

QUARKS	<p>mass → <math>\approx 2.3 \text{ MeV}/c^2</math></p> <p>charge → <math>2/3</math></p> <p>spin → <math>1/2</math></p> <p><b>u</b></p> <p>up</p>	<p>mass → <math>\approx 1.275 \text{ GeV}/c^2</math></p> <p>charge → <math>2/3</math></p> <p>spin → <math>1/2</math></p> <p><b>c</b></p> <p>charm</p>	<p>mass → <math>\approx 173.07 \text{ GeV}/c^2</math></p> <p>charge → <math>2/3</math></p> <p>spin → <math>1/2</math></p> <p><b>t</b></p> <p>top</p>	<p>mass → <math>0</math></p> <p>charge → <math>0</math></p> <p>spin → <math>1</math></p> <p><b>g</b></p> <p>gluon</p>	<p>mass → <math>\approx 126 \text{ GeV}/c^2</math></p> <p>charge → <math>0</math></p> <p>spin → <math>0</math></p> <p><b>H</b></p> <p>Higgs boson</p>
	<p>mass → <math>\approx 4.8 \text{ MeV}/c^2</math></p> <p>charge → <math>-1/3</math></p> <p>spin → <math>1/2</math></p> <p><b>d</b></p> <p>down</p>	<p>mass → <math>\approx 95 \text{ MeV}/c^2</math></p> <p>charge → <math>-1/3</math></p> <p>spin → <math>1/2</math></p> <p><b>s</b></p> <p>strange</p>	<p>mass → <math>\approx 4.18 \text{ GeV}/c^2</math></p> <p>charge → <math>-1/3</math></p> <p>spin → <math>1/2</math></p> <p><b>b</b></p> <p>bottom</p>	<p>mass → <math>0</math></p> <p>charge → <math>0</math></p> <p>spin → <math>1</math></p> <p><b><math>\gamma</math></b></p> <p>photon</p>	
	<p>mass → <math>0.511 \text{ MeV}/c^2</math></p> <p>charge → <math>-1</math></p> <p>spin → <math>1/2</math></p> <p><b>e</b></p> <p>electron</p>	<p>mass → <math>105.7 \text{ MeV}/c^2</math></p> <p>charge → <math>-1</math></p> <p>spin → <math>1/2</math></p> <p><b><math>\mu</math></b></p> <p>muon</p>	<p>mass → <math>1.777 \text{ GeV}/c^2</math></p> <p>charge → <math>-1</math></p> <p>spin → <math>1/2</math></p> <p><b><math>\tau</math></b></p> <p>tau</p>	<p>mass → <math>91.2 \text{ GeV}/c^2</math></p> <p>charge → <math>0</math></p> <p>spin → <math>1</math></p> <p><b>Z</b></p> <p>Z boson</p>	GAUGE BOSONS
	<p>mass → <math>&lt; 2.2 \text{ eV}/c^2</math></p> <p>charge → <math>0</math></p> <p>spin → <math>1/2</math></p> <p><b><math>\nu_e</math></b></p> <p>electron neutrino</p>	<p>mass → <math>&lt; 0.17 \text{ MeV}/c^2</math></p> <p>charge → <math>0</math></p> <p>spin → <math>1/2</math></p> <p><b><math>\nu_\mu</math></b></p> <p>muon neutrino</p>	<p>mass → <math>&lt; 15.5 \text{ MeV}/c^2</math></p> <p>charge → <math>0</math></p> <p>spin → <math>1/2</math></p> <p><b><math>\nu_\tau</math></b></p> <p>tau neutrino</p>	<p>mass → <math>80.4 \text{ GeV}/c^2</math></p> <p>charge → <math>\pm 1</math></p> <p>spin → <math>1</math></p> <p><b>W</b></p> <p>W boson</p>	

# Elementary Particle Physics

**Paul Urban**



## Elementary Particle Physics:

**Facts And Mysteries In Elementary Particle Physics (Revised Edition)** Martinus J G Veltman, 2018-03-21 This book provides a comprehensive overview of modern particle physics accessible to anyone with a true passion for wanting to know how the universe works We are introduced to the known particles of the world we live in An elegant explanation of quantum mechanics and relativity paves the way for an understanding of the laws that govern particle physics These laws are put into action in the world of accelerators colliders and detectors found at institutions such as CERN and Fermilab that are in the forefront of technical innovation Real world and theory meet using Feynman diagrams to solve the problems of infinities and deduce the need for the Higgs boson Facts and Mysteries in Elementary Particle Physics offers an incredible insight from an eyewitness and participant in some of the greatest discoveries in 20th century science From Einstein's theory of relativity to the spectacular discovery of the Higgs particle this book will fascinate and educate anyone interested in the world of quarks leptons and gauge theories This book also contains many thumbnail sketches of particle physics personalities including contemporaries as seen through the eyes of the author Illustrated with pictures these candid sketches present rare perceptive views of the characters that populate the field The Chapter on Particle Theory in a pre publication was termed superbly lucid by David Miller in Nature Vol 396 17 Dec 1998 p 642 *Elementary Particles* Ian Simpson

Hughes, 1991-11-28 This is the third edition of a text that is already well established as one of the standard undergraduate books on the subject of elementary particle physics Professor Hughes has updated the whole text in line with current particle nomenclature and has added material to cover important new developments There is also a completely new major chapter on particle physics and cosmology an exciting subject that has become an area of increasing importance in recent years In this field much can be learned from the way the subject has developed and so where this helps its understanding a historical treatment is used Unlike other texts on this subject at all stages the author closely links theoretical developments to the relevant experimental measurements providing a sound foundation to what might otherwise be a rather abstract subject He also provides historical background where it will aid comprehension of the material *Elementary Particle Physics* I.R.

Kenyon, 1987-10-31 The last few years have seen particular excitement in particle physics culminating in the experimental confirmation of the W and Z particles Ian Kenyon who was involved in the UA1 experiment at CERN that searched for the particles provides an introduction to particle physics and takes a refreshingly non historical approach The aim of the book has been to concentrate on the standard model and the gauge symmetries because these form the core of the subject Leptons quarks and forces are introduced at the beginning After this introduction the gauge theories are dealt with in order of increasing complexity Attention is then focussed on the hadrons deep inelastic scattering of hadrons then hadron spectroscopy and finally hadron interactions Current developments beyond the standard model appear in the last chapter

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*Modern Elementary Particle Physics* Gordon Kane, 2017-02-09 An updated edition on the now completed Structural Model providing an invaluable synthesis of cutting edge research for students and scientists

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Model which has profoundly changed our understanding of nature's fundamental forces Rooted in the experimental tradition this new vision is based on geometry and sees the composition of matter in terms of its accordance with certain geometrical principles This textbook presents and explains this modern viewpoint to a readership of well motivated undergraduate students by guiding the reader from the basics to the more advanced concepts of Gauge Symmetry Quantum Field Theory and the phenomenon of spontaneous symmetry breaking through concrete physical examples This engaging introduction to the theoretical advances and experimental discoveries of the last decades makes this fascinating subject accessible to undergraduate students and aims at motivating them to study it further

**Elementary-Particle Physics** Committee on Elementary-Particle Physics, Board on Physics and Astronomy, Division on Engineering and Physical Sciences, National Research Council, 1998-04-15 Part of the Physics in a New Era series of assessments of the various branches of the field Elementary Particle Physics reviews progress in the field over the past 10 years and recommends actions needed to address the key questions that remain unanswered It explains in simple terms the present picture of how matter is constructed As physicists have probed ever deeper into the structure of matter they have begun to explore one of the most fundamental questions that one can ask about the universe What gives matter its mass A new international accelerator to be built at the European laboratory CERN will begin to explore some of the mechanisms proposed to give matter its heft The committee recommends full U S participation in this project as well as various other experiments and studies to be carried out now and in the longer term

*Gauge Theory of Elementary Particle Physics* Ta-Pei Cheng, Ling-Fong Li, 1994-08-02 This is a practical introduction to the principal ideas in gauge theory and their applications to elementary particle physics It explains technique and methodology with simple exposition backed up by many illustrative examples Derivations of some of well known results are presented in sufficient detail to make the text accessible to readers entering the field for the first time The book focuses on the strong interaction theory of quantum chromodynamics and the electroweak interaction theory of Glashow Weinberg and Salam as well as the grand unification theory exemplified by the simplest SU 5 model Not intended as an exhaustive survey the book nevertheless provides the general background necessary for a serious student who wishes to specialize in the field of elementary particle theory Physicists with an interest in general aspects of gauge theory will also find the book highly useful

Introduction to Elementary Particles David Griffiths, 2008-09-26 This is the first quantitative treatment of elementary particle theory that is accessible to undergraduates Using a lively informal writing style the author strikes a balance between quantitative rigor and intuitive understanding The first chapter provides a detailed historical introduction to the subject Subsequent chapters offer a consistent and modern presentation covering the quark model Feynman diagrams quantum electrodynamics and gauge theories A clear introduction to the Feynman rules using a simple model helps readers learn the calculational techniques without the complications of spin And an accessible treatment of QED shows how to evaluate tree level diagrams Contains an abundance of worked examples and many end of chapter problems

Elementary

Particle Physics in a Nutshell Christopher G. Tully, 2011-10-30 The new experiments underway at the Large Hadron Collider at CERN in Switzerland may significantly change our understanding of elementary particle physics and indeed the universe Suitable for first year graduate students and advanced undergraduates this textbook provides an introduction to the field

Concepts of Elementary Particle Physics Michael Edward Peskin, 2019 This particle physics textbook for senior undergraduates and early graduates explains the Standard Model of particle physics both the theory and its experimental basis The point of view is thoroughly modern Theory relevant to the experiments is developed in detail but in a simplified way without needing full knowledge of quantum field theory Elementary Particle Physics Otto Nachtmann, 2012-12-06 This book grew how could it be otherwise out of a series of lectures which the author held at the University of Heidelberg The purpose of these lectures was to give an introduction to the phenomenology of elementary particles for students both of theoretical and experimental orientation With the present book the author has set himself the same aim The reader is assumed to be familiar with ordinary nonrelativistic quantum mechanics as presented e.g. in the following books Quantum Mechanics by L. I. Schiff McGraw Hill New York 1955 Quantum Mechanics Vol I by K. Gottfried W. A. Benjamin Reading Ma 1966 The setup of the present book is as follows In the first part we present some basic general principles and concepts which are used in elementary particle physics The reader is supposed to learn here the language of particle physics An introductory chapter deals with special relativity of such fundamental importance for particle physics which most of the time is high energy i.e. highly relativistic physics Further chapters of this first part deal with the Dirac equation with the theory of quantized fields and with the general definitions of the scattering and transition matrices and the cross sections Quarks Y. Nambu, 1985 The book explains in a precise and complete manner how elementary particle physics has evolved over the past 50 years The historical development of the ideas that have shaped our thinking about the ultimate constituents of matter is traced out The author has been associated with some of the originators of elementary particle theory and has made significant contributions to the field Here he gives a first person description of some of the main developments leading to our present view of the universe Elementary Particle Physics Paul Urban, 2013-06-29 The observation of the scaling properties of the structure functions  $w$  and  $v_w$  of deep inelastic electron-nucleon scattering has been taken by many people as an indication for an approximate scale invariance of the world It was pointed out by Wilson that in many field theories it is possible to assign a dimension  $d$  to every fundamental field which proves to be a conserved quantum number as far as the most singular term of an operator product expansion at small distances  $x \rightarrow y$  is concerned Later it was shown at the canonical level that in many field theories the dimension of a field seems to be a conserved quantum number even in the terms less singular at small  $x \rightarrow y$  as long as they all belong to the strongest light cone singularity i.e.  $x \rightarrow y^2$  The assumption that this type of scale invariance on the light cone be present in the operator product expansion of two electromagnetic currents has provided us with a rather natural explanation of the observed scaling phenomena We should like to mention however that

this explanation cannot account for the precocity with which scaling is being observed experimentally in energy regions in which resonances still provide prominent contributions to the final states 4

*In Quest of the Quark* Dr. Linda Bartrom-Olsen, 2013-12-26 *In Quest of the Quark* reinforces atomic theory for high school students and links it with Elementary Particle Physics in a structured way that encourages literacy without heavy mathematics by interrelating the particles which make up sub atomic particles At the beginning of the universe matter energy were one and then in the first few micro seconds of time they split apart or separated a process called symmetry splitting in Particle Physics or more commonly The Big Bang The particles of matter called fermions are the bricks of the universe and the bosons which transmit the forces of energy the mortar which binds them together This fundamental view of our time continuum is quite elegant in its organization and startling in its beauty as the worlds within worlds of fundamental particles are explored **Symmetry Principles Particle Physics** W. M. Gibson, B. R. Pollard, 1976-03-11 An understanding of the properties and interactions of the elementary particles is an essential prerequisite of research work in high energy physics Much progress in the subject has been achieved with the aid of symmetry principles In this 1980 book the concept of symmetry or invariance is employed as a unifying theme Using a careful explanation of the mathematical formalism and with many applications to particular cases the authors introduce the reader to the symmetry schemes which dominate the world of the particle physicist The presentation will also appeal to mathematicians and physicists in other fields who are interested in the applications of the general principles of symmetry After a brief survey of the particles and a review of the relevant quantum mechanics the principal symmetries are studied in turn Some technical points are relegated to appendices and the book contains extensive references 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 **Elementary-Particle Physics** National Research Council, Division on Engineering and Physical Sciences, Board on Physics and Astronomy, Committee on Elementary-Particle Physics, 1998-05-01 Part of the Physics in a New Era series of assessments of the various branches of the field Elementary Particle Physics reviews progress in the field over the past 10 years and recommends actions needed to address the key questions that remain unanswered It explains in simple terms the present picture of how matter is constructed As physicists have probed ever deeper into the structure of matter they have begun to explore one of the most fundamental questions that one can ask about the universe What gives matter its mass A new international accelerator to be built at the European laboratory CERN will begin to explore some of the mechanisms proposed to give matter its heft The committee recommends full U S participation in this project as well as various other experiments and studies to be carried out now and in the longer term

## **Elementary Particle Physics** Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Elementary Particle Physics**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we will delve to the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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