

## book reviews

Works intended for this column should be sent direct to the Book-Review Editor, whose address appears in this issue. All reviews are also available from **Crystallography Journals Online**, supplemented where possible with direct links to the publisher's information.

**Le cristal et ses doubles.** By Jean-Claude Boulliard. Pp. 347. Paris: CNRS Éditions, 2010. In French. Price (hardcover) EUR 59. ISBN 978-2-271-07049-4.

*Le cristal et ses doubles* ('The crystal and its doubles') is a book on the twinning of crystals with the subtitle *Historical, scientific and descriptive review of twins and, casually, of epitaxy in the world of minerals and the laboratory*. Its author is the director of the Collection de Minéraux de l'Université Pierre et Marie Curie (UPMC), located in the Laboratoire de Minéralogie-Cristallographie de Paris (renamed in 2005 to Institut de Minéralogie et de Physique des Milieux Condensés). The book was written in conjunction with a temporary exhibition of twinning and epitaxy held in the Collection de Minéraux. It contains a preface by Professor Hubert Curien. The book is divided into three parts.

Part I, *Historical survey of the studies of twins and epitaxy until Friedel*, presents a comprehensive review of the early observations of twins, starting with the first description by the French mineralogist Romé de l'Isle in the second half of the 18th century, followed by sections treating the works of Haüy, Delafosse, Pasteur, Bravais, Mallard, Wallerant and Friedel. Whereas the earlier treatments were mainly based on morphological features, a new aspect of twinning was introduced by the lattice concept of Bravais, which was further developed by Mallard and found its completion in Friedel's lattice theory of twinning. A short section is devoted to epitaxy, here understood as the oriented intergrowth of crystals of different composition. The detailed descriptions are accompanied by many figures and literal quotations reproduced from the original articles, together with portraits of their authors.

Part II, *Descriptions and theories of twinning and, casually, of epitaxy*, starts with a short section on the definition of twins given by various researchers, followed by two chapters dealing with their morphological description and classification by twin laws, and the recognition and characterisation of twins. The next, very detailed, chapter is devoted to the lattice theory by Friedel, who introduced the twin lattice (coincidence site lattice, *reseau de macle*), the twin index and the classification into twins by merohedry, reticular merohedry, pseudo-mero-

hedry or reticular pseudo-merohedry. Later, this classification was supplemented by another grouping into triperiodic, diperiodic or monoperiodic twins (called 'Friedel's last theory' by Boulliard). These approaches and treatments of twinning are further discussed in detail with consideration of publications of other authors, including those who encounter Friedel's purely geometric theory with some criticism, suggesting instead a low energy of the twin boundary as the critical parameter for the occurrence of twins. Further chapters in Part II deal with the group-theoretical treatment of twins (black-white and colour groups, twin composite groups, twin law and coset decomposition), with the genesis of twins (growth, mechanical and transformation twins) and with twin boundaries (composition planes). Part II closes with a short section on epitaxy.

Part III, *Famous twins in the world of minerals*, presents an extraordinarily rich and systematic collection of natural twins. It is grouped according to crystal system, from cubic to triclinic symmetry. Numerous illustrative drawings and excellent colour photos of selected beautiful twin aggregates are given, accompanied by detailed descriptions and explanations – a treasure for fans and collectors of minerals. Also included are short sections on mimetic twins and epitaxial intergrowths.

The list of bibliographic references, from 1751 to 2010, is very comprehensive and – in the referees' opinion – complete with respect of the history, descriptions and theories of twinning. All references are given with their full titles, filling 12 pages of the book, which is concluded by three appendices: the etymology of the term 'twin' and related terms, a resumé of the crystallographic theories of twins, and a glossary.

*Le cristal et ses doubles* is an opus of encyclopaedic character which will attract the interest of mineralogists, crystallographers and mineral collectors. A disadvantage is that it is written in French, which will strongly reduce its attraction in the non-Francophone section of the scientific community. A translation into English is strongly recommended.

### H. Klapper and Th. Hahn

Institut für Kristallographie, RWTH Aachen University, Jägerstrasse 17–19, D-52066 Aachen, Germany