

would give  $R_2 = 0.50$  or  $0.74$ , which are not overwhelmingly smaller.

The situation is perhaps a little more favourable on starting from an entirely wrong structure, and moving the atoms so as to reduce  $R_2$  – the Booth approach. With all atoms wrongly placed  $\Sigma_{cw} = \Sigma_o$ . If some atoms (one atom and its symmetry-related equivalents, or perhaps a structural fragment and its equivalents) are now moved to their correct positions,

$$\Sigma_{cw} = \Sigma_o - \Sigma_{cc}, \quad (5)$$

$$T_{cw} = T_o - T_{cc}, \quad (6)$$

and (2) becomes

$$R_2 = 2 - \frac{2\Sigma_o^2}{(k+1)\Sigma_o^2 - QT_o} - 2 \frac{k\Sigma_{cc}^2 - QT_{cc}}{(k+1)\Sigma_o^2 - QT_o}. \quad (7)$$

This reduces to the expected values (Wilson, 1974) for no atoms correct and for all atoms correct. The first two terms are constants, and the third term represents a genuine reduction in  $R_2$  as the atoms reach their correct positions.

One can compare the Booth and Lenstra approaches qualitatively by writing approximate equations for the case of equal atoms and terms in  $T$  neglected. If the total number of atoms is  $N$ , and the number of correctly placed atoms is  $n$ , the Lenstra approach gives

$$R_2 = 1 - 2n/(k+1)N - (k-1)n^2/(k+1)N^2, \quad (8)$$

(equation 2), whereas the Booth approach gives

$$R_2 = 2k/(k+1) - 2kn^2/(k+1)N^2 \quad (9)$$

(equation 7). If the atoms in the Lenstra approach are all wrongly placed,

$$R_2 = 1 - 2n/(k+1)N + n^2/N^2. \quad (10)$$

The discriminatory part of the reduction in  $R_2$  is of the second order in  $n/N$  in both approaches, but in the Booth approach it is the only reduction, not confused by the larger first-order reduction that occurs in the Lenstra approach, whether the atoms are correctly placed or not. It would seem, therefore, that the Booth approach has a somewhat higher chance of being successful.

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## International Union of Crystallography

### *International Tables for X-ray Crystallography*

Volume I (*Symmetry Tables*) of *International Tables for X-ray Crystallography* has been reprinted and is now available. The Executive Committee had previously decided not to reprint it because the first volume of the new series, on direct space, was expected to be published early in 1977. However, its publication has been delayed and it was felt that a reprint of the present Volume I would be necessary in the meantime.

Because of increases in printing costs it has been necessary to raise the price of Volume I to £15.00 and, because of the steady drop in the value of sterling with respect to other currencies, it has also been necessary to revise the sterling prices of the other volumes. Volume II (*Mathematical Tables*) and Volume III (*Physical and Chemical Tables*) now cost £11.50 each, whilst Volume IV (*Revised and Supplementary Tables for Volumes II and III*) costs £14.00. Copies may be obtained at the special reduced prices of £10.00 for Volume I, £6.00 for Volumes II or III and £9.00 for Volume IV by *bona fide* crystallographers, who must give an undertaking when purchasing that the volume is for their personal use only. Orders may be placed direct with the publishers, The Kynoch Press, Witton, Birmingham B6 7BA, England, or with Polycrystal Book Service, PO Box 11567, Pittsburgh, Pa. 15238, USA, from whom prospectuses may also be obtained.

### Commission on Crystallographic Apparatus Exhibition of Non-Commercial Equipment and Visual Aspects of Crystallography at the

#### Eleventh International Congress of Crystallography

During the Eleventh International Congress of Crystallography, to be held in Warsaw, 3–12 August 1978, the Union's Commission on Crystallographic Apparatus is sponsoring two exhibitions, one of non-commercial crystallographic equipment and the other on visual aspects of crystallography. Crystallographers are invited to participate actively by displaying devices, gadgets charts, striking and unusual photographs, etc.

#### *Non-commercial equipment*

Items of interest to those attending the Congress include new designs or unique modifications of: cameras and diffractometers, high- and low-temperature attachments, high- and low-pressure equipment, crystal-growing apparatus, miscellaneous gadgets which are not intended for commercial exploitation.

The Committee will be able to furnish exhibition space and standard electric outlets (220 V, 50 Hz, 10 A single phase). Items requiring water or high power can be exhibited but not operated.

All potential exhibitors are asked to give the following information:

1. Name and address of exhibitor.
2. Description of apparatus.
3. Exhibition space required.
4. Storage space required (for shipping crates, spare parts, *etc.*).
5. Approximate weight and size of apparatus.
6. Whether or not electricity is required.
7. Whether the apparatus is to be shipped or brought by the exhibitor.

If the actual apparatus cannot be exhibited, then some material (reprints, preprints, schematic diagrams, photographs, *etc.*) describing the apparatus may be sent for display during the Congress.

#### *Visual aspects of crystallography*

Crystallographers and others are invited to participate actively by submitting striking and unusual photographs or drawings on crystallography or crystallographers. Special

attention is drawn to the possibility of submitting drawings which can be used in teaching crystallography.

The contributions should be mounted on standard mounting board (no glass or wooden framing) and may be accompanied by explanatory material if desired. Neither mounted print nor drawing nor explanatory material should separately exceed 2000 cm<sup>2</sup> in area (40 × 50 cm format preferred). Each contribution must have a caption and the exhibitor's name and address. Exhibitors may submit more than one item. The photographs and drawings will be judged primarily in terms of aesthetic appearance rather than technical interest or importance.

Potential exhibitors are asked to submit small prints of their proposed entries. They will be notified thereafter whether their contributions are suitable for the exhibition. Contributions will not be returned unless specifically requested; exhibitors attending the Congress will be required to remove their own contributions.

All potential exhibitors are invited to contact the Chairman of the Non-Commercial Exhibition Committee, Dr Stanislaw Szarras, Institute of Nuclear Research, Swierk Research Establishment, 05-400 Otwock, Poland. The deadline for all applications is 1 February 1978.

## Book Review

*Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.*

**Kristalle.** By J. BOHM. Pp. 166, Figs. 143+9 colour photographs. Berlin: VEB Deutscher Verlag der Wissenschaften, 1975. Price (cloth) DM 20.

This delightful little volume deals in an introductory fashion with almost all known aspects of crystals. It is written in a popular easy-to-read style yet there seem to be no scientific short-comings whatsoever.

It begins with the crystalline state as the normal form of solid matter, and leads on through the concept of crystal lattices, unit cells and the law of constancy of angle, to the principles of diffraction of X-rays by crystals. The second chapter deals with the electronic structure of atoms and types of bonding which are well illustrated by diagrams of simple crystal structures. Then follows an outline of symmetry elements together with descriptions of crystal classes and space groups. Next comes a section on crystal growth with

mention of natural and synthetic gem stones, semiconductor and laser crystals with descriptions of industrial techniques for producing and zone-refining single crystals. The final chapter deals with ice crystals, whiskers, crystal defects and liquid crystals. Appendices give diagrams of the 14 Bravais lattices and the 32 crystal classes with crystallographic data on a selection of well-known minerals.

The diagrams are most helpful and the colour photographs very beautiful. Altogether a lovely book which could be recommended as an introduction for a complete stranger to the subject as well as a refresher for those whose memories are shortening.

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## Books Received

*The following books have been received by the Editor. Brief and generally uncritical notices are given of works of marginal crystallographic interest; occasionally a book of fundamental interest is included under this heading because of difficulty in finding a suitable reviewer without great delay.*

**The physics and chemistry of minerals and rocks.** Edited by R. G. J. STRENS. Pp. xvi+697. Chichester: John Wiley, 1976. Price £19.50, \$39.75.

This book is based on a NATO symposium held in Newcastle, England, in April 1974. Of the 40 papers, three are of

crystallographic interest: *High-pressure crystal chemistry of orthosilicates*, by S. Akimoto, Y. Matsui and Y. Syono; *Crystal structures of pyroxenes at high temperature*, by C. T. Prewitt; and *Single crystal diffractometer analysis using a diamond anvil high pressure cell*, by W. A. Bassett, R. M. Hazen and L. Merrill.