

ground state of three-flavor quark matter at asymptotically large baryon densities. As this is a rapidly evolving field, the presentation in the book is not at the most recent level, but the authors are aware of that and certainly cannot be held responsible.

So where do physicists stand? Lattice-QCD calculations employ methods that work well at any temperature and at vanishing baryochemical potential. On the other hand, weak-coupling methods work well at asymptotically high temperatures and baryochemical potentials. The interesting region of zero to intermediate temperatures and nonzero baryochemical potentials is currently beyond the reach of theoretical tools. The reason for such a predicament is that a difficulty called the fermion-sign problem prevents researchers from applying first-principles lattice-QCD methods in that region, and the authors spend the last chapters of their book elaborating the point. They present simple models that could lead to progress in solving the sign problem. The models are either analytically under control even at nonzero baryochemical potential or, in principle, amenable to the lattice approach. Kogut and Stephanov also discuss several recent, promising attempts to perform lattice-QCD calculations at small, nonzero baryochemical potentials.

*The Phases of Quantum Chromodynamics* gives a well-structured overview of the phases of QCD under extreme conditions. Of course, not everything in this rapidly evolving science can or should be presented in a textbook, but the selection by the authors is informative and represents the activities in the field quite well. My main criticism is that the references are sparse. The reader is often told that more details can be found in the literature, but no reference is provided. Also, the discussion is not really on an elementary level. Although the authors do a good job keeping the discussion as simple and pedagogical as possible, students without some knowledge of statistical field theory may have a hard time understanding some of the material. Nevertheless, for scientists working in the field, the book is a must. And for those who want to learn more about the fascinating world of QCD under extreme conditions, it is a very good starting point.

**Dirk H. Rischke**

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