Out of the Crystal Maze: Chapters from the History of Solid-State Physics. Edited by Lillian Hoddeson, Ernest Braun, Jürgen Teichmann, and Spencer Weart. Oxford University, New York, 1992. Price: $75.00 ISBN 0-19-505329-X. (Reviewed by Zuoyue Wang.)

Considering the central importance of solid-state physics in both science and society, it is strange that little historical research has been conducted. *Out of the Crystal Maze* partly remedies this deficiency. The product of an international effort, it traces the developments of solid-state physics from its roots in the 19th century to maturity during the 1950s.

A helpful but relatively short "Preface" by the editors sketches several unique features of the history of solid-state physics. Research in the field focused on real instead of ideal materials. It emphasized impurities, approximation, and measurement. From the beginning, it forged close ties with industry. The Nazi-forced emigration of scientists from Europe to the United States and Britain made a great impact on the development of solid state physics, as did military funding in the period following World War II.

An effort to mesh technical and social developments is evident in all nine chapters of the book. Each is painstakingly constructed from original publications, correspondence, and interviews with the scientists. Much of the massive volume is densely written and requires some understanding of quantum mechanics.

As with a number of new fields in physics, solid-state physics grew out of the quantum revolution in the 1920s. To be sure, studies of solids were deeply planted in physics and fertilized by industrialization before 1925, as shown by Michael Eckert *et al.* in chapter one. Landmark discoveries in this period included Max von Laue's explanation of x-ray diffraction by crystals in 1912. But the formulation of a coherent electron theory of metals, which formed the foundation of solid state physics, had to await the arrival of quantum mechanics in 1925. Lillian Hoddeson *et al.* in chapter two provide an exciting account of this development. They place the applications of quantum mechanics to solids, usually sidelines in the history of quantum physics, refreshingly onto center stage. Werner Heisenberg and Wolfgang Pauli were the intellectual leaders, while Arnold Sommerfeld acted as a powerful (institutional) godfather of a gang of talented young physicists involved in the investigation. Among them were Enrico Fermi, Paul Dirac, Felix Bloch, Rudolf Peierls, Hans Bethe, John Slater, and Lev Landau. As a commentary on both their versatility and the lack of rigid specialization in that era, many of the group became leaders in nuclear physics as well.

The next turning point was the formulation of the band theory of solids and its application to real solids in the 1930s. This marked the beginning of modern solid state physics. The band theory postulates that conduction electrons in solids occupy a series of energy bands that correspond to the electronic shells of atoms. Frederick Seitz and his mentor Eugene Wigner perfected this theory out of earlier work by Bloch and others. They applied it successfully for the first time to a real material, sodium. Seitz's great impact on solid-state physics, both scientifically and organizationally, is highlighted in chapter three by Paul Hoch with Krzysztof Szymborski, and in chapter four on color centers, by Jürgen Teichmann and Szymborski. These two chapters also describe the work of other major solid-state physicists and institutions, such as Robert Pohl at Göttingen, Slater at MIT, Nevill Mott at Bristol, and the Russian schools.

The next four chapters deal topically with the history of research on mechanical properties of solids (chapter five by Ernest Braun), magnetism and magnetic materials (chapter six by Stephen Keith and Pierre Quédec), semiconductors (chapter seven by Braun), and collective phenomena such as superconductivity (chapter eight by Hoddeson *et al.*). Out of these diverse pursuits, Spencer Weart (chapter nine on the "solid community") makes a welcome attempt to look at the big picture of solid-state physics in terms of the institutional evolution of the field. One wishes there were a similar chapter to synthesize the intellectual developments.

The international collaboration that marks this impressive work encouraged not only additional materials but also perspectives that might otherwise have been neglected. Given the diversity of the subject matter and the limited resources available, the book's shortcomings in cohesion and integration are perhaps inevitable and are freely conceded by the editors. (There are some thoughtless errors—Joseph McCarthy's Permanent Investigations Subcommittee of the Senate was made into "Senator Eugene McCarthy's House UnAmerican Activities Committee" on p. 537.) Nonetheless, all the authors and editors clearly deserve great credit for laying a solid foundation for a history of solid-state physics.

Zuoyue Wang is a Ph.D. candidate in history at the University of California, Santa Barbara, specializing in the history of modern physics. His dissertation examines the rise and fall of the US President's Science Advisory Committee.

Data Reduction and Error Analysis for the Physical Sciences, 2nd ed. (Includes floppy disk.) Philip R. Bevington and D. Keith Robinson. 328 pp. McGraw-Hill, New York, 1992. Price: $22 (approx.) (paper) ISBN 0-07-911243-9. (Reviewed by Gerry Bunce.)

This small book covers the basic techniques of statistical data analysis used in, at the least, experimental physics. Generally, I have found that people in my field of experimental particle physics have learned some or most of these techniques in a very haphazard, anecdotal way. You have some data you are trying to analyze, and you start asking around, eventually stumbling onto an acceptable technique, and you go no farther. The reason is, of course, that statistical techniques are boring, unless that is your métier. So, is this book boring? In fact, it is not. It is very well written, clear, and without academic pedantry.

This book is a second edition, and I understand that the first was a standard reference for university physics labo-