

# STANDARD MODEL OF ELEMENTARY PARTICLES

QUARKS

<b>UP</b> mass $2,3 \text{ MeV}/c^2$ charge $\frac{2}{3}$ spin $\frac{1}{2}$ 	<b>CHARM</b> mass $1,275 \text{ GeV}/c^2$ charge $\frac{2}{3}$ spin $\frac{1}{2}$ 	<b>TOP</b> mass $173,07 \text{ GeV}/c^2$ charge $\frac{2}{3}$ spin $\frac{1}{2}$ 
<b>DOWN</b> mass $4,8 \text{ MeV}/c^2$ charge $-\frac{1}{3}$ spin $\frac{1}{2}$ 	<b>STRANGE</b> mass $95 \text{ MeV}/c^2$ charge $-\frac{1}{3}$ spin $\frac{1}{2}$ 	<b>BOTTOM</b> mass $4,18 \text{ GeV}/c^2$ charge $-\frac{1}{3}$ spin $\frac{1}{2}$ 

LEPTONS

<b>ELECTRON</b> mass $0,511 \text{ MeV}/c^2$ charge $-1$ spin $\frac{1}{2}$ 	<b>MUON</b> mass $105,7 \text{ MeV}/c^2$ charge $-1$ spin $\frac{1}{2}$ 	<b>TAU</b> mass $1,777 \text{ GeV}/c^2$ charge $-1$ spin $\frac{1}{2}$ 
<b>ELECTRON NEUTRINO</b> mass $<2,2 \text{ eV}/c^2$ charge $0$ spin $\frac{1}{2}$ 	<b>MUON NEUTRINO</b> mass $<0,17 \text{ MeV}/c^2$ charge $0$ spin $\frac{1}{2}$ 	<b>TAU NEUTRINO</b> mass $<15,5 \text{ MeV}/c^2$ charge $0$ spin $\frac{1}{2}$ 

<b>GLUON</b> mass $0$ charge $0$ spin $1$ 	<b>PHOTON</b> mass $0$ charge $0$ spin $1$ 	<b>Z BOSON</b> mass $91,2 \text{ GeV}/c^2$ charge $0$ spin $1$ 	<b>W BOSON</b> mass $80,4 \text{ GeV}/c^2$ charge $\pm 1$ spin $1$ 
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<b>HIGGS BOSON</b> mass $126 \text{ GeV}/c^2$ charge $0$ spin $0$ 
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GAUGE BOSONS

# Fundamental Particles

**Muhammad Abdul Quddus**



## **Fundamental Particles:**

Fundamentals of Reality Jules J. Berman, 2025-12-15 The premise of this book is that by understanding the initial conditions at the origins of reality we can comprehend how all of our observable physical systems including chemical and biological systems have emerged The book focuses on familiar principles of quantum physics and provides very simple derivations of the Heisenberg Uncertainty Principle Pauli's Exclusion Principle Schrodinger's wave equation Noether's theorem and the Continuity Equation Background is provided in group theory and symmetries Using these concepts the book explores the nature of vacuum of fundamental constants and particles and of physical laws Building on these basic principles the book explains the emergence of atoms the natural elements chemical reactions and life In the process numerous paradoxes are encountered and solved The Fundamental Particles B. H. Bransden, Desmond Evans, John Victor Major, 1973

**Modern Elementary Particle Physics** Gordon L. Kane, 1993-04-21 Revised and updated from the 1987 version Rather than giving a historical treatment the author explains the modern standard model and the gauge theory of the interactions of quarks and leptons via exchange of photons W and Z bosons and gluons *Proofs and Logical Arguments Supporting the Foundational Laws of Physics* Jules J. Berman, 2025-02-10 For scientists students and curious laypersons this compilation *Proofs and Logical Arguments Supporting the Foundational Laws of Physics A Handy Guide for Students and Scientists* examines the most important laws and relationships taught in science courses attaching a short and accessible proof or logical argument for each assertion Every thoughtful person should seek to understand why we think we know what we say we know about the natural world Otherwise we may as well surrender ourselves to a world ruled by magic In 136 essays readers are provided with proofs and logical arguments supporting the laws and relationships that serve as the foundation of our rational understanding of reality Among the essays included in this book we will find proofs of Pauli's exclusion principle Heisenberg's uncertainty principle the principles of special relativity the Schrodinger wave equation Noether's theorem and many of the laws of physics and chemistry that no scientist should accept on blind faith alone Laypersons will find that the ideas discussed in this volume are always thought provoking and sometimes inspiring For university undergraduates the book will serve as an introduction to the core sciences Graduate students may find this book to be a handy cross disciplinary reference that explains how the tools of their own selected discipline have emerged from fundamental principles that unify all the sciences Jules J Berman received two baccalaureate degrees from MIT from the Department of Mathematics and from the Department of Earth and Planetary Sciences He holds a PhD from Temple University and an MD from the University of Miami His postdoctoral studies were completed at the US National Institutes of Health and his residency was completed at the George Washington University Medical Center in Washington DC Dr Berman served as Chief of Anatomic Pathology Surgical Pathology and Cytopathology at the Veterans administration Medical Center in Baltimore Maryland where he also held joint appointments at the University of Maryland Medical Center and at the Johns

Hopkins Medical Institutions In 1998 he transferred back to the US National Institutes of Health as a Medical Officer and as the Program Director for Pathology Informatics in the Cancer Diagnosis Program at the National Cancer Institute Dr Berman is a past president of the Association for Pathology Informatics and is the 2011 recipient of the Association's Lifetime Achievement Award He has first authored more than 100 journal articles and has written more than 20 single author science books

*The Nobel collection, Volume 2* Idan Segev, Robert Knight, 2023-10-12 This second Volume of our unique Nobel Collection brings you more articles by Nobel Prize winners called Laureates written specifically for young minds These amazing research leaders explain their ground breaking discoveries and how they achieved them and also share their thoughts on making a career path in science with advice for becoming a successful researcher and having a happy life Like everything Frontiers for Young Minds publishes these articles have been reviewed and approved by kids like you What are the Nobel Prizes Humans are highly curious we are eager to understand ourselves and the world around us A scientific understanding is critical for finding solutions to all our global challenges from diseases like Covid to climate change Scientists and researchers devote their lives to exploring and understanding the laws of nature and life itself Every researcher's results contribute to our body of human knowledge Occasionally new discoveries totally transform the way we understand the universe and ourselves for example Albert Einstein's famous breakthroughs in theoretical physics or the pioneering work of Marie Skłodowska Curie which led to the discovery of new elements and advanced treatments using X rays and curing cancer Each year these transformative discoveries are celebrated with Nobel Prizes founded by Alfred Nobel in his will and awarded since 1901 to represent the highest level of recognition for research In our journal we feature the winners of prizes in Chemistry Physics Physiology or Medicine and Economics Did you know that you as a Young Minds reader share an important trait with our Nobel Prize winners This is curiosity The scientific journeys of Nobel laureates are fueled by an intense life long search for answers the same curiosity that motivates you to read these articles As Nobel Laureate May Britt Moser told us As a scientist I feel privileged to be able to ask questions that I think are important I hope the papers in this journal may help nurture and reinforce children's passion and curiosity for science what a gift to humanity that would be Let this unique Collection help you to develop your own curiosity and passion and inspire you reach for new discoveries in your own life Check out the 10 brilliant articles in Volume 1 here find out about key discoveries ranging from how humans find our way using special brain cells to how we might find life on planets beyond our solar system Would you like to submit to thi

**Petroleum Science and Technology** Muhammad Abdul Quddus, 2021-03-30 Petroleum Science and Technology Petroleum Generation Accumulation and Prospecting describes natural hydrocarbon geology along with applicable aspects of physics chemistry biology environmental science mathematics and engineering technology It starts off with a brief coverage of the origin and evolution of the universe petroleum origin and generation in subsurface condition source rock oil gas migration path and reservoir rock Geological geophysical and geochemical petroleum surveys are also

included This book covers both theory and applied information Aimed at graduate students researchers and professionals in petroleum engineering and chemical engineering it Covers petroleum geology and technology including petroleum generation migration and reservoir formation Introduces the nature and formation of petroleum and its exploration Describes oil gas prospecting using geophysico chemical methods under subsurface condition Includes a detailed geochemical survey along with an analysis of kerogen and bitumen Explains petroleum migration and accumulation using two dimensional graphs

MA Quddus PhD has served in the petroleum sector and R D organization both national and multinational for more than 40 years and has worked in various capacities including in the laboratory office field and plant and has also engaged in teaching petroleum technology as a visiting professor for 17 years He earned BSc Hons and MSc degrees along with a PhD with thesis titled Oxidation of Asphalt As a result of his constant research he has published nine international and 12 national papers obtained one patent presented five papers in conferences and prepared six technical reports He has also visited the USA Canada and Indonesia for short courses in petroleum technology and teacher training

**A Tour of the Subatomic Zoo** Cindy Schwarz,1997 This popular book introduces the ideas terminology and techniques of high energy physics Insights into the structure of matter from the atom down to the quark are made accessible to readers who have no physics background With hardly a mathematical formula Ms Schwarz clearly explains the language and much of the substance of elementary particle physics

FROM THE INTRODUCTION BY STANLEY GLASHOW HARVARD UNIVERSITY NOBEL LAUREATE *The Renaissance of Devnagari Akshras (Sanskrit Sounds)* Prem Krishan Bhatnagar,1892

**Atoms and Fundamental Particles** James F Frayne,2018-03-19 This book represents a snapshot in time Tomorrow we will discover something new about the humble atom which may modify or even radically change the paradigms we have held so sacrosanct until then It is hoped though that it will present sufficient ground work as to provide a spring board to students in their quest for a greater understanding of the atom and of its fundamental particles It is also hoped that a more profound understanding of the nature of life may also be gained as well as raise begging questions which have not here to for been entertained It is intended to cover much of the syllabus for A Level and High School studies Because of the simple language tables and diagrams however the subject matter will be easily absorbed by and be of great interest to the comparative lay persons among us

**Science Abstracts** ,1900 Fundamental Particles Brian G. Duff,1986 **Exploring Fundamental Particles** Lincoln Wolfenstein,2017-11-15 The search for the elementary constituents of the physical universe and the interactions between them has transformed over time and continues to evolve today as we seek answers to questions about the existence of stars galaxies and humankind Integrating both theoretical and experimental work Exploring Fundamental Particles traces the development of this fascinating field from the discoveries of Newton Fermi and Feynman to the detection of CP violation and neutrinos to the quest to observe the Higgs boson and beyond An Accessible yet In Depth Account of How Fundamental Particles Shape Our World The book first examines the experiments and theoretical ideas that gave rise to the standard

model It discusses special relativity angular momentum spin the Dirac electron quantum field theory Feynman diagrams Pauli s neutrino Fermi s weak interaction Yukawa s pion the muon neutrino quarks leptons and flavor symmetry The authors then explain the violation of the symmetry between matter and antimatter known as CP violation They cover the discoveries of CP violation in the decays of kaons and B mesons as well as future experiments that could detect possible CP violation beyond the standard model In the next part the authors present experimental results involving the once mysterious neutrino They explore the evidence that neutrinos have mass new neutrino experiments in various countries and the potential of neutrino astronomy to offer a new perspective on stars and galaxies The final section focuses on the one undetected particle of the standard model the Higgs boson The authors review the experiments that established important constraints on the mass of the Higgs particle They also highlight recent experiments of the Tevatron particle accelerator at Fermilab along with the near future impact of the Large Hadron Collider LHC at CERN and th

Exploring Fundamental Particles Lincoln Wolfenstein,Joao P. Silva,2010-09-22 The search for the elementary constituents of the physical universe and the interactions between them has transformed over time and continues to evolve today as we seek answers to questions about the existence of stars galaxies and humankind Integrating both theoretical and experimental work Exploring Fundamental Particles traces the developme

**College Physics for Engineers** Robert Francis Earhart,Alvin Herborg Nielsen,1941 **Optical Geometry of Motion** Alfred Arthur Robb,1911 The Athenaeum ,1902 *The Athenaeum* James Silk Buckingham,John Sterling,Frederick Denison Maurice,Henry Stebbing,Charles Wentworth Dilke,Thomas Kibble Hervey,William Hepworth Dixon,Norman Maccoll,Vernon Horace Rendall,John Middleton Murry,1901 General Science Quarterly ,1928

**Molecular Physics and the Electrical Theory of Matter** James Arnold Crowther,1927 *Brotherhood of Locomotive Firemen and Enginemen's Magazine* ,1926

The book delves into Fundamental Particles. Fundamental Particles is an essential topic that must be grasped by everyone, from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Fundamental Particles, encompassing both the fundamentals and more intricate discussions.

1. This book is structured into several chapters, namely:
  - Chapter 1: Introduction to Fundamental Particles
  - Chapter 2: Essential Elements of Fundamental Particles
  - Chapter 3: Fundamental Particles in Everyday Life
  - Chapter 4: Fundamental Particles in Specific Contexts
  - Chapter 5: Conclusion
2. In chapter 1, the author will provide an overview of Fundamental Particles. The first chapter will explore what Fundamental Particles is, why Fundamental Particles is vital, and how to effectively learn about Fundamental Particles.
3. In chapter 2, the author will delve into the foundational concepts of Fundamental Particles. The second chapter will elucidate the essential principles that need to be understood to grasp Fundamental Particles in its entirety.
4. In chapter 3, this book will examine the practical applications of Fundamental Particles in daily life. The third chapter will showcase real-world examples of how Fundamental Particles can be effectively utilized in everyday scenarios.
5. In chapter 4, the author will scrutinize the relevance of Fundamental Particles in specific contexts. The fourth chapter will explore how Fundamental Particles is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, the author will draw a conclusion about Fundamental Particles. The final chapter will summarize the key points that have been discussed throughout the book.

This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Fundamental Particles.

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