Calogero–Sutherland models describing particles that interact via long-range exchange interactions. These models, not as heavily studied as the Heisenberg or Hubbard model, are fascinating in their own right and require significant generalizations of the standard methods. The book provides a welcome introduction presented with verve and clarity.

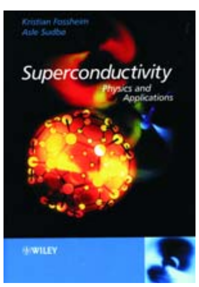
My only regret and criticism is that too much is left out of this slim monograph. But perhaps the omissions reflect the author's intent to make *Beautiful Models* accessible rather than exhaustive.

Natan Andrei
Rutgers University
Piscataway, New Jersey

Superconductivity: Physics and Applications

Kristian Fossheim and Asle Sudbø
Wiley, Hoboken, NJ, 2004. $110.00 (427 pp.). ISBN 0-470-84452-3

Kristian Fossheim and Asle Sudbø's *Superconductivity: Physics and Applications* is a modern review of the subject.



The book covers key aspects of superconductivity, outlined in a clear and logically structured form. It also provides much up-to-date information and covers advanced topics. This work is one of the first general monographs about superconductivity written after the discovery of high-temperature superconductors (HTSs), an event that has led to considerable new kinds of investigations.

The book discusses many novel classes of superconductors: oxide, organic, heavy-fermion, and magnesium diboride. Except for MgB_2, the classes, for the most part, were found before HTSs but were typically regarded as exotic materials, and their features were not described in other monographs. Maybe the only new, interesting class is magnetic superconductors, which are not mentioned in the book. The coexistence of superconductivity and magnetism currently attracts much interest among researchers. Inclusion of the subject would have been useful in completing the story of a modern view of superconductivity.

The theory of superconductivity, even in its simplest description, still needs to be updated, especially in light of new superconducting materials. The authors discuss superconducting order-parameter symmetry, anisotropy, and the quasi-two-dimensionality of electron and vortex systems as necessary elements of a modern theory of superconductivity. Investigations of HTSs have led to many exciting developments in vortex structures, pinning, and dynamics—and such meaty topics richly deserve their place in the book. The authors have written readable and accurate sections on such new topics as thermally activated creep and collective creep, geometric barriers, and solid–liquid transition in vortex structures. However, they could have expanded discussions on fluctuations in low-dimensional superconductors: Only the Kosterlitz–Thouless transition and vortex–antivortex unbinding and disordering by other topological defects are discussed in detail. On the other hand, a full-length review of the superconducting–normal (SN) transition problem is very useful, even if the discussion is of interest to only a small group of readers.

Fossheim and Sudbø devote insufficient attention to Josephson structures. They only briefly mention novel effects like plasma oscillations in multilayered superconducting systems, and leave out such important subjects as macroscopic quantum phenomena in submicron-scale Josephson structures. A discussion of those new directions in superconductivity could have been placed in sections on "Advanced Topics" or "Topical Contributions."

Fossheim and Sudbø's choice of subjects and contributing authors for the topical contributions is random, and presented papers are fragmentary. For example, Yoshiteru Maeno's paper covers spin-triplet superconductivity but does not mention recent publications by Kostya Efetov and colleagues, which are related to possible spin-triplet superconductivity in multilayered superconductor–ferromagnet structures. Jochen Mannhart's paper describes π-junctions based on d-wave symmetry in HTS systems but fails to mention π-junction realizations in superconductor–ferromagnet–superconductor Josephson junctions and mesoscopic SN structures.

In "Selected Applications," the authors also create a general impression that the book is incomplete. For instance, they do not mention that Josephson-junction applications also include rapid single-flux quantum Josephson logic, microwave flux-flow generators and receivers, amplifiers based on superconducting quantum interference devices, and so forth. In their discussion of high-frequency applications of superconductors, the authors also should have mentioned superconducting bolometers and switches.

Although the second half of *Superconductivity* is somewhat disconnected, the monograph as a whole offers a fresh look at the modern state of superconductivity. Certainly, it is not a book for readers who are new to superconductivity, but for scientists familiar with and interested in superconductivity, the new monograph has many interesting moments.

Valery Ryazanov
Institute of Solid State Physics
Chernogolovka, Russia

The Phases of Quantum Chromodynamics: From Confinement to Extreme Environments

John B. Kogut and
Mikhail A. Stephanov
Cambridge U. Press, New York, 2004. $110.00 (364 pp.). ISBN 0-521-80450-7

In recent years, physicists have realized that there are more phase transitions in quantum chromodynamics (QCD) than just the one that separates the world of hadrons from the quark–gluon plasma, where color charges become deconfined and chiral symmetry is restored. Particularly in the domain of low temperatures and high baryon densities, researchers have found a good number of phases that are strikingly similar to systems from condensed matter physics such as electronic superconductors or superfluid helium-3. Those QCD phases can be studied systematically at low temperatures and asymptotically large baryon densities via weak-coupling methods. At high temperatures and moderate baryon densities, considerable progress has been made by extending lattice gauge theory calculations from zero to low, nonzero baryon densities.

Why are the developments mentioned above interesting? QCD is not the only theory of elementary interactions that features various phases, but it is the only one in which the transition between phases can be experimentally investigated. The transitions are studied via heavy-ion collisions and by observing the properties of compact stellar objects. The phase transitions of QCD also have had a