

Foundations And Abelian And Non Abelian Gauge Theories Graduate Texts In Physics

Are you a physics enthusiast looking to dive deep into the world of gauge theories? Look no further! In this article, we will explore the foundations of gauge theories and delve into the fascinating realms of Abelian and non-Abelian gauge theories. Whether you are a graduate student or simply someone with a passion for physics, this in-depth exploration will surely captivate your imagination and broaden your understanding of this fundamental aspect of modern theoretical physics.

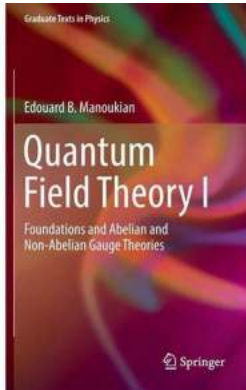
to Gauge Theories

Gauge theories form an essential framework in understanding the fundamental forces of nature. They provide a mathematical language to describe interactions between elementary particles, culminating in the unification of the electromagnetic, weak, and strong forces in the Standard Model of particle physics. To comprehend the intricacies of gauge theories, a solid foundation is crucial.

Foundations of Gauge Theories

Before we embark on the journey of Abelian and non-Abelian gauge theories, it is essential to establish a solid groundwork in the foundations of gauge theories. Key concepts such as symmetry, gauge invariance, and local gauge symmetry will be thoroughly explored, laying the necessary groundwork for our subsequent explorations.

Quantum Field Theory I: Foundations and Abelian and Non-Abelian Gauge Theories (Graduate Texts



in Physics) by Bart De Bruyn (1st ed. 2016 Edition, Kindle Edition)

★★★★☆ 4.8 out of 5

Language : English
File size : 28137 KB
Text-to-Speech : Enabled
Enhanced typesetting : Enabled
Print length : 1016 pages
Screen Reader : Supported
Paperback : 239 pages
Item Weight : 1.08 pounds
Dimensions : 6.69 x 0.57 x 9.45 inches



Abelian Gauge Theories

Abelian gauge theories stand as the gateway to understanding the intricacies of gauge theories. These theories are characterized by commutative Lie algebras and are based on the principles of symmetry and gauge invariance. We will dive into the details of Abelian gauge theories, exploring Maxwell's theory of electromagnetism as a prime example. Through detailed mathematical formulations, we will unravel the beauty and elegance of Abelian gauge theories and understand their essential role in our understanding of electromagnetic interactions.

Non-Abelian Gauge Theories

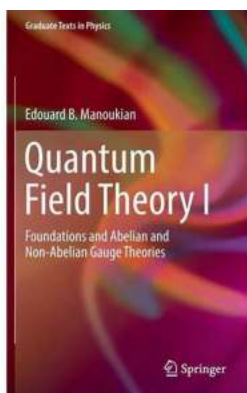
Building upon the foundation laid by Abelian gauge theories, we will now venture into the captivating world of non-Abelian gauge theories. Unlike their Abelian counterparts, non-Abelian gauge theories involve non-commutative Lie algebras and pose unique challenges in their understanding. However, these theories provide a powerful framework for describing fundamental forces such as the strong force, which binds quarks together to form protons and neutrons. We will

explore the intricacies of non-Abelian gauge theories, including the groundbreaking Yang-Mills theory, and understand their profound implications in our comprehension of the fundamental interactions in the universe.

Applications and Implications

Understanding gauge theories goes beyond mere theoretical fascination. These concepts have far-reaching applications and implications in various branches of physics. From particle physics to condensed matter physics and beyond, the principles of gauge theories permeate our understanding of the universe at both the microscopic and macroscopic scales. We will delve into these applications, appreciating the practical significance of our theoretical explorations.

The world of gauge theories holds a mesmerizing allure for physics enthusiasts. As we conclude our journey through the foundations, Abelian and non-Abelian gauge theories, and their applications, we hope to have sparked your curiosity and deepened your understanding of this captivating field in theoretical physics. Whether you are a graduate student or someone simply intrigued by the wonders of the universe, exploring gauge theories will reward you with insights into the fundamental forces that shape our world.



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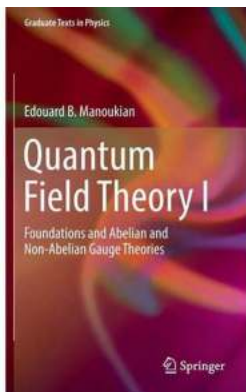


This textbook covers a broad spectrum of developments in QFT, emphasizing those aspects that are now well consolidated and for which satisfactory theoretical descriptions have been provided. The book is unique in that it offers a new approach to the subject and explores many topics merely touched upon, if covered at all, in standard reference works.

A detailed and largely non-technical introductory chapter traces the development of QFT from its inception in 1926. The elegant functional differential approach put forward by Schwinger, referred to as the quantum dynamical (action) principle, and its underlying theory are used systematically in order to generate the so-called vacuum-to-vacuum transition amplitude of both abelian and non-abelian gauge theories, in addition to Feynman's well-known functional integral approach, referred to as the path-integral approach. Given the wealth of information also to be found in the abelian case, equal importance is put on both abelian and non-abelian gauge theories.

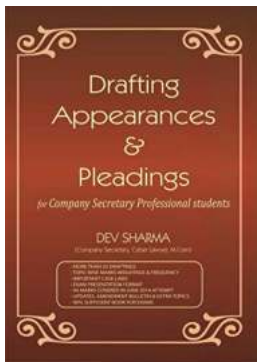
Particular emphasis is placed on the concept of a quantum field and its particle content to provide an appropriate description of physical processes at high energies, where relativity becomes indispensable. Moreover, quantum mechanics implies that a wave function renormalization arises in the QFT field independent of any perturbation theory - a point not sufficiently emphasized in the literature. The book provides an overview of all the fields encountered in present high-energy physics, together with the details of the underlying derivations. Further, it presents "deep inelastic" experiments as a fundamental application of quantum chromodynamics.

Though the author makes a point of deriving points in detail, the book still requires good background knowledge of quantum mechanics, including the Dirac Theory, as well as elements of the Klein-Gordon equation. The present volume sets the language, the notation and provides additional background for reading Quantum Field Theory II - to Quantum Gravity, Supersymmetry and String Theory, by the same author. Students in this field might benefit from first reading the book Quantum Theory: A Wide Spectrum (Springer, 2006), by the same author.



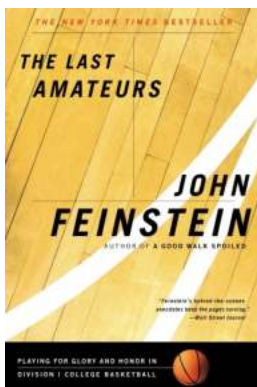
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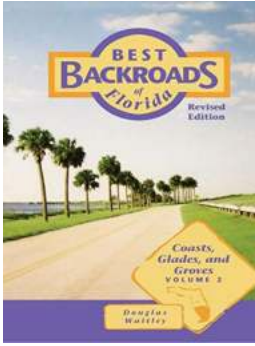
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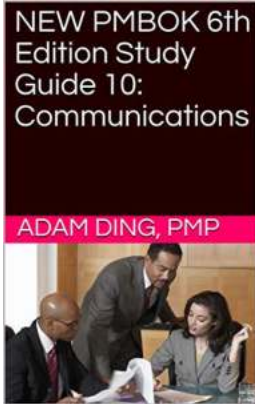
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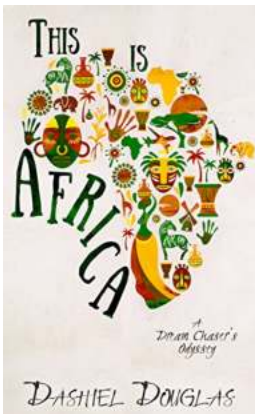
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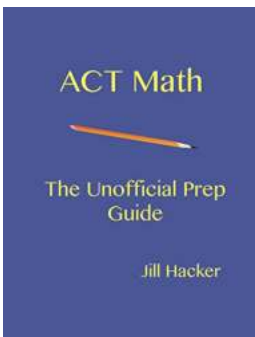
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