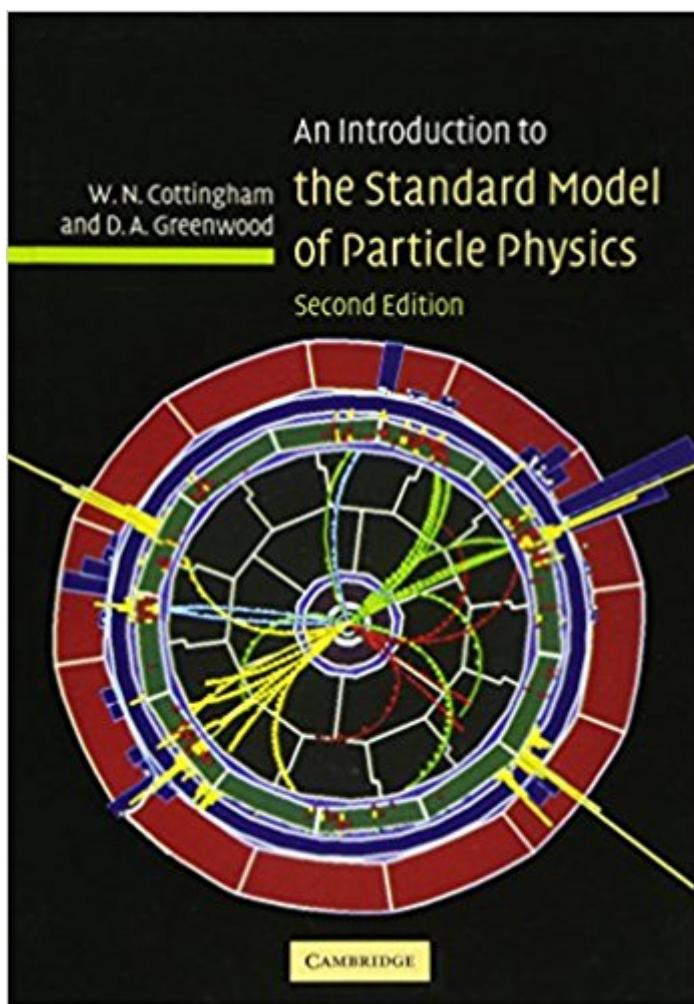


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# An Introduction To The Standard Model Of Particle Physics



## Synopsis

The second edition of this introductory graduate textbook provides a concise but accessible introduction to the Standard Model. It has been updated to account for the successes of the theory of strong interactions, and the observations on matter-antimatter asymmetry. It has become clear that neutrinos are not mass-less, and this book gives a coherent presentation of the phenomena and the theory that describes them. It includes an account of progress in the theory of strong interactions and of advances in neutrino physics. The book clearly develops the theoretical concepts from the electromagnetic and weak interactions of leptons and quarks to the strong interactions of quarks. Each chapter ends with problems, and hints to selected problems are provided at the end of the book. The mathematical treatments are suitable for graduates in physics, and more sophisticated mathematical ideas are developed in the text and appendices.

## Book Information

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## Customer Reviews

Review from the first edition 'I am very impressed with this book. It is a beautifully clear and concise introductory text ... for a first course in the basic physics of the standard model this book would be an excellent choice. Both experimental and theoretical students would benefit from it.' Neil Turok, The Observatory'It is fun to read this book!' Evelyn Weimar-Woods, Zentralblatt fÃ¼r Mathematik'... a very clearly written and recommendable introduction to the Standard Model of particle physics.'

The Observatory

The second edition of this introductory graduate textbook provides a concise, accessible

introduction to the Standard Model. It has been updated to account for the theory of strong interactions, and observations on matter-antimatter asymmetry. Each chapter ends with problems, with hints to selected problems at the end of the book.

This book is about the experimental facts and the theoretical principles that lead to the construction of the Standard Model lagrangian. It is NOT about calculating scattering cross-sections. Some of the problems ask you to calculate decay rates but only at tree level and the fields are treated like classical fields not operators, with the exception that the fermionic fields anticommute. There is a 12-page chapter on quantizing the fields and renormalization but I find it rather sketchy so don't expect to understand a lot from it if you don't already know it. You should have some background in varying lagrangians otherwise the book will frequently seem difficult to you. The authors obtain symmetry currents corresponding to a symmetry of the lagrangian not in the standard way of Noether's theorem. Their method is entirely correct but it took me long time to understand because they didn't explain it with enough details the first time they used it (section 7.1, page 65). I think that will throw off the horse many readers. The style is wonderfully concise which makes the logical structure easier to follow and there isn't the usual fluff 'to motivate' things that are simply put guesses like the principle of local gauge invariance. On the other hand, some places definitely need more detailed explanations like signs of certain quantities or the symmetry currents I mentioned above. The treatment of the Dirac equation and spinors is the least messy I've seen. The way they obtain the nonrelativistic limit of the Dirac equation with EM field is again the best and least messy I've seen. The book has nice appendix on the groups of the Standard Model which covers what you need to know about  $SO(3)$ ,  $SU(2)$  and  $SU(3)$  in a very efficient way. There are about 5 problems after each chapter most of which have a solution outline at the end of the book. Things I understood from this book:-- why time reversal, space inversion and charge conjugation of fields are defined in a way that previously seemed to me quite arbitrary-- how demanding local gauge invariance necessitates introduction of gauge fields which leads to interaction terms-- how local gauge invariance can't be proven, it's just a guess that has worked so far hence it's called 'principle' (my own interpretation)-- global and local symmetry breaking, Goldstone bosons and Higgs boson-- how the Lagrangian densities of the electroweak and strong interactions were constructed from the experimental input by demanding local gauge invariance and guessing the symmetry group to be  $SU(2)$  and  $SU(3)$  correspondingly-- what's Kobayashi-Maskawa matrix that mixes the quark fields and how it arises-- how symmetries of the lagrangian density lead to conservation numbers-- how neglecting some terms in the lagrangian leads to effective lagrangian and effective theory-- how to

work with the terms in the QCD lagrangian where different matrices multiply different indices

This book is good, but I must complain about the typos that are in many formulas in the Kindle edition. I'm assuming that the real book doesn't have this issue. Many places the del operator is not there. Particularly, chapter 4 has all del operators missing. This chapter is on electromagnetic field theory which I understand well, and so can recognize the mistakes. The problem is that the other chapters I'm trying to learn and I can't be sure where the formulas are wrong yet. There are clear places where there are white spaces indicating a missing symbol, which I assume should be the del operator again, but I can't be sure. I've reached a point where I'm fed up with paying almost full price for digital edition of books and getting an unacceptable number of typos in formulas, or poorly formated formulas that are difficult to interpret. Since I get these books to learn, I can't tolerate being misinformed by the book I'm trying to learn from.

This book is an excellent introduction to particle physics. The chapters are short, clear and very readable. As the previous reviewer mentioned, there are a series of reasonable exercises at the end of each chapter with answers provided in the back of the book. Many concepts that field theory or particle physics books leave mysterious or have a difficult time explaining are clearly laid out in this book. I would judge it superior to Griffiths particle physics book, and if you are looking for a nice supplement to serious study of quantum field theory, this is it.

In this second edition the authors have upgraded their book to incorporate recent discoveries in several areas including:  
o the successes of the theory of strong interactions  
o the observations on matter-antimatter asymmetry  
o advances in neutrino physics, especially as it has become clear that neutrinos are not mass-less  
o the theoretical concepts from the electromagnetic and weak interactions of leptons and quarks to the strong interactions of quarks.  
The book is aimed at the graduate student in particle physics. It has a rigorous mathematical structure. After all, the Standard Model is basically a mathematical theory that describes the interactions between leptons and quarks. Throughout the book there are many references to open questions that likewise reflect the state of the Standard Model.

This is a very short resume of Standard Model, but well written, the misguidance here, is the title "introduction" ... this text is not for beginners.

I would expect to see fairness in pricing of Kindle Books as opposed to hard or paper bound copies of the same book. But on 12 Jul 2010, here was the price structure for each edition of the book: Hardcover ..... \$44.30 Kindle Edition .. \$57.60 Paperback ..... \$111.25 URL: [http://www..com/gp/product/B000URVA0M/ref=cm\\_cr\\_rev\\_prod\\_title](http://www..com/gp/product/B000URVA0M/ref=cm_cr_rev_prod_title) Who is kidding who?

Nice book. But the quality of hardcover is very bad (on my book it is badly glued).

The Kindle edition has numerous problems with the mathematics in this book. Equations are small and fuzzy when expanded, almost to the point of unreadability. In many cases, e.g. Maxwell's Equations the nabla symbol is missing, this is also the case in the text, making the whole exercise deeply frustrating to read. This is a good text for the mathematical nuts and bolts of the Standard Model, but is pretty much a waste of money in Kindle format.

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