

Preface

This is an introductory textbook of nuclear physics for upper undergraduate students. The book is based on lectures given at British, American and Indian Universities over several years.

The idea of writing a text book on this subject was born some forty years ago. It is attempted to survey the major developments in nuclear physics during the past 100 years. In Rutherford's time and early 1950's, only a few Elementary particles were known and the existence of the neutrino was taken for granted. The development of the subject is so fascinating that we were inclined to present the historical facts in chronological order.

The prerequisites for the use of this book are the elements of quantum mechanics comprising Schrodinger's equation and applications, Born's approximation, the golden rule, differential equations and Vector Calculus. Basic concepts are explained with line diagrams wherever required. An attempt is made to strike a balance between theory and experiment. Theoretical predictions are compared with latest observations to show agreement or discrepancies with the theory.

The subject matter is developed in each chapter with the necessary mathematical details. Feynman diagrams are used extensively to explain the fundamental interactions. The subjects of various chapters are so much intimately connected that the logical sequential presentation of various topics became a vexing problem. For example, from the point of view of introducing quarks, the logical sequence would be strong, electromagnetic, weak and electroweak interactions, but from the point of view of introducing Feynman's diagrams, the desirable sequence would be electromagnetic, weak, electroweak and strong interactions, which is why one finds some variance in sequences for particle physics in various textbooks. The only remedy is to make cross references to the chapters which were previously studied and to those in which the relevant material is anticipated.

The size of the book did not allow to also include applied nuclear physics and cosmic rays. At the end of each chapter, a set of questions is given. A large number of worked examples is additionally presented. A comparable number of unworked

problems with answers helps the student to test the understanding. The examples and problems are not necessarily of plug-in type but are given to explain the underlying physics. Useful appendices are provided at the end of the book.

Murphy, TX, USA

Anwar Kamal

Note: These two volumes are the last books by my father Dr. Ahmad Kamal, the work he had conceived as his dream project and indeed his scientific masterpiece. Unfortunately, he passed away before he could see his manuscript in print. While we have tried our best to bring the publishing process to as satisfactory conclusion as possible, we regret any errors you may discover, in particular, that some of the references could not be as completely specifically cited as would otherwise be the case. We trust that these errors however do not compromise the quality or standard of the content of the text.

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Nuclear Physics

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2014, XIX, 612 p. 269 illus., Hardcover

ISBN: 978-3-642-38654-1