Errata in den *International Tables for X-Ray Crystallography*, Vol. I (1. Ausgabe). Von ERNST SCHULTZE-RHONHOF, *Anorganisch-Chemisches Institut der Universität, 53 Bonn, Meckenheimer Allee 168, Deutschland*

1. Zu S. 377, Raumgruppe *Pm* (Nr. 6):
Die Phasenbedingungen müssen heissen:
Für *c* als $\bar{2}$: $\alpha(hkl) = -\alpha(hkl)$ und
für *b* als $\bar{2}$: $\alpha(hkl) = -\alpha(hkl)$.

2. Zu S. 426, Raumgruppe $P4_122$ (Nr. 91) und S. 429, Raumgruppe $P4_322$ (Nr. 95):
Die Phasenbedingungen für $l=4n+1$ und $l=4n+3$ müssen heissen:
$\alpha(hkl) = \ldots \quad \ldots = \pi - \alpha(hkl)$.

3. Zu S. 436, Raumgruppe *I4cm* (Nr. 108):
Die Phasenbedingungen für $h+k+l=2n$, $l=2n$ müssen heissen:
$\alpha(hkl) = \ldots \quad \ldots = -\alpha(hkl)$.

4. Zu S. 488, Raumgruppe $P6_3/mcm$ (Nr. 193):
Die Beziehung zwischen den Strukturamplituden $F(hkl)$ und $F(hkl)$ für $l=2n+1$ muss heissen:
$F(hkl) = -F(hkl)$.

Degeneracy between interlayer scale factors and b_{ii} in structure refinement. By E. C. LINGAFELTER, *Department of Chemistry, University of Washington, Seattle, Wash.* 98105, and JERRY DONOHUE, *Department of Chemistry, University of Southern California, Los Angeles, California* 90007.*

It is apparently not uniformly realized that the usual expression for the anisotropic temperature factor may be factored by removal of terms which vary with *h*, *k*, or *l* alone. It follows that when intensity data are collected by the Weissenberg method with rotation about only one axis, *i*, so that, in general, data affording interlayer scaling are wanting, then there is complete degeneracy between b_{ii} and the scale factors, and it is accordingly *impossible* to evaluate them individually. If a least-squares refinement is attempted which includes both the b_{ii} and the K_i as variable parameters, meaningless (and sometimes catastrophic) results, or a singular matrix, will be obtained. Data from a zero level Weissenberg photograph may be placed, by statistical methods, on an approximate absolute scale only if the corresponding projection is resolved. This situation does not hold for the upper levels: these cannot be scaled by such methods because of the above mentioned degeneracy.

Notes and News

Summer School in Boboty, Mala Tatra, CSR, 24–29 July 1966

This Summer School is organized by the Commission on Crystallographic Teaching of the International Union of Crystallography, with the sponsorship of the Slovak Academy of Sciences and the Komensky and Slovak Technical Universities (Bratislava). It will be devoted to the *Dynamical Theory of Diffraction by Crystals and its Applications* (*Study of Crystal Defects*).

The school is intended for teachers of crystallography and advanced students in crystallography and physics. There will be lectures and informal discussions.

The attendance fee will be *ca.* U.S.$10 per day, which includes full-board accommodation. The nearest airport is Bratislava. Bus services will be available from Bratislava to Boboty on 23 July.

For information and application please contact Dr F. Hanic, Institute of Inorganic Chemistry of the Slovak Academy of Sciences, Dubravska cesta, Patronka, Bratislava, Czechoslovakia, before 31 March 1966.

Shubnikov groups

The Publishing House of Moscow State University will shortly publish a book on the above subject, written by Professor V. Kopcik and edited by Academician N. V. Belov. It will contain about 700 pages and cost 2·30 roubles. It is expected that copies will be available through the X-ray Analysis Group of The Institute of Physics and The Physical

Society (47 Belgrave Square, London S.W.1, England), and The Polycrystal Book Service (P.O. Box 11567, Pittsburgh, Pennsylvania 15238, U.S.A.). As it contains many figures and much tabular matter, it may be expected to be of use even to those with only a rudimentary knowledge of Russian.

Although the subject appears rather abstract, it has a very wide application in connection with the properties of magnetic materials, and the Shubnikov groups have been much studied by scientists in the USSR from 1951 onwards. This monograph is the first to give a general account in a form convenient for practical purposes. It contains the full group-theoretical and geometrical description of the 1651 space groups of anti-symmetry. For 1191 of them it gives drawings of symmetry elements and general positions in two colours, table of coordinates and symmetries of equivalent sets in magnetic unit cells, tables of subgroups, and other information. It is claimed that the tables make it as simple to work with Shubnikov groups as with the classical groups, and that the book will be invaluable to research workers in the fields of solid-state physics, magnetic properties of solids, and crystal-structure determination.

Book Reviews

Works intended for notice in this column should be sent direct to the Editor (A. J. C. Wilson, Department of Physics, The University, Birmingham 15, England). As far as practicable books will be reviewed in a country different from that of publication.

Symmetry aspects of M. C. Escher's periodic drawings. By CAROLINE H. MACGILLAVRY. Pp. xi + 84. Utrecht: Published for the International Union of Crystallography by A. Oosthoek's Uitgeversmaatschappij NV, 1965. Price F. 24.

The Song of Solomon speaks of certain things 'for delight', and no phrase could be more appropriate when applied to this beautifully produced book. The late Professor G. H. Hardy considered aesthetic content to be essential for the most creative work in mathematics, indicating a fundamental grasp of form and rhythm. Here, in the periodic drawings of M. C. Escher, a Dutch artist, this principle is plain to see. By itself alone, however, it might be a trifle inaccessible, and so we are given the services of a distinguished cicerone in the person of Professor C. H. MacGillavry of Amsterdam. Under her sure guidance the reader is skilfully conducted through such regions of the theory of symmetry as are necessary for a tolerable grasp of the full significance of these patterns, several of them produced in full colour.

It is well to recollect at once that those designs are all two-dimensional, and are close-packed in the sense that there is no redundant amorphous background, the whole effective area being filled with meaningful shapes, in fact animals and flowers. At first sight this presents, as might be expected, a problem in *Gestalt*; it is not always easy to grasp immediately the existence of visual forms in the matrix, if the primary grouping is very strong. This in itself is an interesting psychological effect often used in the testing of visual acuity, coupled with brain reactions of the observer. But having overcome this temporary hazard, the reader will soon find himself engrossed in these examples of symmetry, translations, glide-lines, rotations, and all the rest. Individual *motifs* are analogous to large organic molecules, partitioned, as in formal crystallography, into unit cells of greater or lesser complexity.

The volume is divided into three main sections: I, patterns with classical symmetry, II, patterns with black-white symmetry, and III, patterns with polychromatic symmetry. (Class II is actually composed of two-colour symmetry, reduced to black-white for convenience.) In addition, there is an index of crystallographical expressions which,

by the way, are in full accord with those of the International Union (Fifth Congress, Cambridge, 1960). We are reminded that, using these notations carefully, there is much to recommend these plates for teaching purposes as at least as instructive as the conventional arrays of balls and wires constituting our stock-in-trade of crystal models. It is intriguing to compare them with the 'appearance' of any one layer in a *Schichtengitter* such as graphite, and then to enlarge one's conception to a much diversified unit of pattern. In one respect at least the artist has the advantage over nature; there are no *Lockerstellen* with which to contend, nor the deformations resulting from slip planes. How all this would have delighted the late Sir George Beilby in his pioneering research on crystal gliding!

There is a profound element of epistemology to be noticed here, and that is that the draughtsman has been able to select at will any configuration which consciously or unconsciously leads the eye to satisfaction; an example of the law of *Prägnanz*, uninhibited by considerations of mechanical or electrical stability. This is the type of morphogenesis which may prove the harbinger of future developments in theoretical biophysics – the need for a major breakthrough to some new phase of quantum mechanics applicable to living systems, even perhaps to those of the stylized creatures displayed in this volume. D'Arcy Thompson's *Growth and Form* was not a great distance away in conception.

Two other matters remain for comment, and a third for passing reference. The first is the important reminder that X-rays are 'blind' to the difference between certain centres such as K^+ and Cl^- set in a row, as also to the orientation of magnetic moments, whereas these finer points are picked up by neutron scattering. Our author notes this one in plate 14, where a 'colour-blind' observer, who could distinguish contour but not shade, would probably class the black and white Pegasus beasts as a true translation, whereas in strict geometry this is not so.

The second point is more speculative, and refers to the coloured designs in section III. Here is portrayed the great, and fairly novel, subject of colour symmetry: some basic examples, attractive to the eye, are before us. But there must be some connexion, albeit only a circumscribing one,