amination of the resulting connectivity relations. In the last part of the book, a brief discussion of Dirichlet domains introduces the concepts of nearest neighbors, space lattices and polyhedra inscribed within orthogonal lattices.

Space Structures concludes with a photographic essay of two ways in which a pair of cubes may be transformed into a rhombohedral dodecahedron. In the first, each cube is divided into eight unsymmetric triangular bipyramids formed by bisecting each original face along a diagonal. In the second, the cube is divided into six square pyramids with cube faces forming the square base. A similar transformation performed in the classroom with the aid of models would make an effective lecture demonstration.

The loftier objectives of the book are scarcely met, unless they are attained subliminally. There is a tendency to explore the individual trees in the forest of basic form, harmony and design too thoroughly, at the risk of failing to uncover the shape of the forest itself. While the book provides a very readable first text on the study of polyhedra, those interested in the wider applications of symmetry to the design sciences will find they must look elsewhere.

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Low Energy Electron Diffraction: The Theory and Its Application to Determination of Surface Structure

J. B. Pendry
407 pp. Academic, New York, 1974.
$22.25

The Davisson–Germer experiment reported in 1927 was the first observation of low-energy electron diffraction (hereafter called "LEED") from a crystal surface. But it has been only within the last decade that the great potential value of LEED as a practical analytical tool in the study of surfaces has begun to be realized to a significant degree. This advance has come about not only because of experimental refinements, but also due to the development of multiple-scattering theory for surfaces and practical computational schemes for evaluating this theory in order to extract the structural information buried in the data of a LEED experiment.

In this monograph John Pendry, who is a prominent contributor to the recent development of LEED theory, has set out to provide a comprehensive guide to the new forms of LEED theory and their use in characterizing surface structures.

He presents the various forms of LEED theory in a coherent and detailed account

that begins with scattering theory at the level appropriate to a student who has completed the first graduate quantum-mechanics course in physics at an American university.

The first two-thirds of the book Pendry devotes to the presentation of this account of the theory, together with qualitative discussion of why the experiments produce the results they do and quantitative discussions of some applications of the theory to the interpretation of experiments in surface-structure analysis. The last third of the book gives a complete set of working FORTRAN computer programs for carrying out LEED calculations according to the theories discussed in the first part of the book. These programs are well documented by means of very apt COMMENT cards, discussions of setting up the mathematics for programming and a comprehensive set of test runs. This feature of the Pendry volume is bound to evoke memories of the appearance of Terry Loucks' book on the APW method and the impetus it gave to electronic energy-band calculation; Pendry's book should be every bit as influential in surface science. Although the programs in the book are not generally available in machine-readable form, Pendry informs me that those portions based on the renormalized forward-scattering perturbation theory are available in alternative form [J. Rundgren and A. Salwén, *Computer Phys. Commun.* **9**, 312 (1975)].

The book succeeds so well in its primary objective of preparing the reader for carrying out "state-of-the-art" LEED calculations that perhaps a cautionary note on its limitations should be raised here. Surface science has continued its rapid development since the book's completion, so that the discussions of the interpretation of particular experiments in the book should not be read in all cases as authoritative statements of consensus; subsequent critical reviews should also be consulted (such as, for LEED, C. B. Duke, *Adv. Chem. Phys.* **27**, 1 (1974) and S. Y. Tong, *Prog. Surf. Sci.* **7**, part 1 (1975), as well as T. N. Rhodin and S. Y. Tong, PHYSICS TODAY, October 1975, page 23). In sum, however, the book's shortcomings are rather minor for a monograph in such a rapidly developing field.

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Statistical Mechanics

D. A. McQuarrie
641 pp. Harper and Row, New York, 1976. $29.95

Reviewing Donald McQuarrie's *Statistical Mechanics* reminds me that it has been 20 years since the appearance of Terrell Hill's excellent and influential