

Discovering the Secrets of the Universe: Particle Physics in the LHC Era - Oxford Master in Physics 24

Particle physics is a fascinating field that seeks to understand the fundamental building blocks of the universe and the forces that govern them. In recent years, the Large Hadron Collider (LHC) at CERN has revolutionized our understanding of the subatomic world, and the Oxford Master in Physics program ensures students are at the forefront of this exciting era.

What is Particle Physics?

Particle physics, also known as high-energy physics, is a branch of physics that explores the fundamental particles and interactions that make up the universe. It aims to answer questions about the nature of matter, antimatter, dark matter, and the fundamental forces of nature.

The Large Hadron Collider (LHC)

The LHC is the world's most powerful particle accelerator and is located at CERN, near Geneva, Switzerland. It consists of a 17-mile underground ring where protons are accelerated to nearly the speed of light before colliding with each other. These collisions create conditions similar to those immediately after the Big Bang, allowing scientists to study particles and phenomena that existed only microseconds after the birth of the universe.

Particle Physics in the LHC Era (Oxford Master Series in Physics Book 24)

by Samuel Hack (1st Edition, Kindle Edition)

★★★★☆ 4.6 out of 5

OXFORD MASTER SERIES IN PARTICLE PHYSICS,
ASTROPHYSICS, AND COSMOLOGY

Particle Physics in the LHC Era

G. Barr
K. Devenish
K. Walczak
S. Weidberg

Language : English
File size : 19792 KB
Screen Reader : Supported
Print length : 432 pages
Lending : Enabled



Oxford Master in Physics Program

The Oxford Master in Physics program is renowned for its excellence in providing students with a comprehensive understanding of particle physics and its various subfields. Students gain a solid foundation in theoretical concepts, experimental techniques, and data analysis methods required to conduct research in this cutting-edge discipline.

Research Opportunities

The Oxford Master in Physics program offers students numerous research opportunities in collaboration with world-leading scientists. Participants have access to state-of-the-art labs and facilities, including the ATLAS experiment at the LHC, where they can directly contribute to groundbreaking discoveries.

Particle Physics in the LHC Era

The LHC has allowed physicists to make significant advancements in understanding the universe. It has led to the discovery of the Higgs boson, a particle that gives mass to other particles, confirming a fundamental piece of the Standard Model of particle physics. Scientists are also actively searching for

evidence of new particles, such as dark matter particles or additional forces beyond the known ones.

Career Prospects

Graduates of the Oxford Master in Physics program with a specialization in particle physics have excellent career prospects. They can pursue research positions at universities, national laboratories, or industry, contributing to groundbreaking scientific discoveries or working on developing new technologies. Additionally, they can explore opportunities in science communication, consulting, or policy-making related to particle physics.

Particle physics in the LHC era opens up a world of exciting possibilities for students pursuing the Oxford Master in Physics program. With cutting-edge research opportunities and a comprehensive curriculum, students are prepared to contribute to the advancement of our understanding of the universe and shape the future of science.

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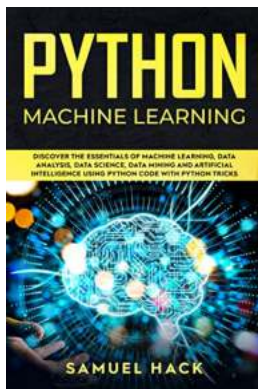
This text gives an to particle physics at a level accessible to advanced undergraduate students. It is based on lectures given to 4th year physics students over a number of years, and reflects the feedback from the students. The aim is to explain the theoretical and experimental basis of the Standard Model (SM) of Particle Physics with the simplest mathematical treatment possible. All the experimental discoveries that led to the understanding of the SM relied on particle detectors and most of them required advanced particle accelerators. A unique feature of this book is that it gives a serious to the fundamental accelerator and detector physics, which is currently only available in advanced graduate textbooks. The mathematical tools that are required such as group theory are covered in one chapter. A modern treatment of the Dirac equation is given in which the free particle Dirac equation is seen as being equivalent to the Lorentz transformation. The idea of generating the SM interactions from fundamental gauge symmetries is explained.

The core of the book covers the SM. The tools developed are used to explain its theoretical basis and a clear discussion is given of the critical experimental evidence which underpins it. A thorough account is given of quark flavour and neutrino oscillations based on published experimental results, including some from running experiments. A simple to the Higgs sector of the SM is given. This explains the key idea of how spontaneous symmetry breaking can generate particle masses without violating the underlying gauge symmetry. A key feature of this book is that it gives an accessible explanation of the discovery of the Higgs boson, including the advanced statistical techniques required. The final chapter gives an to LHC physics beyond the standard model and the

techniques used in searches for new physics. There is an outline of the shortcomings of the SM and a discussion of possible solutions and future experiments to resolve these outstanding questions.

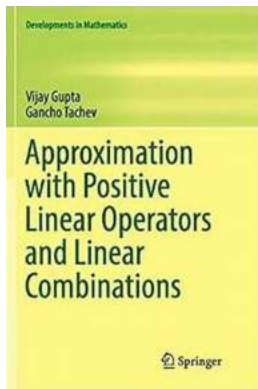
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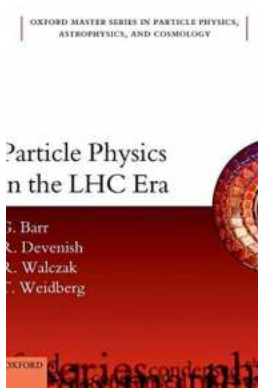
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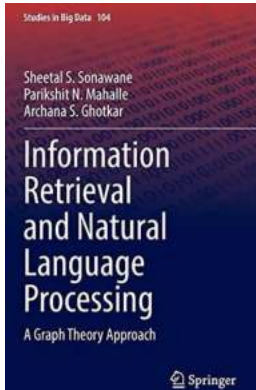
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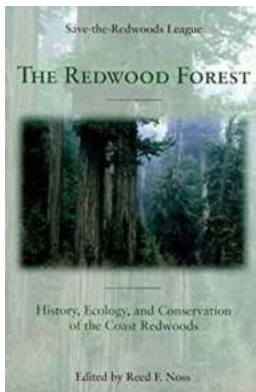
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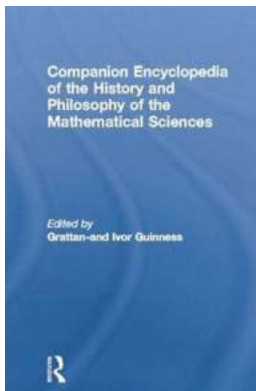
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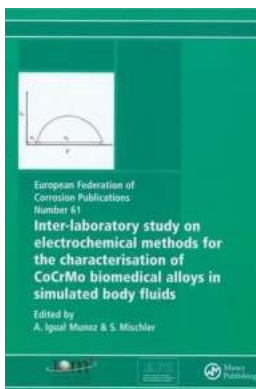
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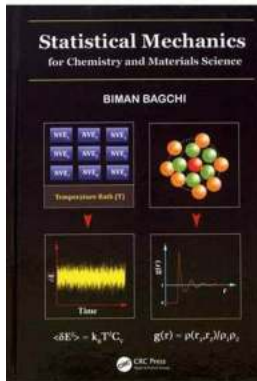
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