

Preface

The study of high-energy heavy-ion collisions is an emerging field of research. Being at the interface between particle physics and nuclear physics, it carries the burden that many topics which are familiar to workers in one branch may not be familiar to workers in the other branch. Furthermore, students and researchers entering into this field need to learn a vast set of material which are scattered in many different areas and textbooks. The task is made all the more difficult because many of the contemporary problems in this field fall within the realm of nonperturbative quantum chromodynamics. The lack of nonperturbative solutions of quantum chromodynamics for these problems makes it inherently hard to discuss many topics with theoretical lucidity. The absence of definitive solutions also brings with it a proliferation of models. The same physical phenomenon is often described in many different ways with different concepts and modes of operation.

This book is written for students and new-comers who are entering the fascinating field of high-energy heavy-ion collisions. The objective is to present an elementary introduction to the major topics which one encounters in the literature. The emphasis is on the acquisition of basic tools and concepts. Accordingly, the pace of description is deliberate and unhurried, and the mathematical derivations are given as fully as possible, to show the origins of how the different concepts and models arise.

For the purpose of further assisting the readers, "supplements" and "exercises" have been included throughout the book, to give detailed descriptions of new concepts and detailed derivations of mathematical results. They are described as fully and as simply as possible so that the readers can follow the logical and mathematical steps without much difficulty. The supplements and exercises may appear too detailed to the experts and may be by-passed by those who are familiar with their contents. They are nevertheless included here in the hope that a thorough knowledge of the origin of the concepts presented in this book will assist the readers for further explorations on their own, using for example the excellent and extensive literature in the series of Quark Matter meetings through the years:

1. *Quark Matter '80*, Proceedings of the Workshop on Future Relativistic Heavy Ion Experiments, GSI, Darmstadt, Germany, 1980.
2. *Quark Matter '82, Quark Matter Formation and Heavy Ion Collisions*, Proceedings of the Bielefeld Workshop at Bielefeld, Germany, edited by M. Jacob and H. Satz, World Scientific Publishing Company, (1982).
3. *Quark Matter '83*, Proceedings of the Third International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Brookhaven, New York, U. S. A.,

- edited by T. W. Ludlam, and H. E. Wegener, published in Nucl. Phys. A418, (1984).
4. *Quark Matter '84*, Proceedings of the Fourth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Helsinki, Finland, edited by K. Kajantie, published by Springer-Verlag, Berlin, (1984).
 5. *Quark Matter '86*, Proceedings of the Fifth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Asilomar, California, U. S. A., edited by L. S. Schroeder, and M. Gyulassy, published in Nucl. Phys. A461, (1987).
 6. *Quark Matter '87*, Proceedings of the Sixth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Asilomar, California, U. S. A., edited by H. Satz, H. J. Specht, and R. Stock, published in Zeit. Physik C38, (1988).
 7. *Quark Matter '88*, Proceedings of the Seventh International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Lenox, Massachusetts, U. S. A., edited by G. Baym, P. Braun-Munzinger and S. Nagamiya, published in Nucl. Phys. A498, (1991).
 8. *Quark Matter '90*, Proceedings of the Eighth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Menton, France, edited by J. P. Blaizot, C. Gerschel, B. Pire, and A. Romana, published in Nucl. Phys. A525, (1988).
 9. *Quark Matter '91*, Proceedings of the Ninth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Gatlinburg, Tennessee, U. S. A., edited by T. C. Awes, F. E. Obenshain, F. Plasil, M. R. Strayer, and C. Y. Wong, published in Nucl. Phys. A544 (1992).
 10. *Quark Matter '93*, Proceedings of the Tenth International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions at Borlänge, Sweden, edited by E. Stenlund, H.-Å. Gustafsson, A. Oskarsson, and I. Otterlund, published in Nucl. Phys. A566 (1994).

This book has been written on such a level that the readers are assumed to have some familiarity with quantum mechanics and statistical mechanics. Because of the diverse nature of the subject matter, a few chapters may require some simple knowledge of quantum field theory. For those readers with a more focussed interest, the material can be subdivided so that many chapters can be independently studied. The table of contents in the beginning and the summary chapter at the end provide a guide to the contents of the book.

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While much effort has been made to eliminate misprints and errors, it is unavoidable that they may still be present. The author would appreciate receiving communications concerning corrections and improvements so that should future printing be contemplated, they may be included in later editions. The author's Internet address is wong@orph01.phy.ornl.gov and fax number is (615)-574-4745.

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