measurements. As already mentioned, the treatment of this subject is excellent and very detailed. This is the subject in which the author is particularly interested; he is a great authority on it and he and his collaborators made many important contributions in this field. There is also a very large collection of experimental material, no doubt the largest available.

Many other aspects of dielectrics are also treated in the book, but they do not receive such detailed attention as the questions relating to molecular structure. It so happens that most of those subjects in which the crystallographer or the solid-state physicist is interested are treated very briefly. The treatment of ionic crystals is very sketchy, but there is a good summary of the behaviour of ferroelectrics which many readers may find of interest. As far as solids are concerned, the most interesting parts are those which deal with the order–disorder transitions above which dipolar molecules can change their directions in the crystalline state. In this respect much experimental material is presented, an important part coming from the author's laboratory.

In addition to the more or less free orientation of dipolar molecules in the disordered solid state, there is also another type of orientational polarization, much smaller than the former, but it persists at temperatures below the order–disorder transition. This is sometimes called librational polarization; in contrast to the usual orientational polarization, this type of polarization is not a relaxation phenomenon but is connected with a proper frequency of the crystal, namely with the frequency of the rotational oscillations of the molecules. This polarization is not mentioned in the book. So far there are hardly any experimental data available about it, but there is no doubt that it must exist. Its frequency is in a very awkward region experimentally, but its measurement would be of considerable interest because it would provide important clues concerning the intermolecular forces in solids.

In conclusion it can be said that the book treats many aspects of dielectric materials. It is written mainly from the point of view of the chemist, and in this respect it is very good indeed and undoubtedly the most important book available.

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**Small-Angle Scattering of X-rays.** By A. GUINIER and G. FOURNET. Translated from the French by C. B. WALKER. Pp. xi+268 with 78 figs. New York: Wiley; London: Chapman and Hall. 1955. Price $7·50; 60*s*.

The diffraction of X-rays at small angles is a relatively new subject which has already attracted a great deal of attention and has produced an imposing list of publications. The time is certainly ripe for a comprehensive review of the subject and this purpose is more than adequately served by the present book.

There are six chapters. The first is a short introduction of a few pages; the second is a comprehensive summary of fundamental theory; the third provides descriptions of experimental equipment; the fourth is concerned with methods of interpretation of experimental data; the fifth is concerned with the comparison of results with those obtained by other methods; and finally there are examples of actual applications. There is a 40-page bibliography compiled by K. L. Yudowitch.

To most X-ray crystallographers the subject will appear rather unusual. The reason is, of course, that while X-ray crystallography is mainly concerned with complete diffraction patterns, small-angle scattering is concerned with one order of diffraction only—the zero order. This is chosen partly because it is so strong and partly because it has the property that all the waves that produce it are in the same phase; that is, the paths do not differ by whole numbers of wavelengths. From the broadening of the zero-order diffraction one can obtain information about crystal imperfections that is not easily obtained by any other method.

The information is, however, extracted only with difficulty. The experimental conditions must be precisely controlled, and the results obtained must be accurately analysed. There is little doubt that there has been some over-optimistic work in the past, and the book serves a welcome purpose in describing in great detail the essential experimental requirements and the steps necessary in carrying out the theoretical analysis.

The chapter on general theory is long and rather daunting; it seems to cover every conceivable circumstance that can produce small-angle scattering and gives full details of the associated mathematics. The chapter on experimental methods is of the same high quality. In contrast, the final chapter is somewhat disappointing; a large range of subjects, from proteins to metals, is covered, but most of the conclusions are rather tentative and make sadly little use of the elaborate theoretical edifice created in the second and fourth chapters. Nevertheless, for the general reader, this final chapter will probably be the most useful, since it describes a variety of types of problem to which small-angle scattering can be applied.

To sum up, the book must be considered only as introductory. It lays a very solid foundation, but it demonstrates clearly that considerably more experience must be gained before quantitatively reliable results can be obtained from small-angle scattering.

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**Bibliography of Hardness and Hardness Testing.** Pp. ii+118. London: Industrial Diamond Information Bureau. 1955–1956. Price 5*s*.6*d*.

This is an extremely comprehensive bibliography of books, national standards and original articles on all aspects of hardness testing which should be invaluable to workers in this field. The bibliography includes not only work specially devoted to hardness testing, but also work in which hardness testing was used only as one of the methods of investigation. The period covered is from 1937 to 1955, the former year having been chosen for the beginning of the bibliography as it marks approximately the date when microhardness testing methods were first introduced. The majority of the entries give only author,

title and reference, but in some cases the editors have added a few explanatory words. There are very full indexes of names, subjects and materials tested.

The book is reproduced by offset lithography direct from typescript. The use of an electric typewriter would have resulted in a more pleasing appearance, but the quality of reproduction is adequate for a work of reference and the price (which is said to cover only a part of the cost of publication) is very moderate.

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**Irradiation Colours and Luminescence.** By K. PRZIBRAM. Translated and revised by J. E. FAFFYN. Pp. xiv+332 with 72 figs. London: Pergamon Press. 1956. Price 63*s*; $10.

This book is a translation of the author's *Verfärbung und Lumineszenz* already reviewed in these columns (*Acta Cryst.* (1954), **7**, 383). The translator, in collaboration with the author, has taken the opportunity of making some minor modifications in the text and of adding some 500 references to recent work.

The book is very elegantly printed and bound but the use of small capitals for the names of authors is distracting to the eye, especially in a work in which the number of references is so large (about 1200).

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**Structure Reports for 1942–1944.** Edited by A. J. C. WILSON, N. C. BAENZIGER, J. M. BIJVOET and J. M. ROBERTSON. Pp. viii+448 with many figs. Published for the International Union of Crystallography. Utrecht: N.V. A. Oosthoek's Uitgevers Mij. 1955. Price 65 Dutch florins; $17·50; £6.6.0.

There must be a growing number of crystallographers, metallurgists and chemists who are interested in the results of structure analysis. Many substances show unexpected polymorphism or other complexities, and our knowledge of structure is bound to be used more and more in the explanation of the properties of the solid state. For these reasons it is important to collect results of structure determination, and this volume of *Structure Reports* makes an excellent attempt to cover papers giving these results published in the years 1942–4. During these war years the output of work was comparatively small, but nevertheless the book represents a great deal of effort on behalf of editors and abstractors.

The book is divided into three parts, covering metals, inorganic compounds, and organic compounds respectively, and there are excellent indexes of authors, substances, formulae and an index of carbon compounds. The contents bear out the editorial claim in being not ordinary abstracts, but even at times considerably enlarged versions of the original. Opportunity is taken to improve the presentation of the results, occasionally as a result of correspondence between abstractor and author, and a specially valuable feature is the frequent comment in square brackets by the abstractor. This critical comment is particularly valuable in the case of the older papers reported in this volume, often giving more than a hint as to the value of the work and at times giving references to later work on the same subject. This latter type of coverage does not, however, seem to be complete, the volume being meant to be used along with the later volumes of *Structure Reports*. A book covering a small portion of the history of structure investigation is necessarily somewhat patchy and interim in its nature, but one of the most satisfying portions is that dealing with chain polymer structures by C. W. Bunn.

As in the case of its companion volumes, the book is beautifully produced and printed. Many different type faces are used and the setting-out is as attractive as it could possibly be. One comment may, however, be made. Many of the structures in the inorganic and organic sections are well illustrated by clear diagrams, but in some ways these diagrams are not much above the general standard of draughtsmanship in the literature. The representation of crystal structures on paper is a difficult art, and an expensive one also, but nevertheless some improvement might be made. In many cases several drawings may be necessary, the first showing a substructure and the others showing how these units are connected together. Most of the pictures in *Structure Reports*, however, consist of the usual somewhat meaningless projection of the cell contents down an axis, with no bonds shown and no symmetry elements. Now these latter two features are most important, since they show how the atoms hold together and how they repeat. It is true, of course, that the bonding is not as definite always as one would wish, and a diagram which contains all these things becomes very complex. However, I think some progress could be made with advantage in crystallographic illustration, and *Structure Reports* might be a suitable opportunity. This is a large undertaking and one in which all authors must play a part. Meantime we can only offer our thanks to the producers of this volume, and give them the best reward of all by making intensive use of their work.

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