# Book Reviews

*Works intended for notice in this column should be sent direct to the Book-Review Editor (R. O. Gould, Department of Chemistry, University of Edinburgh, West Mains Road, Edinburgh EH9 3JJ, Scotland). As far as practicable books will be reviewed in a country different from that of publication.*

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**Modern crystallography. IV. Physical properties of crystals.** By L. A. SHUVALOV. Pp. xviii+583. **Springer series in solid state sciences 37.** Berlin: Springer-Verlag, 1988. Price DM 198.00.

This book is the final volume of *Modern Crystallography*, and completes the series whose other components are: I. *Symmetry of Crystals and Methods of Structural Crystallography*; II. *Structure of Crystals*; and III. *Crystal Growth*. These volumes are a somewhat updated English translation of the original Russian *Sovremennaya Kristalografiya*, published by the Nauka Publishing House, Moscow, in 1981. It is written by a large group of authors from the USSR Academy of Sciences.

The first chapter is a kind of mathematical introduction, summing up the fundamentals of tensor and symmetry descriptions and enabling the reader to understand what is discussed in the following chapters. The second chapter deals with the mechanical properties of crystals, focusing on the three basic characteristics of elasticity, plasticity, and strength or resistance to failure. The role of dislocation in these phenomena is discussed in detail. The chapter concludes with methods for studying the mechanical properties of crystals. The electrical properties of crystals are presented in chapter 3. Among the phenomena discussed, pyroelectricity and piezoelectricity are widely used in practice, especially in the field of ferroelectrics.

In the discussion of the magnetic properties of crystals (chapter 4), the reader is introduced to the realm of magnetic symmetries (coloured space groups) starting from the common space-group symmetries. Chapter 5 is devoted to semiconducting materials. In comparison with other chapters, this one is more phenomenological; structural aspects are not emphasized. Transport phenomena in crystals are described in chapter 6. Along with others, the Hall and magnetoresistance effects, widely used in science and technology, are given a thorough discussion.

Chapter 7 starts with the description of classical optical phenomena including reflection, interference, birefringence and optical activity. It is then continued with a report of electro-, magneto-, piezo-, and nonlinear optical properties, which are gaining more and more important applications in practice. The spectra of impurity crystals are interpreted in terms of crystal-field theory.

The last chapter is concerned with liquid crystals. Following a description of the four main types of liquid crystals (smectic, nematic, cholesteric and lyotropic), the theory of the liquid crystal state and the magnetic, electrical and thermal properties of liquid crystals are reviewed.

References for each chapter are summarized at the end of the book. I have some criticisms to make of these references. Since the book is a translation of a Russian original published in 1981, even the latest references are more than 10 years old. Moreover, these references are normally given without title, and, as they are rarely actually cited in the corresponding chapter, it is extremely difficult to discover which ones are relevant to a particular topic.

The style of the book and all the figures are very clear, so it can be recommended to undergraduate and postgraduate university students and to all scientists interested in the solid-state sciences.

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**Handbook of the physics and chemistry of rare earths.** Vol. 11. Edited by K. A. GSCHNEIDER and L. EYRING. Pp. v+612. Amsterdam: Elsevier Science Publishers, 1988. Price Dfl 350.00.

This is the eleventh volume in a series published over the last ten years on the rare-earth elements (REE). It opens with a biographical prologue by H. J. Svec on F. H. Spedding, whose interest and pioneering work on rare-earth elements spanned over 50 years, forming a basis for much of the work that led up to and followed on from the Manhattan Project, and resulted in the establishment of the Ames Laboratory as a US and world centre for research on rare-earth elements.

The rest of the volume consists of seven chapters, some of them on more or less specific aspects of REE research (*Atomic theory and optical spectroscopy*, by B. R. Judd; *Highlights from the exotic phenomena of lanthanide magnetism*, by J. J. Rhyne; *Magnetic resonance spectroscopy and hyperfine interactions*, by B. Bleaney; *Physical metallurgy*, by K. A. Gschneider Jr and A. H. Daane), and three with a rather wider basis. Of these latter, the first is an interesting if inevitably complicated account of the history of the discovery and separation of the REE by F. Szabadvary of Budapest. This includes 'thumbnail sketches' of the biographies of most of the principal workers concerned, from Arrhenius to Moseley.

The chapter by C. K. Jorgensen, entitled *Influence of rare earths on chemical understanding*, is a fascinating ramble through many aspects of chemistry and physics as illumined by research on REE and their compounds. It is characteristically eccentric in places, and at times seems to wander rather far from the rare earths, but overall gives an impression of a lively mind appreciating a variety of detailed work, his own and other people's, making connections over a range not attainable by most of us. There is a certain amount of overlap with other chapters, but this is inevitable given the universal scope of this chapter!