

concise summary of metal-insulator transitions, both thermal and compositional, and mixed-valence compounds, including charge-transfer complexes. Low-dimensional solids are reviewed briefly.

The book goes on to discuss ferroics, liquid crystals, fast ion conductors, photoelectrochemistry, magnetic materials and amorphous materials, followed by solid-state reactivity, inter-

calation chemistry, organic reactions and heterogeneous catalysis.

In each case, the authors attempt to create some excitement by appealing to the "latest news" and practical applications. Chapter 7, on materials design, describes a number of major problems related to the energy crisis, and points to work on tailoring solids for storage batteries, solar energy conversion and magnetic bubble

memories. The impression that these discoveries all occurred by design is misleading. Experienced workers are aware that the application of garnets to bubble memory devices was unanticipated owing to their cubic symmetry; the explanation of the uniaxial anisotropy of garnets has been the subject of numerous papers.

Having attempted the impossible, a one-volume treatise covering a vast field, the authors give a compact bibliography covering most of the known materials. Perhaps they are lucky to have gone to press before the recent explosion of copper-based superconductors.

The major use of this book is likely to be as a quick reference on the synthesis and properties of recently studied materials with unusual properties. It does not appear to be a viable text, but might be a useful supplement to illustrate structure-property relationships.

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Polytechnic University
Brooklyn, New York

Introduction to Modern Statistical Mechanics

David Chandler

Oxford U. P., New York, 1987.

274 pp.

\$42.50 hc ISBN 0-19-504276-X;

\$24.95 pb ISBN 0-19-504277-8

I recently taught a one-semester course in statistical mechanics, the rapid-fire type in which a student who drops a pencil runs the risk of losing a week's work. Toward the end of the course, one of the students, about to go under for the third time, came to me in desperation. I suggested that she try the text by David Chandler. It worked—not a miracle cure, but it worked.

Measured on a logarithmic time scale, statistical mechanics feels like a middle-aged field. But its target—that of developing concepts and techniques appropriate to systems containing large numbers of similar units—has made it more and more the *lingua franca* of physics. This raises obvious difficulties in writing a modern textbook. One can dispatch—with admiration and without prejudice—older books such as *Principles of Statistical Mechanics* by Richard Tolman, *Statistical Mechanics* by Joseph and Maria Mayer, or even *Statistical Mechanics* by Terrell Hill, as inadequate by current standards, too formal and of course incomplete. From a pedagogical point of view, the updated *Statistical Physics* (Pergamon, New York, 1980) by Lev Landau and Ev-

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genii Lifschitz and Linda Reichl's tome *A Modern Course in Statistical Physics* (not mentioned in the bibliography of any chapter in Chandler's book) are a bit overpowering. What is a reasonable strategy for a textbook author? For one thing, don't feel compelled to unburden yourself of your accumulated knowledge. For another, don't be afraid of being impressionistic—at times supplying

the student with little more than important vocabulary—*providing* you steer those suitably motivated to more complete treatments. This is what Chandler has done, taking seriously the "Introduction" that leads off his title. In other words, this is not a treatise, not a manual for student or teacher, but rather a breezy and enthusiastic guide with quite solid content.

A fair portion of an introductory text is, to be sure, prescribed, the only question being which among the alternative presentations is to be used. In statistical mechanics, where even the foundations are lamentably murky, this involves real decisions. Or does it? It is a mark of Chandler's pedagogical bent that standard equilibrium ensembles are developed from both the open system and the entropy maximization viewpoints (an omitted sign confusion for dW in chapter 1 is a real shame). From another direction, the division of molecular levels into electronic and collective contributions is not just thrown at the student, but motivated via the Born–Oppenheimer approximation. Sometimes, taking the student gently by the hand and gradually focusing doesn't work that well; Chandler's discussion of the fluctuation–dissipation theorem remains unfocused. But another important aspect is worthy of mention. It is Chandler's use of simple models—drastically simplified if necessary—to ease the reader into a more complicated formalism. This is an approach also favored by the mathematically inclined, who find that they can avoid "hand-waving" only by asking very simple questions about very simple systems, most often lattice caricatures of continuous descriptions. It is not easy to keep such an approach from being physically sterile, and in my own course notes I have had my share of failures. But Chandler—from his discussion of ergodicity on a discrete space to his use of the one-dimensional Ising model as an entrée to phase transitions, renormalization group methods and prototypical two-level quantum systems—chooses quite well indeed.

The author's field is chemical physics, to which he has contributed imaginatively and effectively for two decades. Reasonably enough, this colors his presentation: Superfluidity, superconductivity, Fermi fluids and so on are notably absent, while more than lip service is paid to real molecular fluids. But the subject matter that is covered is substantial, and is enriched by extensive problem sets going beyond rote operations, as well as by little puzzles and exercises for the reader during the exposition. The text is very accessible as a one-semester course, and the viewpoint is up to date: The crucial role of fluctuations is emphasized; nonequilibrium is attended to; there is a clear discussion of Monte Carlo methods, including sample programs; and mathematical tools such as δ functions, path integrals, and Euler–MacLaurin expansions are used without a fuss

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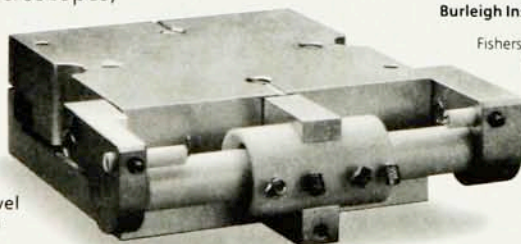
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The Making of the Atomic Bomb

Richard Rhodes

Simon and Schuster,

New York, 1986. 886 pp.

\$22.95 hc ISBN 0-671-44133-7.

Touchstone (Simon and Schuster), New York, 1988.

\$12.95 pb ISBN 0-671-65719-4

Richard Rhodes, a talented journalist, by shrewdly exploiting some relevant archives and others' scholarship on the A-bomb, has written a compelling book of drama and tragedy, of passion and commitment, and of moral lament. It is historical journalism on a grand scale—rich detail, colorful scenes, vivid portraits and gripping vignettes—chronicling the lengthy scientific and political roads that led to Hiroshima and beyond. The book, though narrating a familiar story, has won such major honors as the Pulitzer Prize, the National Book Award and the National Book Critics' Circle Award, and has sold over 35 000 hardback copies.

In these pages, the great and near-great physicists of an earlier generation—Niels Bohr, Enrico Fermi, J. Robert Oppenheimer, Leo Szilard, Edward Teller and Ernest O. Lawrence, among others—often come alive. Scientists will be especially delighted by such sketches and by Rhodes's lengthy (over 250 pages) charting of the 20th-century breakthroughs leading to fission and the chain reaction.

The Making of the Atomic Bomb offers much regret, no villains (except Nazi Germany and possibly General Curtis LeMay) and two physicist heroes: Bohr and Szilard. In 1944 Bohr pleaded, unsuccessfully, with Britain's Prime Minister Winston Churchill and with US President Franklin D. Roosevelt for the abandonment of Anglo-American nuclear secrecy, for informing the Soviets about the research on the bomb, and for moving toward international control before the bomb was used. Szilard, who conceived of the chain reaction and who later pushed the Roosevelt Administration to embark on the A-bomb project, in the war's last year opposed the prospective combat use of the bomb on Japan, pleaded for approaching the Soviets on international control and, like Bohr, warned that the alternative was a ruined

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