atmospheres (NbC and TiC), as do some borides (ZrB_2) and sulfides (CeS). The numerous tables of physical properties of these materials which appear in the first nine chapters are especially valuable.

Furnace designs, principles of operation, and their range of usefulness are discussed in several chapters. Methods of producing high temperatures based upon resistance heating, arc furnaces, induction heating, and solar furnaces are well summarized. A brief description of an electronic torch suggests the possibilities offered by the energy released on recombination of dissociated polyatomic gases. No reference appears to the tremendous temperatures achieved in nuclear fission or fusion reactions.

The concluding third of the book deals with the measurement of temperature and of such mechanical and physical properties as high-temperature plastic flow, hardness, melting point, vapor pressure, thermal conductivity, linear expansion, thermal shock, and electrical conductivity.

For a book whose authorship is as manifold as this, there is a gratifying uniformity of style and over-all sense of organization. References are numerous and up-to-date, and the indexing (author and subject) appears to be well done. This should be a useful reference book both to scientists and engineers interested in the technical aspects of high temperatures.

Methods of Mathematical Physics (Third Edition). By Sir Harold Jeffreys and Bertha Swirles. 714 pp. Cambridge U. Press, New York, 1956. $15.00. *Reviewed by Philip M. Morse, Massachusetts Institute of Technology.*

The development of theoretical physics has been intimately related to the development of the branch of mathematics called analysis, from its beginnings in the era of Newton and Euler, to the present. It is thus not surprising that courses and texts purporting to show the physicist how to use mathematics, if they get beyond the cookbook stage, spend most of their time on analysis. The book under review is no exception, though it is far from being a collection of recipes. Since the appearance of its first edition, ten years ago, it has become one of the five or six standard reference works on the use of analysis for the solution of problems in physics.

The pedagogic problem of showing how mathematics is used in physics may be solved by developing the mathematics logically, bringing in the various applications to physics as illustrative examples, or by sticking more closely to the physics and working out the mathematics as needed. Probably both methods have to be applied before the treatment is successful. At any rate the book of the Jeffreys is of the first type, with the exposition following the logical development of the mathematics as far as possible. In this it can be compared with the two-volume treatise of the same title by Courant and Hilbert. The fact that the two volumes supplement, rather than duplicate, each other may

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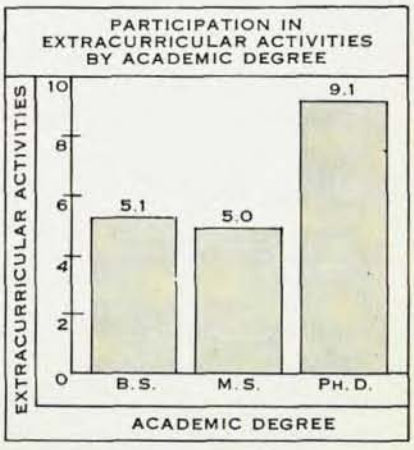

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have other implications than the obvious one that the subject is too vast to be covered in any one treatise, even of the size of these two. The Courant-Hilbert work emphasizes variational methods, eigen-functions, integral equations and boundary conditions; the Jeffreys' volume emphasizes operational calculus, differential equations and initial conditions. There are, of course, some areas of overlap, but even here the point of view is quite different.

The features in the work of the Jeffreys which are not duplicated in any of the other large treatises on the use of mathematics are the several chapters on the operational calculus and the chapter on numerical methods. Both subjects are carefully tied in with the rest of the mathematics and the exposition is clear and detailed, as indeed it is throughout the book.

The third edition exhibits major differences from the first edition in about ten per cent of the book. The chapters on multiple integrals, on functions of a complex variable and on numerical methods contain revisions and additions which improve the exposition and also extend the coverage; the changes in other chapters are less important.

Ludwig Boltzmann. By Engelbert Broda. 152 pp. Franz Deuticke, Vienna, Austria, 1955. Clothbound DM 11.00; paperbound DM 9.50. *Reviewed by R. B. Lindsay, Brown University.*

This year marks the fiftieth anniversary of the death of Ludwig Boltzmann, probably the greatest physical scientist of Austrian nationality and one of the giants of nineteenth century physics. This first book-length biographical sketch is therefore all the more to be welcomed from the fact that it has been long overdue. As Hans Thirring implies in his introductory note, it is all too easy to forget the lively struggle over the foundations of modern atomic theory which took place not much more than a half century ago and the significant part that Boltzmann played in it, vigorously defending, as he did, the utility of the atomic point of view against the strenuous attacks by phenomenologically minded scientists like Mach and Ostwald.

Though scarcely a full dress biography in the usual sense the volume under review does present an adequate and in many respects a vivid picture of Boltzmann as a man, a physicist, and a philosopher. In place of a chronological account of his subject's life, the author provides a series of illuminating sketches of Boltzmann's skill as a lecturer and teacher, his love of beauty, his sense of humor, patriotic spirit, etc. There is even a short section on his psychological difficulties which presumably led to his tragic death by suicide at the comparatively early age of 62, while he was still at the height of his intellectual powers.

The most interesting sections relate to Boltzmann's position in physics and philosophy. All students of classical theoretical physics of course know about the Maxwell-Boltzmann statistics, the famous H-theorem, and the relation between entropy and probability. Not so