
The authors start with a series of interesting provoking questions such as “What happens when nuclear matter is heated to such great temperatures that the nucleons and pions melt into quarks and gluons…”. The answers to these questions are approached by first reviewing quantum statistical mechanics in the first chapter, and then developing in the second chapter a finite-temperature field theory using a Functional Integral representation of the Partition Function. I commend the authors, for a remarkable clear and concise exposition of the foundation from which the rest of the book flows.

The chapters in this book cover subjects that in themselves are subjects of vast volumes. In roughly twenty chapters, the authors amazingly manage to introduce the basic ideas of each area, deriving some of the key results in finite field extensions, and point out frontiers of the subject at hand. The derivations are detailed just enough so that material flows without strain but not so detailed as to create a monster text. Chapter topics that cover entire fields include Quantum electrodynamics, Linear response theory, Quantum chromodynamics, and Nucleation theory. The book also has a number of chapters devoted to particular mathematical approaches, such as Interactions and diagrammatical techniques, Renormalization, Lattice gauge theory, Resummation and hard thermal loops. Special topic chapters such as Spontaneous symmetry breaking and restoration, Dense nuclear matter, Heavy Ion collisions, Weak interactions, Hot hadronic matter and Astrophysics and cosmology give impressive coverage to the entire subject area of finite-temperature field theory.

Each chapter ends with a few exercises, references, and bibliography. In a subject where the difficulty of the manipulations are legendary, the problems seem to have found a nice balance between being doable and engaging. The bibliography and reference entries range from classic texts to specialized articles in journals and appear to have been chosen with care.

This book would make a strong graduate textbook on the subject for those with necessary background courses in statistical mechanics and field theory. At several places in the text, I had kind of an epiphany where facets of the subject that had eluded me suddenly became clear. This book would also be of interest to specialists in QCD, etc. that would like to broaden their understanding to related fields. While reading the book I experienced the feeling that the book was on a quest to bring one to a place where calculable results that can be compared to experiment and observed phenomena, a rare touch in a mathematical physics text.

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