with the four-colour map problem originally noticed by Möbius in 1840, relating to the fact that, mathematically, five colours are needed in the general case to distinguish regions sharing common boundaries, whereas in practice four colours satisfy all maps at present known or devised. Of course, the lower number is a conjecture, but has been proved for the special case of maps containing up to thirty-eight significant areas, so the task is not altogether easy. The question therefore is whether we have a limit (or possibly, in reverse, a self-denying ordinance) upon two-dimensional arrays of polychromatic figures. Here, for the moment, we have deserted group theory for topology.

And finally, for a trivial remark. The text is clear, but there are nevertheless a number of instances wherein idiomatic English has not been achieved, and there are one or two spelling mistakes. Neither mislead, but they are little blemishes on so fair a landscape.

In conclusion, it is tempting to ask where, on the bookshelves of those who appreciate form at its best, will they tend to put this book? A fair guess would be, close to Birkhoff's *Aesthetic Measure*, Weyl's *Symmetry*, and Speiser's *Theorie der Gruppen von Endlichen Ordnung*. More than that one cannot say.

F. I. G. RAWLINS

Danny
Hurstpierpoint
Hassocks
Sussex
England

Mechanical twinning of crystals. By M. V. KLASSEN-NEKLYUDOVA. Translated from the Russian by J. E. S. Bradley. Pp. xiv+213. New York: Consultants Bureau, 1964. Price $19.50.

It may be doubted whether the recent flood of translations from Russian always provides valuable and useful contributions to the scientific and technological literature. It appears to be beyond doubt, however, that the translation of the present book was worthwhile, both because of the qualifications of its author and her collaborators and because of the lack of a comparable modern work in one of the western languages. Although the 'classical' crystallographic aspects of twinning are not neglected, the outlook of the book is very modern. It discusses the relations to such subjects as martensitic transitions, recrystallization twins, lattice rotations in inhomogeneous deformations, fracture, ferroelectricity, ferromagnetism, and covers (in contributions by V. L. Indenbom) both the macroscopic and the microscopic (dislocation) theory of twinning. The book contains extensive tabular material and is well suited as a reference work.

The translation has been done expertly apart from occasional, but nevertheless irritating, misspelling of names (the same proper name may even be misspelled in two different ways).

A. SEEGER

Max-Planck-Institut für Metallforschung
7 Stuttgart – N
Azenberstrasse 12
Germany

The structure of glass. Vol. 3. Catalyzed crystallization of glass. Editor: E. A. PORAI-KOSHITS. Translation from the Russian by E. B. UVAROV. New York: Consultants Bureau, 1964. Pp. 208. Price $20.00.

Der vorliegende Band enthält einen Teil der auf dem dritten Leningrader Glaskongress gehaltenen Vorträge. Er behandelt vor allem die Probleme der Entstehung der 'Glaskeramik' und der Vorgänge in den lichtempfindlichen Gläsern. Dabei steht die Frage der Primärvorgänge bei der Kristallisation bzw. der Entmischung und der Methoden zu ihrer Erkennung und Verfolgung mit im Vordergrund.

Die insgesamt 44 Vorträge sind in vier Kapitel zusammengefasst, denen ganz kurz die wichtigsten Diskussionsbemerkungen folgen. Das erste Kapitel beschäftigt sich mit den allgemeinen Gesichtspunkten der Glaskristallisation. Unter diesen durchweg interessanten Berichten ist besonders der von Filipovich 'Initial Stages in the Crystallization of Glasses and Formation of Glass-Ceramics' zu erwähnen. Auf ihn wird in den Diskussionen wieder Bezug genommen. Porai-Koshits hebt in den Schlussbetrachtungen zum Kongress hervor, dass die Übereinstimmung dieser Kristallisationstheorie mit vielen experimentellen Resultaten eine der wichtigsten Erkenntnisse des Symposiums gewesen sei.

Das zweite Kapitel 'Two-Component Systems' enthält fünf Vorträge, das dritte 'The Lithium Aluminosilicate System' 18, das vierte 'Other Three-Component and Multicomponent Systems' 14 Vorträge. Auf Einzelheiten einzugehen ist bei den zahlreichen behandelten Themen nicht möglich.

Der Band gibt eine Vorstellung von den energischen Anstrengungen der russischen Glasforscher, wissenschaftliche und technische Erkenntnisse auf dem wichtigen Sektor der Kristallisations- und Entmischungsvorgänge im Glas zu gewinnen. Den Vorstufen wird dabei besondere Beachtung geschenkt. Die Bedeutung der Glasstruktur und damit der Vergangenheit des Glases für die ablaufenden Prozesse wird hervorgehoben; ebenso sind die Schwierigkeiten, die sich der Deutung der experimentellen Ergebnisse entgegenstellen, klar erkannt.

Das Buch bringt die Ansichten und Ergebnisse der russischen Glasforscher zur Zeit des Kongresses (1961?), der vielseitige und anregende Bericht ist aber auch heute noch aktuell. Der Band ist wichtig für jeden, der sich mit diesen und ähnlichen Problemen befasst, er verdient aber auch sonst das Interesse der Kristallographen.

H. WONDRATSCHEK

Institut für Mineralogie
Technische Hochschule
75 Karlsruhe
Hertzstrasse 16
Deutschland

Borides, silicides, and phosphides: A critical review of their preparation, properties and crystal chemistry. By B. ARONSSON, T. LUNDSTRÖM and S. RUNDQVIST. Pp. 120. London: Methuen, 1965. Price 25*s*.

This little monograph will serve as a simple introduction to an interesting field of research even though the title is mis-

leading. One would expect to find some information on materials such as boron phosphide and the silicon borides; actually only the *metal* compounds are treated. From the subtitle a *review* implies a rather comprehensive literature compilation and *critical* implies a detailed comparison of a specific item of information among several authors. With only 276 references, the literature cited is not very exhaustive, although the inclusion of several review articles is helpful. With eight pages devoted to characterization and preparation, and thirteen pages to chemical and physical properties, the word *critical* does not seem applicable.

The usefulness of this book lies mainly in its chapter on crystal chemistry (45 pages) and in its appendix of crystallographic data (10 pages) for the metal borides, silicides, and phosphides. The Appendix would be more useful if arranged alphabetically, based on the metal atom, but the current grouping according to the periodic table does serve the purpose of concentrating information on chemically similar metals.

As the authors point out, a great deal of crystallographic and physical property measurement research remains to be done before a 'satisfactory treatment of the borides, silicides, and phosphides becomes possible'.

R. B. ROOF, JR

University of California
Los Alamos Scientific Laboratory
Los Alamos
New Mexico
U.S.A.

Metallic solid solutions. Edited by J. FRIEDEL and A. GUINIER. Pp. xi + 653. New York: W. A. Benjamin, Inc., 1963. Price, $19.75.

This book contains proceedings of the international symposium on the electronic and atomic structure of metallic solid solutions held at the University of Paris at Orsay, France, in July 1962.

Some 63 papers describe and review theoretical and experimental studies on metallic solid solutions. The papers concerned with atomic structure encompass short- and long-range order in alloys, precipitation, and pay particular attention to Guinier–Preston zones. Those primarily concerned with electronic structure treat the transition and rare-earth impurities in alloys, and correlate electronic properties with problems of atomic structure. Interatomic interactions and interactions between vacancies and impurities are also presented. A number of papers dealing with magnetic resonance, superconductivity, and thermodynamic properties, to mention a few, are included.

The papers printed in this book give a well rounded presentation of research activities in metallic solid solutions, with the exception of questions relating defect structures to mechanical properties.

K. HAEFNER

Department of Metals and Ceramic Engineering
Virginia Polytechnic Institute
Blacksburg
Virginia
U.S.A.

The direct observation of dislocations. By S. AMELINCKX. Pp. x + 487 + 236 Figs. New York and London: Academic Press, 1965. Price 121*s.* 6*d.* [Supplement 6 of *Solid State Physics,* Edited by F. SEITZ and D. TURNBULL.]

Theoretical and experimental investigations of dislocations have considerably increased within the past 10 or 15 years. In particular the technical development of electron microscopy of thin single-crystal foils has given so much new and striking information that a report of about 500 pages can present only a general review of the numerous results given by the various methods.

The author begins with the observation of dislocations at the crystal surface, as revealed by crystal growth, evaporation, etching and surface decoration. The second chapter describes different decoration techniques for studying the dislocation lines themselves by optical microscopy. The detection of dislocations by X-ray methods based on the dynamical theory of X-ray diffraction is included, and a short review of the investigations of the stress field around a dislocation by measurements of the optical birefringence is given. The third chapter covers about two-thirds of the whole contents and is devoted to thin-film methods in electron microscopy. A detailed introduction to the kinematical theory and a brief survey of the dynamical theory of electron diffraction is given, which enables the reader to evaluate all observed effects quantitatively. The determination of the direction of the Burgers vector of dislocations and the displacement vector of stacking faults is described. The splitting of normal dislocations into two or more partial dislocations is demonstrated and thoroughly discussed with respect to the lattice geometry in question and the determination of the stacking-fault energy. Several pictures are shown and interpreted with respect to the complicated movement of dislocation lines. The chapter ends with a review of recent results on moiré patterns. Finally the results of field-emission electron and ion microscopy are very briefly discussed. The Appendix gives some additional theoretical treatment of electron diffraction:

1. The calculation of stacking-fault fringes in crystals with anomalous absorption.
2. The intensity distribution of dislocation images in case of negligible absorption.

The general scope of the book is the geometry of dislocations and their diffraction effects in electron microscopy rather than the application to the physical properties of the crystal. This restriction is necessary, but the reviewer felt that sometimes a more detailed treatment of the applications would be useful, even if more space were needed. A more detailed description of the results of X-ray diffraction would round off the knowledge given in this book.

The presentation of the theoretical part is clear, and its application to the experimental results convincing. All figures are of first-class quality; only very few errors and misprints could be found by the reviewer. Author and editors must be congratulated for an excellent book which may be recommended to all advanced students and scientists working in the fields of Crystallography and Solid-State Physics.

H. JAGODZINSKI

8 *München* 2
Luisenstrasse 37
Germany