tron-probe microanalysis has now become a routine analytical procedure and, insofar as future events can be predicted, no major developments seem to be around the corner. The appearance of an authoritative, up-to-date and fairly extensive treatise on the subject is therefore well timed.

Reed's book is not the first one on this subject. Among those still of general usefulness are the ones by Birks (1971) and Andersen (1973). Birks's book is a concise and mainly descriptive introduction into the subject, recommendable to the beginner or the scientist or student seeking an overview of electron probe microanalysis. *Microprobe Analysis*, edited by Andersen, is a compilation of chapters written by various authors who are experts in their respective fields. Such a format provides a selection of topics rather than complete coverage. Other publications (Heinrich, 1968; Salter, 1970; Hall, Ecklin & Kaufmann), deal with partial aspects of electron probe microanalysis.

S. J. B. Reed has apported valuable and widely used contributions to the art of microanalysis. His book reflects his long experience in the field, and it will serve very satisfactorily as a textbook for the analyst performing electron probe microanalysis or using the lithium-drifted detector in conjunction with scanning electron microscopy. The principles of instrumentation and operation, the theory of quantification and the analysis of thin films are extensively and rigorously treated. The level of the text is uniformly high and eminently readable. In the application section, the author discusses a small but representative sampling of practical analyses.

The disagreements I may have with the author are mostly of detail – such as to his doubts on the efficacy of the hyperbolic iteration for multielement specimens (p. 294), or concerning the use of an atomic number effect in the absorption correction (p. 252). A more serious objection is that the computer programming, though 'practically essential for matrix corrections ...' (p. 296) is not discussed in sufficient detail. Manual correction calculations are impractical for all but the most casual users of the microanalyzer, and the problems arising from the use of a program which is not fully understood by the analyst are obvious.

Overall, Reed's book is a valuable source of information to the microanalyst, and it deserves a place on the shelf of all scientists who make use, directly or indirectly, of electron probe microanalysis.

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Advances in X-ray analysis. Vol. 18. Edited by *W. L. Pickles, C. S. Barrett, J. B. Newkirk* and *C. O. Ruud*. Pp. xix + 642. New York: Plenum, 1975. Price $46.90.

In recent years we have all been made aware of a world shortage of raw materials and immediately usable energy, a crisis which increasingly threatens modern society's mode of existence. With this daunting prospect in mind, the subject emphasis for the 23rd Annual Conference on Applications of X-Ray Analysis, held at Denver in August 1974, was appropriately 'The Application of X-ray Technology to Current Problems in Energy and Resource Development'. The latest volume in *Advances in X-ray Analysis* consists of some fifty papers read at this conference on a wide variety of topics.

In the currently fashionable field of plasma diagnostics, of direct relevance to power generation by a fusion process, measurement of soft X-ray emission from high-temperature plasmas is capable of yielding information about its condition and provides a method of determining plasma parameters. Several papers in the current volume report on this field of interest and cover areas such as spectrometers for investigating shortlived plasmas together with other relevant instrumentation.

On the subject of quantitative X-ray spectrometry several papers are directed towards mathematical correction procedures. With the increasing availability of small on-line computers to facilitate data handling the determination of inter-element correction constants, either based on experimental data or theoretically derived, continues to attract attention. Analyses of geological samples, for example, are reported and one is impressed by the accuracy of determination of constituents currently attainable.

As a measure of the diversity of interests represented at the 23rd Conference one might randomly select papers devoted to the analysis of infected blood, the generation of high-intensity monochromatic X-rays, and aerosol analysis – in addition to the more usual characterization of solid materials. It is of course impossible to do justice to such a wide range of papers and merely a representative few have been mentioned briefly in this review. The overall standard of the contributions is remarkably high and serves to emphasize the expanding interest in X-ray analytical techniques.

One hopes that the aims of this Conference will be achieved and at least a partial solution found to the materials and energy crisis.

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Quantitative scanning electron microscopy. Edited by *D. B. Holt, M. D. Muir, P. R. Grant* and *I. M. Boswarva*. Pp. x + 570, Figs. 302, Tables 25. London: Academic Press, 1975. Price £15.50.

The book contains sixteen independent review chapters but the attempt has been made by the Editors to produce a comprehensive coverage of scanning electron microscopy and its applications in both reflexion (SEM) and transmission (STEM) modes. The bulk of the book is concerned with SEM although three articles touch on the high-resolution STEM introduced by Crewe.

In respect of STEM, Howie invokes the reciprocity theorem for elastic scattering to describe the similarities between the STEM and the conventional transmission electron microscope (CTEM) and points

out the advantages of STEM in relation to image recording generally and especially in connexion with recording inelastically scattered electrons. Comparisons between STEM and CTEM are also drawn by Muir (within a general chapter on instrumentation) and by Crewe – the latter in a short summary chapter advancing his intention to build a 1 Mev STEM instrument with the hope of a resolution of 1 Å. Both Muir and Crewe emphasize the importance of the spherical aberration of the objective lens in determining image resolution: neither considers the possibility of correcting for this limitation by image processing.

Muir's article is sure-footed on the details of gun design, electron emitters and signal detection. Data for the properties of thin films are quoted from published sources; a cautionary note would have been valuable on (at least) the density of evaporated carbon given here to three significant figures (the reviewer can quote published sources for values from 1·5 to 2·5 g cm^{-3}).

Bishop gives a brief description of electron–solid interactions with principal attention to electron back-scattering, secondary emission and range–energy relationships where a useful introduction is given to a complex field of study. The effects of crystal structure on the electron interactions are introduced in an excellent and fundamental chapter by Joy on electron channelling patterns in the SEM. The channelling patterns supplement the usual topographic and elemental composition information of the SEM with information on orientation, crystal preparation *etc.* to which a dynamical theory of image interpretation is applicable. The dynamical contrast in SEM (and STEM) images form the theme of Howie's contribution and emphasis is given to the wave theory of back-scattering from thin perfect and imperfect crystals and also from bulk crystals in connexion with the study of surface dislocations.

Gibbard is concerned both with geometrical parameters – shape, perimeter, mean width *etc.* – and with those concerned with image tones. This is not the place to seek image theory or signal-to-noise optimization as found in image analysis as applied to the CTEM and the STEM.

In the rest of the book, four chapters describe applications of the SEM and six the various roles of X-ray emission in the SEM. Gopinath deals with electron emission (secondaries, back scattering) and Holt with the currents and voltages induced by electron bombardment (the conductive mode). Attention is given in both articles to instrumental (detecting) systems, to contrast mechanisms, and to applications – Holt's treatment being particularly extensive. The 'electron' section of the book closes with two articles on cathodoluminescence by Muir and Grant and by Holt, the first being technique, interpretation and breadth of application, the second showing the power of the method when applied to adamantine semiconductors. The information content of these four chapters is high and they provide valuable up-to-date summaries of general and particular SEM applications with method and results of general interest.

Belk, in a very contracted article, provides a general introduction to quantitative X-ray microanalysis from the instrumental and interpretative points of view. This theme is expanded by Gedcke who considers the use of the Si(Li) X-ray energy spectrometer in both the SEM and the electron-beam microprobe instrument. Gedcke's article is the most detailed and specific in the book since it concerns the implementation and application of a particular detecting system. Yakowitz explains the formation of divergent-beam (Kossel) X-ray patterns which provide complementary crystallographic data to the SEM channelling patterns and Dingley and Steeds describe the principles of the generation and observation of Kossel X-ray back-reflexion technique in the SEM.

The book concludes with two chapters introducing automatic handling first to the instrument and specimen in all its aspects (Long and Jefferies) and second to the stereological data from an electron-probe X-ray microanalyser (Jones).

I believe the Editors have been more than usually successful in putting together an integrated comprehensive review of the SEM, and its application to metallurgy and solid-state physics, less so in the excursions into the uses and promise of the STEM. This, of course, reflects the relative infancy of studies using STEM. The achievements and promise of the various SEM techniques are dealt with here at a level of high technical competence and sometimes with an equally high degree of literary truncation.

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Crystal growth. Edité par *Brian R. Pamplin*. Vol. 6. International Series of Monographs in the Science of the Solid State. Editeur Général, *Brian R. Pamplin*. Pp. xiv+672, Figs. 384, Tableaux 55. Oxford, New York, Toronto, Sydney: Pergamon Press, 1975. Prix $45, £18.

Les cinq ouvrages qui précèdent *Crystal Growth* dans la série de Monographies intitulée *The Science of the Solid State* traitent tous de sujets concernant les semiconducteurs comme par exemple celui de leurs propriétés optiques et de leurs structures de bande, celui des hétérojonctions ou la théorie du transport de l'électricité. Le présent volume est le premier de la série à étudier une question qui intéresse aussi d'autres composés. Ses dix sept chapitres ont été écrits par dix huit experts de la croissance cristalline qui à part deux d'entre eux occupent un poste en Grande Bretagne, dont en outre la moitié est universitaire et la moitié exerce son activité dans des laboratories industriels ou d'organismes publics.

Il y a peu de domaines de la croissance que ce livre passe complètement sous silence, il étudie particulièrement les questions les plus importantes, donne les principales étapes qui ont marqué leur progression et fait le point sur leurs plus récents développements. Les résultats marquants sont confrontés, analysés, critiqués. En général ce sont plutôt les conséquences des études théoriques que leur développement mathématique qui retiennent l'attention des auteurs. Dans tout ce qui concerne les techniques, de nombreux détails trés intéressants sont donnés, et il est certain que beaucoup de lecteurs en tireront le plus grand profit.

Le premier chapitre est une introduction qui mentionne les principes des méthodes de la croissance cristalline, on appréciera la longue liste d'ouvrages relatifs aux techniques de la croissance, aux diagrammes de phases, à la structure et aux défauts des cristaux et enfin aux publications des travaux, présentés dans les conférences spécialisées, qui est proposée par l'auteur. Les deux chapitres suivants sont théoriques: l'un traite de la germination bi et tridimensionnelle, des mécanismes de croissance et fournit des indications qualitatives sur la cinétique qui préside à l'obtention des diverses formes cristallines; l'autre est consacré au problème difficile mais essentiel de la stabilité de l'interface, il donne une synthèse des solutions apportées jus-