorganic chemistry electrons and wave particle duality electrons in atoms chemical binding molecular symmetry theories of bonding valence bond theory VSEPR theory orbital hybridization molecular orbital theory crystal field theory ligand field theory electronic spectroscopy vibrational and rotational spectroscopy

**Edward Carpenter** Sheila Rowbotham,2008 Acclaimed biography of the pioneering advocate of free love gay rights and women s suffrage **Particle Physics** Abraham Seiden,2005 Author

Abraham Seiden brings more than 40 years of teaching and research experience to this advanced introductory particle physics text Particle Physics A Comprehensive Introduction has the most complete and up to date coverage of any book on the market The author focuses on the basic principles of particle physics using recent data to illustrate key concepts and provides a comprehensive collection of worked examples and problems KEY TOPICS Complete introductory coverage of all major topics in the field of particle physics MARKET For college instructors students scientists or anyone interested in particle physics

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