

Umklass processes and the low-temperature Lorenz ratio. The lattice component of thermal conduction in metals and alloys is discussed, but there is only the briefest treatment of superconductors, and semiconductors are covered mainly with respect to some low-temperature properties.

Although ordinary and high temperatures are certainly mentioned, the emphasis is on low-temperature properties, and on the special solids that have played a large role as models to illustrate physical principles (solid helium, lithium fluoride and other alkali halides, monovalent metals, but diamond is surprisingly omitted). The technically important materials and higher temperatures receive less attention, and this is perhaps as it should be in this small volume, which emphasizes the basic interaction processes and their illustrations. The book would therefore be a good companion text in a basic solid-state physics course, covering in depth a field that requires a knowledge of many solid-state principles. Those interested in thermal conduction per se would find J. E. Parrott and Audrey D. Stuckes's *Thermal Conductivity of Solids* (Pion, London 1975) more relevant, since it covers more materials, particularly semiconductors and magnetic materials. Even though these books have much in common, a serious student of the field could read them both with profit. Berman's book will be of special value for his skillful exposition of the basic physical principles.

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Introduction to the Renormalization Group and to Critical Phenomena

P. Pfeuty, G. Toulouse
190 pp. Wiley-Interscience, New York,
1977. \$19.95

During the last seven years renormalization-group theory has made a strong impact on the thinking and methodology of theoretical physics. The area of most extensive applications of renormalization-group ideas is that of critical phenomena. This field witnessed quite an outburst of research activity, with many workers making original and innovative contributions.

Pierre Pfeuty and Gérard Toulouse, professors of physics at the Université de Paris Sud, Centre d'Orsay, have both done significant work in the field. Pfeuty's main contributions concern studies of quadratic anisotropy and mapping of classical models to quantum ones at lower dimensionality. Toulouse studied the

analytical continuation of the order-parameter dimensionality to the value $n = -2$ and considered the systematic variation of exponents in the (n, d) plane.

Although the field has produced a number of review articles, so far only a relatively small number of books has been published. Therefore one can only welcome the appearance of "a truly introductory book ... as thin as possible" containing a "clear outline of the simplest ideas."

The book is thin indeed. Its brevity, together with the clear and concise style, make for enjoyable reading. It covers a

wide range of topics and applications, including discussions of the dimensionality n of the order parameter and its relation to the excluded-volume problem, percolation and the spherical model, derivation and discussion of the Ginzburg criterion, and the characteristic dimensionality (above which exponents become classical) for various models. A brief and clear presentation of covariance under dilatations and its relation to scaling and homogeneity is followed by introduction of the renormalization-group ideas, with a strong emphasis on the topology of renormalization group trajectories, and a

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description of the various ϵ -expansion techniques. Topics such as magnetoelectric and gauge-field couplings, finite size and surface effects and treatment of random systems are also discussed, in addition to the more standard crossover problems such as quadratic and quartic symmetry breaking, long-range and dipolar forces. A brief discussion of multicritical points, marginality in two-dimensional models and the Kondo effect is also presented.

Thus the book, intended for the first-year graduate or advanced undergraduate, does an excellent job in providing a broad overview of the central ideas and applications of the renormalization group.

Brevity, however, is also a disadvantage. Of the currently used techniques, only those based on ϵ or $1/n$ expansions are discussed (position-space renormalization-group methods are mentioned only in the context of the one-dimensional Ising model in an appendix). The book is far from being self-contained; it does not teach any calculational techniques (even the $O(\epsilon)$ recursion relations are presented without derivation). What I find a more serious deficiency of some chapters is the lack of extensive references for the interested reader to follow up; for instance, a three-page introduction to the Callan-Symanzik equations does not contain a single reference. I also could not find any reference to an experimental review article, nor an original experimental figure, even in cases where it would seem most appropriate (such as scaling functions and data collapsing). The present volume is an essentially unrevised translation of the original 1975 French edition; a radical updating of the references would have definitely eliminated most of these shortcomings.

Nevertheless, this is a very well written and organized book, which I would highly recommend as collateral reading for a graduate course on the renormalization group and critical phenomena. The curious science graduate student (or advanced undergraduate) who wishes to gain an understanding and taste the flavor of renormalization-group ideas will certainly find it enjoyable and rewarding. Also, the advanced graduate student, who has already mastered some renormalization group techniques, will gain a broad outlook and many new areas of application.

G. Barton should be commended for an outstanding translation, which may enrich the English vocabulary of American students; for instance, who would know that the domain of attraction of a fixed point may be called its "catchment area"?

As a final remark, I cannot resist the urge to address the issue of the outrageous prices physics students are forced to pay for any textbook. One can only hope that the increasing availability of copying

machines will eventually force the publishing companies to devote some thought to this matter.

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The Development of Newtonian Optics in England

H. Steffens

190 pp. Science History (Neale Watson),
New York, 1977. \$12.00

Historical research on Isaac Newton, his work and his influence has flourished in the last three decades. The current volume is one of ten Newtoniana book publications issued just by this publishing house alone, a record that measures the real service this firm is rendering to scholars.

Henry John Steffens's book began as an MA thesis while he was a student at Cornell about a dozen years ago, and it combines some of the best of the "old" and the "new" styles of historical scholarship. That is, he presents the history of Newtonian optics in England (and Scotland) as "a continuous development" with extensive quotations from the primary, contemporary publications, thereby emphasizing the conceptual growth of science. But he also is interested in the substantial differences between Newton and "Newtonians" who followed him, thereby aiming to show "in detail the fallacy of believing that Newton's science, or anyone else's, is objective, free from metaphysical assumptions, and exclu-

sively empirical." It is a case study stretching over two centuries, from Newton's teachers to David Brewster, who in the 1830's was the last major holdout in favor of a Newtonian optics steadfastly committed to forces and particles rather than ether and waves.

The account of the rise and fall of the Newtonian theory of light in its constantly changing forms proceeds in three main stages. First, of course is Newton's own theory, treating a group of problems that went far beyond the more widely known of his experiments. It includes Newton's speculations on the forces operative in the interaction of light and matter, his views of the degree to which studies in science touch on the nature of the Deity and his conceptions of the power and limits of the scientific method itself. Ironically, the large influence of Newton's *Optics* was in good part due to the fact that it could be read primarily as a descriptive and experimental work; like most scientific treatises with pedagogic intent, the more problematical and philosophical aspects were kept rather in the background. That made it that much easier for the more enthusiastic and less profound followers of Newton to use Newton's *Opticks* and build on it their patchwork "Newtonian" optics. While outwardly more modern and positivistic, inside this new construction there resided quietly "a whole corpus of metaphysical assumptions [concerning forces, action at a distance, corpuscularity of light, etc.], unattended and largely unquestioned." Steffens is particularly good and novel in his discussion of Robert Smith's *Compleat System of Opticks* of 1738, the influential text that amalgamated portions of Newton's *Principia* and *Opticks* to produce a corporal theory of light lacking all of Newton's subtleties and hesitations.

The maturing of the theory of light in eighteenth-century Britain is the subject of the middle portion of Steffens's book. Toward the middle of the century, the ether had become again a proper topic for speculation, and thus there occurred increasingly a bifurcation of the theory of optics into a primarily corpuscularian school and a smaller, primarily etherial school. With the figure of Newton towering over all scientific discussion, both schools were careful to trace at least some of their ancestry to Newton's own writings, even though in thematic terms they were fundamentally opposed to each other. The cast of characters includes Leonhard Euler, John Dolland, Joseph Priestley, Henry Pemberton, Henry Cavendish, Roger Joseph Boscovich, William Herschel, John Robinson and Henry Brougham. Their arguments and some of their experiments are concisely described, particularly those of the last two mentioned, two corpuscularians whose vigorous and sometimes almost reverential espousal of what they took to be the



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