From reviews of Electronic Structure of Materials

From a review by Volker Heine in *Contemporary Physics*

This book is a giant step forward in teaching the electronic structure of solids in a way which is better related to the facts about materials one wants to understand. It differs from earlier texts in several ways. A reasonably thorough discussion of the (heteronuclear) chemical bond is introduced early on, and this chemical picture is maintained throughout the book. It runs alongside the electron gas or band structure view, and the relation between the two is emphasised.

Thus we have the reason for transition metals having different structures discussed in terms of bond order, developed as a quantitative tool. Similarly the ideas of hybridisation and electronegativity are applied throughout, and the reader is taken back and forth between k-space and real space according to whichever is more appropriate. An important feature of the real-space approach is that it can be used , indeed has to be, in discussing defective solids, surfaces and amorphous materials. For example, a demonstration is included that a tetrahedral bonding model of amorphous silicon leads to a band gap between valence and conduction states: it has nothing to do with band theory. But the treatment is not all basic theory: a more empirical element is the universal scaled binding curve and the structure map of alloys and compounds. At the same time the treatment is right up to date in some of the applications and in describing where current computations can take us …

Translated from a review by H Teichler in *Physikalische Blätter* in German

This book is very much to be welcomed, as it fills a gap in the introductory literature on the electronic structure of solids. It is suitable as an exposition of the modern view of the subject to students of physics, chemistry and materials science at an early stage, and is useful for anyone who would like an introduction to this approach to the electronic structure of solids.

From a review by Gyaneshwar Srivastava in *Physics World*

The author uses simple models to gain insights and basic understanding of the electronic structure and properties of materials. He also outlines the essence of a modern theory, and points out situations where band theory breaks down.

Without recourse to mathematical complexity Sutton discusses the basic concepts of energy bands using the reciprocal space (k-space) description of free and nearly free electron models based on Bloch's theorem , and the origins of band gaps using the real space atomic/chemical picture.

One of the main achievements is the provision of a qualitative real-space treatment. This is based on simple models of bond energy and the moments theorem. These relate the local density of states to the topology of the local atomic environment so as to explain trends along a group and across the transition metal series. This is followed by identification of atomic factors influencing the crystal structure of compounds. … Sutton presents an elementary account of the density functional theory and its application in semiconductors and metals.

Review of the German translation of the book in *Zeitschrift für Kristallographie*

A modern introduction to the electronic structure of real, defective crystals and non-crystalline materials has been missing - until now. In real materials defects influence the electronic structure. Models based on the linear combination of atomic orbitals (LCAO) are presented which take this into account. They are compared with "momentum space models" (e.g. band theory) and the strengths and limitations of both approaches are discussed using examples. The book will be of interest to lecturers and postgraduate students of solid-state physics, chemistry and materials science.