

Book Reviews

Simon L. Altmann: Induced Representations in Crystals and Molecules. London–New York–San Francisco: Academic Press 1977, 369 pp., price: £18.00/\$35.25

This is an advanced book on applied group theory for graduate students and researchers in solid state physics and theoretical chemistry rather than a book that could serve as a textbook for beginners to be introduced to group theory. It provides a rigorous treatment of the theory and the application of induced representations in finite groups.

Chapters 1–12 present an introduction of basic definitions and general results of group theory. The following three chapters are indeed the backbone of the theoretical development in this book. It starts with Mackey's theorem and its extensions, elucidating the properties of induced representations, where Altmann stresses the elegance and economy which can be achieved through Mackey's work. The little groups and orbits are discussed next, which are important in the reduction of semidirect products.

The remaining part of the book is devoted to applications. Chapter 17 deals with space group theory developed non-traditionally for non-symmorphic groups, with symmorphic groups as special case. Selection rules in crystals are treated in Chapter 18. The last two chapters deal with two topics of Altmann's own research interests, namely the semidirect product in point groups and nonrigid molecules. This part contains a thorough discussion of the meaning of symmetry operations for electronic, vibrational, and vibronic states in molecules. On that subject such a presentation with so many details is hardly found otherwise.

The pedagogical structure of the book demonstrates Altmann's experience in lecturing. He has devoted Chapter 0 to his elaborate system of references, the notation, and symbols. At first glance this referral system looks complicated, because it is new, but the reader is urged to get acquainted with this scheme, because he will find it extremely useful in following a proof or derivation, which in all important cases is given line by line and fully cross-referenced. Furthermore, Altmann has helped those many readers who start such a book somewhere in the middle, by beginning each chapter with brief introductory remarks on purpose and theorems required, so the reader can refer back for necessary background.

In my opinion this book can be recommended to readers interested in solid states physics or theoretical chemistry, provided they have some experience in elementary group theory. What makes this a distinguished book on group theory, is – besides content – the fact that Altmann has put a real effort into its form in general, the referral system and the clear notation in particular.

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