Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (R. F. Bryan, Department of Chemistry, University of Virginia, McCormick Road, Charlottesville, Virginia 22901, USA). As far as practicable, books will be reviewed in a country different from that of publication.

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Reflections on symmetry in chemistry ... and elsewhere. By E. HEILBRONNER and J. D. DUNITZ. Illustrated by R. PFALZBERGER. Pp. 154. Basel: Verlag Helvetica Chimica Acta, and Weinheim: VCH Verlagsgesellschaft mbH, 1993. Price DM 58.00. ISBN 3-906390-01-2 (Basel), 3-527-28488-5 (Weinheim).

A lecture given by Edgar Heilbronner at the Erni museum in Lucerne in 1980 dealt with the area between science and art. The audience was described as 'non-specialist,' and the lecture was later published. Several scientists clamored for a translation into English, particularly Vladimir Prelog, Sason Shaik, M. Volkan Kisakurek and Jack D. Dunitz. The text was translated by Dunitz and augmented during this process. The result is a jewel of a book covering many aspects of symmetry, that subject so interesting to the crystallographer. The heaviness and mathematics of the subject of symmetry have been thrown to the winds, and been replaced by marvellous illustrations, some new and some of historic interest, and by a clear and lucid text that makes one read the book from cover to cover without stopping. The authors admit that 'the interconnection between the playful aspect of symmetry on the one hand and an exact science on the other is not at all simple.' They have had to steer between 'the Scylla of irresponsible superficiality and the Charybdis of unintelligible jargon'. In this they have done an excellent job. The book provides a splendid introduction for a scientist to use when explaining concepts such as symmetry to non-scientific friends.

It is shown for example, how the decorative symmetry of tiling by the Moors in the Alhambra palace in Granada provided an inspiration for Maurits Escher who, unlike the Moors, could use animals, fishes, birds and lizards in his designs. Also discussed is how human ideals of beauty involve symmetry of some kind or other. The association that Plato (*circa* 400 BC) made between polyhedra and the four elements - a tetrahedron for fire, an octahedron for air, a cube for earth and an icosahedron for water - is described and illustrated.

And so the authors lead us through a history of the principles of symmetry and the stories associated with the understanding of such symmetry in molecules and crystals that have been described in the old literature. The snowflake, which intrigued Johannes Kepler because of its sixfold symmetry, provides a stepping stone for this and leads eventually to the discovery of the structure of benzene by Auguste Kekulé around 1860. This was a natural sequel to the idea of the tetrahedral C atom and the importance of three dimensions to our understanding of basic chemistry.

From there the authors proceed to chirality, invoking, as do so many, the works of Lewis Carroll. That really points out the genius of Carroll, because he has produced a series of stories that all children love, yet which can be used to illustrate mathematical points. Surely, in the context of symmetry, one of the best quotes is 'Perhaps looking-glass milk isn't good to drink'. The problem of mirror-image proteins has recently been addressed, and it has been shown that an enzyme composed entirely of D-amino acids acts on the mirror image of the substrate of the normal enzyme!

But, as good chemists, the authors also lead us to chemical reactions and the impact of symmetry on our ability to predict the outcomes of these. The chemistry involved is only touched on lightly but, as in many other instances in the book, provides a stepping stone to a further study or exposition on the subject.

To keep us alert, the authors present some elementary puzzles that the reader will really enjoy. This was a wonderful book to review. It belongs on the bookshelf among other books on the beauty and joys of crystallography and the ways to interest any of your non-scientific friends, or students for that matter, in the endlessly fascinating subject of symmetry.

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