it is quite possible that the science of the far future will be quite different from that of the present. The same may therefore be the case with ethics.

This book is warmly recommended to all who are interested in science as a method for coping with all aspects of human experience.

The Theoretical Significance of Experimental Relativity. By R. H. Dicke. 153 pp. Gordon and Breach, New York, 1964. Cloth $4.95; paper $1.95.

Reviewed by Herbert Malamud, Sperry Gyroscope Company, Division of Sperry Rand Corporation.

In his preface to this thin volume, Professor Dicke states, ". . . as an experimentalist I attempted to counteract in some small measure the decided tendency in times past for general relativity to develop into a formal science divorced from both observations and the rest of physics". This tendency is due to the fact that "Because of the great weakness of gravitation, results are far easier to obtain by calculation than by measurement."

Clearly, Professor Dicke is correct. Nearly every book on general relativity is a theoretical treatise and mentions the experimental facets of the field only in a short summary, as if to protest that general relativity is really more than the mathematical exercise that the remainder of the book makes it seem.

Professor Dicke has valiantly attempted to counteract this tendency, not only in this volume, which represents the notes for his course of lectures at the Les Houches summer school in 1963, but in his work at Princeton, which has established him as probably the world's foremost experimentalist devoted to relativity.

The first thirty pages or so of the book discuss the relationship of general relativity with experiment, not so much to ask whether the few available observations are compatible with the theory, but more generally to see how many other theories would also be supported by the same facts. Among these other theories, philosophical considerations limited the field to relativistic field theories, a procedure not completely consistent with a pragmatic (experimental) approach, but reasonable, nonetheless. The remainder of the book consists of twelve appendices, all but one a reprinted article, authored or coauthored by Professor Dicke during the past six years. Appendix number (4) is on field theories of gravitation, and has not apparently seen previous publication.

The organization of this volume consists of a division of the subject into four classifications: (a) null experiments of great precision, (b) null experiments of ordinary precision, (c) the "classical" three tests of general relativity, and (d) cosmological observations. For each, the discussion does not attempt to describe the experiment so much as to describe its implications for the theory. The book summarizes rather well the subject of what experiment has accomplished for general relativity theory.

This little book is not an introduction by any means. It is on an advanced level, and one suspects that the more the reader understands the subject before coming to the book, the more he can learn from it. A corollary to this statement clearly indicates that the book merits, and rewards, more than one reading, a thought that this reviewer willingly grants.

Handbook of X-Ray Analysis of Polycrystalline Materials. By Lev Iosifovich Mirkin. 731 pp. Consultants Bureau, New York, 1964. $35.00.

Reviewed by H. M. Otte, Martin Company.

This volume contains an extensive collection of tables, graphs, and charts which can serve as computational aids to workers in x-ray diffraction analysis of polycrystalline materials. These tables of experimentally determined data and evaluated mathematical functions are currently found mostly in appendices of textbooks, review articles, or in other handbooks of x-ray tables published by industrial firms, by educational institutions, or by the International Union of Crystallography. The present Russian compiler, Dr. L. I. Mirkin of the Moscow University Institute of Mechanics and his coworkers have gathered these data, tables, and graphs into one convenient handbook.

Dr. Mirkin points out in his foreword to the English edition, that "Specialization in x-ray structure analysis methods is now so great, and the amount of source material is now so vast, that it is practically impossible to include in one book all the information needed to solve all problems in structure analysis." However, he has done a most commendable job in the 731 pages (including the index) which this translated edition takes up. In the preface, Dr. Mirkin suggests a sequence that may be followed for best utilization of the book, but undoubtedly many users will find their own mode. Professor Ya. S. Umanskii, the scientific editor, emphasizes (in his foreword) that the book is not intended to present the type of material to be found in textbooks; thus, derivations of formulae or descriptions of methods are seldom included, and explanations of tables and nomograms are kept to the minimum compatible with clarity.

Since it is impossible for anyone to cover adequately all the fields of x-ray analysis over which a handbook of this type extends, only topics with which the reviewer is more familiar will be singled out for comment.

The value of a reference book is very dependent on the ease and speed with which any particular item can be located in it; thus, the index is an important part of such a book. The index, unfortunately, is very poor: for a book of this size it takes up only six and a half pages (of single column)! This compares unfavorably with seven pages at the beginning of the book, listing the contents. The contents list, although of value, clearly is far less useful than the index. Consequently, as regards the index, it was easy to find many serious omissions. For instance, whereas the conversion table for kX to Å on pages 11-12 was under C in the index; the conversion table (on page 501) of wt. percent to at. percent was not, nor could it be located anywhere else in the index. Similarly, transformation of indices (for the hexagonal system, page 268) was not listed in the index either. Stacking faults, mention of which was found on p. 592 under "packing errors" were not given in the index under S, F, P, E, or anything

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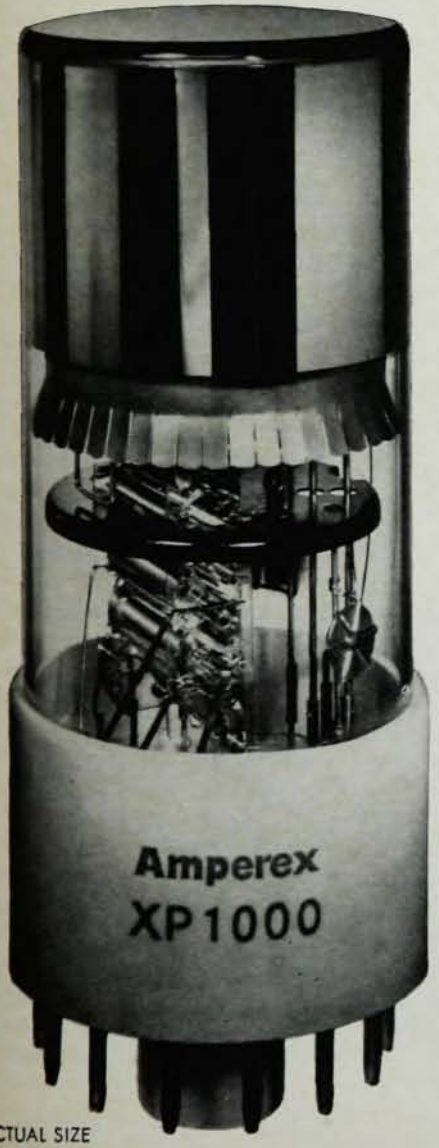

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else. Low-angle scattering was indexed under Scattering only. These are but a few of the examples.

In connection with the conversion table of kX to Å, the reviewer noted what seemed to be an unnecessary, and therefore disturbing, numerical discrepancy of one unit in the difference column between the kX and the Å columns.

Although both the compiler and the American publisher, in their acknowledgements at the beginning of the book, extend their sincere apologies to any and all authors whose data have been used, but inadvertently credited to a secondary source, there are many other shortcomings in the bibliography of 464 references (up to 1960 only) cited at the end of the book. Perhaps the most important is that the references have not been arranged in any systematic way. They follow neither the sequence of citation in the book, nor an alphabetic sequence of first author, nor a chronological order. Thus, it is not surprising to find some references quoted twice. For example, references 39 and 145 are the same, as are 36 and 148.

Chapter 8, which was singled out for closer study, seemed poorly organized. Thus, the section (8-3) on x-ray determination of dislocation densities, using particle size (translated as block size) and rms strain (translated variously as lattice deformation, atomic displacement, etc.), was placed between sections dealing with the determination of these quantities, rather than at the end of these sections, i.e., at the end of the chapter (after 8-12). The section (8-9) on the value of the constant in the Scherrer equation $D=K\lambda/\beta\cos\theta$ follows the section (8-7) on the separation of the effects of block-size and of microstress, so that this equation has to be repeated unnecessarily. A few lines (on p. 592) are devoted to the measurement of stacking–fault probability, α, with reference, curiously, only to body-centered cubic crystals, which in general (except for those formed martensitically) do not contain stacking faults, whereas no mention is made of faults in face-centered cubic and hexagonal close-packed structures, in which they are far more common. Consequently, also, there appears to be no mention of the peak shifts produced by stacking faults in the diffraction patterns from face-centered cubic structures and now so widely used to measure α in these structures. Furthermore, these peak shifts can seriously influence the measurement of residual stresses by x rays.

There are many more curious inconsistencies in this and other chapters. For example, in a table (section 6-9) listing the lattice constants of some standard substances, gold is included, but no value of the lattice constant is given! Presumably one is supposed to consult the reference cited.

The ASTM Power Data File, the 1957 version of which apparently appeared in the Russian version of this book, has been omitted from translation by the publisher and an explanatory note printed (p. 425) instead.

The description of x-ray units is confined to Soviet instruments, which may be of great assistance to all who follow the Russian literature on crystallography. Also, there are numerous good illustrations of many of the crystal structures. These are among the several good features of the book, which in spite of its many shortcomings, will undoubtedly be of great help to laboratory workers in industry and educational research institutes as an extremely valuable source book. Although the price is rather high, this comprehensive reference volume will, nevertheless, serve as a useful addition to most x-ray laboratories.

Les Fonctions généralisées ou Distributions. By M. Bouix. 223 pp. Masson et Cie, Paris, 1964. 46 F.
Reviewed by J. E. Mansfield, Harvard University.

This book nicely complements the number of excellent monographs on distribution theory that have appeared in recent years. The approach is fundamental and pedagogical, though it is problematical whether rigor suffers at all from this approach. The general orientation and development lead to the study of differential equations, a fact that will be of particular interest to physicists. A general treatment it admittedly is not; the basic theme is one of application, especially as regards the introduction of singular sources into field equations.

The notion and definition of a distribution are developed in both popular ways: by Schwartz' method of linear functionals; and by the limit method of Mikuzinski and Sikorski, called here the method of fundamental sequences. Extension to complex variables allows a simple interpretation of the Cauchy and Hadamard principal parts. The treatment of the Dirac delta function is very complete; a whole chapter is given to the complex plane extension and derivatives.

Special cases of Fuchs' theorem are discussed in the case of distribution solutions to certain differential equations. An extensive survey of familiar differential equations is given in this light. Especially helpful is a very concise appendix on the Lebesque integral.

Unfortunately there is no treatment of the Fourier transform, though references are given. Also the applications are chosen more from a pedagogical than from a practical viewpoint. Thus this little book is rather a complement to some of the more specialized books, such as Arsac.

Optical Illusions. By S. Tolansky. 156 pp. (Pergamon, Oxford) Macmillan, New York, 1964. $5.00.
Reviewed by L. Muldawer, Temple University.

"This book is an attempt to revive and revitalize an almost forgotten subject. It is not at all aimed at the professional psychologist, but, on the contrary, is addressed to the layman, to the artist, and to the scientist." So writes the author in his preface. He has succeeded in presenting the subject of geometrical illusions in a pleasant, interesting, and nonmathematical way. The physicist might be tempted to ask for a more mathematical treatment but we are warned that theory of illusions is primitive and that "it is wiser to restrict oneself to the bare exposé of the illusions and leave it at that."

The author *does* consider causes of the bisection illusion and discards several hypotheses as obvious failures. But the author could have suggested several obvious experiments which would have borne him out: (1) close one eye and examine, (2) rotate figure 90° and examine. Professor Tolansky shows that the number of independent