situation and to give students a modern perspective that is not tied so strongly to the independent-electron picture. The book's scope is ambitious and far-reaching. It begins with Bloch's theory, proceeds through the perturbative methods of many-body theory that enhance Bloch's theory, and then discusses a variety of currently interesting physical situations in which electron interactions are paramount.

The strongest feature of Phillips's book is its excellent choice and presentation of modern topics. Interspersed among sections on traditional Bloch–Landau–BCS theory, these topics will help to prevent students from being lulled by the successes of the independent-electron picture. The book begins with the Hartree–Fock theory of the interacting electron gas, and discusses that theory's success in describing the alkali metals. There follows an interesting discussion of magnetic moments and the nontrivial electron correlations associated with the Kondo effect. Similarly, a discussion of the successes of Fermi-liquid theory is followed by a treatment of its breakdown in the one-dimensional Luttinger liquid. The discussion of those advanced topics introduces the renormalization group and bosonization, which surely belong in the arsenal of every theory student. The book ends by concisely introducing central concepts in localization theory, metal–insulator transitions, quantum phase-transition theory, and the quantum Hall effect.

No other text has such a wide scope, and readers will appreciate the concise sweep through nearly a century of developments in solid-state theory. But if a broad sweep is the book's unique strength, it also leads to a weakness. A short book cannot cover all its topics in any depth, and uninitiated readers may find it difficult to rely on this book alone. For instance, the book assumes no prior knowledge of second quantization or the renormalization group, but its terse survey of those key concepts surely needs to be supplemented by other reading. Fortunately, other excellent texts cover most such topics, and Phillips provides a useful list of references.

Advanced Solid State Physics can serve as a valuable centerpiece of an up-to-date advanced graduate course. The main topics and central concepts are all presented compactly. Where the discussion is cursory, the book can be a useful starting point for in-depth exploration through other sources.

Subir Sachdev
Yale University
New Haven, Connecticut

Bose–Einstein Condensation in Dilute Gases

C. J. Pethick and H. Smith
Cambridge U. Press, New York, 2002. $110.00, $40.00 paper (402 pp.). ISBN 0-521-66194-3, ISBN 0-521-66580-9 paper

Since the 1995 discovery of Bose–Einstein condensation in atomic gases, the field of degenerate quantum gases has expanded incredibly. Even after eight years and the award of a Nobel Prize, new frontiers in the subject are appearing in rapid succession. The highly interdisciplinary field attracts researchers from such traditionally separate areas as atomic physics, condensed matter physics, quantum optics, nuclear physics, high-energy physics, and quantum information theory. As interest rises and new knowledge accumulates, the time has come for a book that can serve both as a text for students and as a resource for researchers.

In *Bose–Einstein Condensation in Dilute Gases*, Christopher J. Pethick and Henrik Smith focus on the subject's fundamentals and basic phenomenology. The authors' clear writing style and balanced choice of topics will appeal to a diverse audience.

The first five chapters form a pedagogical introduction. A brief overview of superfluids is followed by two chapters on the fundamentals of the noninteracting Bose gas and the atomic physics of alkali atoms. These chapters provide the necessary background for later discussions. Chapters 4 and 5, along with the discussion of trapped (scalar) Bose condensates in chapter 6, are central to the book. Chapter 4 discusses cooling and trapping methods that are widely used in current experiments. Readers unfamiliar with the methods will be amazed by their ingenuity and power. Chapter 5, on interactions between atoms, derives the effective atomic interaction in a low-energy theory. It also discusses a subject that nowadays is of great interest, the scattering of particles that have internal states and Feshbach resonances.

In chapters 6 and 7, on the equilibrium and dynamic properties of trapped Bose condensates, readers learn about the Thomas–Fermi approximation and simple methods for deriving collective modes. Chapter 7 treats surface modes and has an elegant discussion of solitons. Chapter 8, on the microscopic theory of the homogeneous Bose gas, discusses the standard Bogoliubov theory at zero temperature and covers such nonzero-temperature approaches as the Popov approximation. The chapter ends by describing the collision shift in atomic hydrogen. Chapter 9, on the vortices of rotating condensates and their motions in a trap, culminates with a discussion of attractive Bose gases, whose rotational properties are different from those of repulsive Bose gases.

In chapter 10, on superfluidity, readers learn about Lev Landau's famous two-fluid picture, his remarkable prediction of second sound, and Landau damping. Chapter 11 treats the behavior of trapped Bose gases at nonzero temperature. In general, the behavior is more complicated for finite temperatures than for zero temperature, but simplifies at temperatures high enough to cause the system to become a Boltzmann gas. In this chapter, the authors also show how collisional and anisotropic effects of a trap can be analyzed in detail for high temperatures.

The final three chapters deal with special topics. Chapter 12, on mixtures and spinor Bose condensates, introduces multicomponent superfluids—a unique aspect of alkali Bose gases that distinguishes them from conventional scalar superfluids. Chapter 13 discusses the fascinating subject of interference and quantum correlations of Bose condensates. This chapter describes the quantum correlations in interference processes and explains how condensates that are originally far apart (and hence phase-incoherent) can lead to interference fringes after they expand and overlap. Chapter 14 is on fermions, a topic of current interest because many experimental groups are now searching intensely for fermion superfluids. This chapter discusses the difficulties in cooling Fermi gases, the effective interactions in those systems, and the gases' hydrodynamic modes. It also briefly describes fermion–boson mixtures.

Bose–Einstein Condensation in Dilute Gases will be useful to newcomers to the field and will help researchers with diverse backgrounds communicate with each other. It is an excellent text, a broad survey with some in-depth discussions. The book is meant to be introductory, but the authors—world experts in transport phenomena—offer sophisticated discussions of such nonequilibrium processes as evaporative cooling. Scientific maturity beyond that of beginning graduate students may be required to fully appreciate the motivations of various approximations. The book does not include such current topics as degenerate gases in optical lattices, quantum gases with large angular momenta, low-dimension Bose gases, condensates in chip traps and waveguides, atom–molecule coherence near Feshbach resonance, or fermion pairing near Feshbach resonance. The authors are not to be blamed for such omissions, because those subjects all appeared within the past year or two. The rapid developments only illustrate why an excellent text such as *Bose–Einstein Condensation in Dilute Gases* is needed in these exciting times.

Tin-Lun Ho
Ohio State University
Columbus

Soft Condensed Matter

R. A. L. Jones
Oxford U. Press, New York, 2002. $65.00, $30.00 paper (195 pp.). ISBN 0-19-850590-6, ISBN 0-19-850589-2 paper

Soft condensed matter has had a slow and difficult evolution toward acceptance as a subfield of physics. Even acceptance of the field's name has taken time. What does "soft" mean? And what does soft condensed matter physics include? Liquid crystals and polymer physics are surely parts of it, but the study of those topics has been well established for much longer than soft condensed matter.

Good textbooks are essential in establishing any field; they help broaden interest in the field and ensure that the next generation of physicists can learn it. The classic textbook for soft condensed matter is *Principles of Condensed Matter Physics*, by Paul Chaikin and Tom Lubensky (Cambridge U. Press, 1995), which does not even have "soft" in its title, even though it was the first general text to deal with the subject comprehensively. That book, which has certainly helped stimulate interest, is suitable for advanced graduate students (or for bedtime reading in British sitcoms like "Keeping Up Appearances"). But a need has long existed for texts suitable for an introductory graduate or senior undergraduate course. *Soft Condensed Matter*, by Richard A. L. Jones, is the first textbook to meet that need. Jones, a professor of physics at the University of Sheffield, UK, is an experimentalist whose expertise is polymers at interfaces.

A first critical task for a book on soft condensed matter physics is to define the field's extent. That task is particularly difficult because the field is still so young that it continues to expand its reach; I think many scien-