ering every aspect of schistosomiasis and its control. It is designed to be used in the farming areas, where 80 percent of the population lives and the place where snails and schistosomiasis flourish.

So the Chinese display an intention to control schistosomiasis whatever the human cost. The mobilization of human energy is unbelievable, and at times it is hard for Westerners to comprehend.

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Metals for Theorists

Introduction to the Theory of Normal Metals. A. A. ABRIKOSOV. Translated by Alexis Baratoff. Academic Press, New York, 1972. xii, 294 pp., illus. $16.50. Solid State Physics, vol. 12.

Abrikosov has produced a clearly written and self-contained book whose content is rather aptly described by the title. As an introduction it stops distinctly short of the level of serious research papers in both the detail and the sophistication of the treatment. (It does, however, assume a good knowledge of quantum physics.) It is a book for theorists, by which is meant not only that most references to experiment are omitted but that the theory is presented as if the author expected to follow up this course with a more sophisticated treatment. Results that could be obtained by a neat trick or physical argument are often presented in a more formal and elaborate manner as if in preparation for the application of the methods to more difficult situations.

The book makes no attempt to give a balanced coverage of all topics important to the theory of normal metals. It lays relatively more stress on transport phenomena, particularly those historically central to the understanding of the Fermi surface. It includes also a discussion of certain quantum effects that are of importance. However, there are some topics central to a complete theory of normal metals which Abrikosov chooses to give minimal treatment, including band structure calculational methods and results, pseudopotential theory, and practically all the theory of electron-electron, electron-phonon, and electron-impurity interaction.

While reflecting on the author's choice of topics and level of coverage, I discovered that the book is an outgrowth of a series of lectures given in India in 1966. Seen as a limited lecture series to a specialized audience, the choice makes considerable sense. (It does not retain the colloquial style of the usual lecture series book, however.) There are a few topics added later dating from about 1968, but by and large the material and its treatment are no more contemporary than those of Ziman's book on solid state theory.

In spite of the date of writing, there does not seem to be a direct competitor (in English) to the monograph, although nearly all of the material can be found in other books. However, those interested in this field of research should watch for a work (now only in Russian) of I. M. Lifschitz, M. Ya. Azbel, and M. F. Kaganov ("Electron Theory of Metals," Science Publishing House, Moscow, 1971). If that work receives as felicitous a translation as that provided for Abrikosov by Alexis Baratoff, it will be very interesting, because of its more modern choice of topics.

Baratoff has provided, in addition to a very readable translation, a number of valuable footnotes clarifying otherwise confusing points. All in all, it is unfortunate that publication of the book was delayed so long after completion of the manuscript, but many students of the subject will still want to add it to their libraries.

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Vibrational Properties

Thermal Expansion. BERNARD YATES. Plenum, New York, 1972. x, 122 pp., illus. $12.50. Monographs in Low-Temperature Physics.

According to the publisher, this is the first volume of a new monograph series being edited by John G. Daunt and K. Mendelssohn. The audience at which the series as a whole is to be aimed is not specified, but the volume under review comes reasonably close to its stated mark of being suitable for undergraduates and postgraduate workers "who wish to gain an introduction to the vibrational properties of solids."

The chief difficulty with the general subject of vibrations in solids is that either too much or too little information is at hand. The well-known texts in solid state physics, such as Kittel's, usually give satisfactory introductory treatments of crystal structures, reciprocal lattices, and quantization of lattice vibrations for one-, two-, or three-dimensional systems. But when it comes to the analysis of experimental data for real solids the reader has to be satisfied with a few short paragraphs at the end of a chapter. At the other extreme, there are available comprehensive reviews of lattice theory and its applications that can easily frighten the beginner and the average experimentalist.

Yates has chosen to stay close to the realm of actual physical measurements on solids and to describe how information about their vibrational structure can be derived from measured thermodynamic properties, including thermal expansivities. Actually, detailed discussion of thermal expansion is given only one chapter, and in this respect the title of the book is somewhat misleading. A more appropriate one might have been "Thermodynamic and Vibrational Properties of Solids."

Most of the analytical procedures that are described are based on the quasiharmonic model and were developed originally by T. H. K. Barron. The examples given are mainly of insulating crystals such as the alkali halides. Metals, alloys, polymers, and other types of solids are dealt with much more briefly.

To sum up: *Thermal Expansion* meets adequately its limited objective of being post-Kittel but pre-Chocquard. It can be used with confidence.

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Soviet Pronouncements

Science and Technology as an Instrument of Soviet Policy. MOSE L. HARVEY, LEON GOURE, and VLADIMIR PROKOFIEFF. University of Miami Center for Advanced International Studies, Coral Gables, Fla., 1972 (available from its Washington research division, 1225 Connecticut Ave. NW, Washington, D.C. 20036). xvi, 218 pp., illus. Cloth, $5.95; paper, $4.95. Monographs in International Affairs.

This book has two parts, one consisting of translated extracts from Soviet articles and official documents on science and technology, the other an analysis by the authors of "specific issues

regarding science and technology with which the Soviet leaders are evidently most concerned." Both parts of the book are well up to date: it concentrates on developments since the major Communist party decree of 24 September 1968 on improving the efficiency of R & D, and takes the story up to May 1972.

Both in their selection of Soviet materials and in their own commentary, the authors correctly stress the tremendous emphasis now being placed by the Soviet authorities on the need for scientific and technological progress in the U.S.S.R. and on the difficulties of the traditional Soviet economic organization in coping with what the Russians officially describe as the "scientific-technological revolution." Other Western commentators, preoccupied with the political and intellectual conservatism of the Brezhnev period, have grossly underplayed this recurrent theme of Soviet official pronouncements, for example, in their accounts of the 24th party congress of April 1971. While total United States expenditure on R & D fell between 1968 and 1971, Soviet expenditure has continued to rise, both in absolute terms and as a proportion of national income. All estimates show that both the number of qualified scientists and engineers and the number of auxiliary personnel employed in R & D are substantially larger in the U.S.S.R. than in the United States.

The authors are, however, much too alarmed both about the Soviet pronouncements and about the continuing rise in R & D expenditure. They place too much stress (for example pp. 3–4) on ritual Soviet denials of any convergence between Soviet-type and Western economies, and on Soviet assertions that world communism remains their ultimate goal. Moreover, ambiguous or muted statements such as a warning by Brezhnev that weapons technology must not stagnate are reinterpreted to mean that "Moscow relentlessly seeks to attain on its own initiative not only quantitative but also qualitative advantage in its weapons system" (pp. 17, 24).

It must be frankly stated that in their handling of Soviet R & D expenditure and manpower statistics the authors are not sufficiently competent. Thus they present *total* Soviet allocations to "science" as equal to "budgetary allocations" (p. 67, and graph number 1). The Soviet figures for "scientific workers" (*nauchnye rabotniki*), which *include* over a quarter of a million teachers in higher education and *exclude* over a million auxiliary R & D personnel, are taken to refer to "the number of research and development personnel," and reconciled with the expenditure data only by the assumption that their average wage is 500 rubles a month (a professorial salary!) (pp. 64, 72). Eventually, in spite of their stress elsewhere on inefficiencies in Soviet R & D, the authors conclude that Soviet "buying power" in R & D amounted to at least $30 billion in 1972 (p. 195), evidently on the assumption that the "productivity" of a Soviet research worker equals that of his United States equivalent, although all available evidence points to its inferiority.

Neither the conclusion of the authors that Soviet goals are utterly unchanged, even after Nixon's visit to Moscow, nor their assumption that there is an immediate risk that Soviet technology will outpace that of the United States is soundly grounded in their evidence from the Soviet documents. But the translated documents, and the authors' discussion of Soviet reforms of R & D organization, merit careful study.

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Oceanic Boundaries

Waves on Beaches and Resulting Sediment Transport. Proceedings of a seminar, Madison, Wis., Oct. 1971. R. E. MEYER, Ed. Academic Press, New York, 1972. viii, 462 pp., illus. $16. University of Wisconsin Mathematics Research Center Publication No. 28.

Beaches are the place where the ocean impinges most obviously and forcefully on human affairs. The vital role these boundaries play in recreational and industrial affairs has meant that they are more often the concern of politicians and bureaucrats than of scientists. In the absence of complete scientific understanding, the human propensity to meddle with nature has often led to disastrous results. The literature, including daily newspapers, is replete with examples of attempts to protect beaches from erosion that have had precisely the opposite effects, or of supposedly well-sited sewage or power plants whose effluents have ended up in the wrong place, that is, on the beach.

Scientifically, beaches are a sometimes ill-defined boundary between the concerns of the geologist and those of the oceanographer. From the hydrodynamicist's point of view, the beach presents a wealth of intriguing, if difficult, phenomena. The mathematical linearizations upon which is based so much of theory ultimately fail at some point on the beaches. The medium under study is itself ill-defined as one goes from fluid to solid through a transition that is neither. The transition region is of course the crucial area when it is a calculation of the actual transport of sand that is required. Anyone familiar with breakers will understand some of the difficulties of making quantitative observations in the field. Despite all the difficulties, much is known about certain aspects of the dynamics of beaches, even though much more remains to be done.

In October 1971, an "advanced seminar" brought together geologists and mathematicians to review the state of the art of beach dynamics. The volume under consideration is a compendium of the papers presented. Since none of the discussion is reproduced, it is difficult to know how much communication there was between the disciplines. However, several of the review papers included in the book are excellent surveys of the field. The papers range from a nice series of photographs of New England beach forms (a challenge to the theorists) to an up-to-date review of the theoretical progress made by means of the concept of "radiation stress."

The civil engineer is required to make estimates of beach movements whether or not complete theoretical understanding has been obtained. Empiricism precedes a complete theory. The civil engineering approach is represented in both older (Einstein) and somewhat more modern (Kennedy and Locher) points of view. To find the actual movement of sand, given the fluid motions, is the crux of the matter.

Peregrine presents a useful summary of the mathematical approximations that have been used in the hydrodynamical problems, and other papers exploit various limits from purely linear theory to slightly nonlinear (Mei and Unluata). Longuet-Higgins's mildly polemical paper on longshore currents represents the most determined effort to relate sand movement directly to the incoming wave field. Inevitably many of the difficulties are parametrized away, but the resulting physical ideas are sensible. The remainder of the 11 papers included explore various aspects of more particular problems and range