

surfaces of semiconductors and insulators, but I would not recommend it for learning the more modern aspects of the subject.

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Surface Crystallography: An Introduction to Low Energy Electron Diffraction

L. J. Clarke
329 pp. Wiley, New York, 1985. \$59.95

The substantial growth of work on surface structure in the last few years and the continuing important contribution of low-energy electron diffraction to that field have made the present a good time for a new text on LEED. This book by Lionel J. Clarke, an experienced user of LEED in the study of surface structure, is a useful and timely text that discusses informatively many features of modern work on LEED, including topics that previous texts do not cover. It should serve well both as an introductory text and as a reference with which active research workers in surface physics can review and amplify their knowledge of particular topics.

Among the notable features of the book is a detailed treatment of the geometry of the surface structure of crystals and its relation to diffraction patterns. The discussion provides practical illustrations of how to deduce the geometry of substrates and overlayers from the observed patterns, including how to deal with incommensurate overlayers or stepped substrates. Modern LEED experimental technique and instrumentation are extensively discussed and well illustrated by numerous figures. The text explains carefully the requirements and advantages of different instruments and offers many critical judgments about the relative merits of various experimental procedures. A valuable chapter on the comparison of theoretical and experimental results places particular emphasis on the now essential reliability factors (r factors); Clark provides explanations and comparisons of several r factors, accompanied by detailed illustrations, critical comments and notes on the refinement of crystal structures. Also noteworthy are a survey of currently used computational approaches and computer programs for LEED intensity calculations and a survey and comparison of LEED with selected other surface analysis techniques, with notes on the special capabilities of each technique.

The least successful part of the book is the attempt to sketch the mathematical development of electron scattering theory. Material as complex as the

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multiple scattering theory used in LEED intensity calculations requires careful definitions, precise formulations and detailed derivations to be useful. The mathematical developments in the chapters on scattering of electrons by crystals, multiple-scattering calculations and kinematic theory are both too sketchy and marred by too many errors to be followed by readers new to the theory. The discussion of scattering potentials and phase shifts in chapter 3 is useful, although it contains perhaps too much material on phase shifts; there are errors in the radial equation and its solution and in the equations for the scattering amplitude. The plane-wave expansion formula is in error, and the corresponding figure referred to in the text is absent. The attribution of the KKR method of band theory to Hendrik Kramers, R. Kronig and Norman Rostoker (page 156) is incorrect. The mathematical formulation of kinematic theory in chapter 6 has too many errors and misprints to be useful and is not really needed in the informative discussion of kinematic theory applied to defects, steps, domains and so forth that follows in the chapter.

Clarke is to be commended for producing a readable, up-to-date, well-informed and critical text on a rich variety of topics in the application of LEED to surface structure studies. There is a wealth of practical lore that researchers will appreciate, as well as an extensive bibliography with which to pursue topics in detail. Personal taste of course enters into the choice of topics, but I would have preferred a chapter on the remarkable and fundamental phenomenon of relaxation on clean metal surfaces, which has been the subject of so much LEED work in the last few years, to the long chapter on temperature effects in LEED. The survey of other techniques (chapter 8) should have presented more discussion of ion scattering (particularly medium-energy ion scattering and the double alignment technique) in view of its many quantitative contributions to surface structure studies. I hope a second edition will be without the rather large number of misprints.

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book note

Annual Review of Astronomy and Astrophysics, Volume 24

Edited by Geoffrey Burbidge. viii + 627 pp. Annual Reviews, Palo Alto, Calif., 1986. \$44.00 US; \$47.00 elsewhere

At a minimum, even the most isolated research astrophysicists would un-

doubtedly include *Annual Review of Astronomy and Astrophysics* among their subscriptions. Since 1963 astrophysicists have looked forward each year to the September publication of the by now familiar blue volume containing authoritative, up-to-date technical review articles at about the beginning graduate student level. The current volume contains 15 reviews of solar physics, active galaxies, magnetic fields in spiral galaxies, pulsars, supernova explosions, mass loss from stars, evolution of massive stars, stellar populations, Galactic star counts, stellar molecules, interstellar ionized hydrogen gas, high-resolution observations of interstellar gas, charge-coupled devices and maximum-entropy image restoration. Starting with volume 15, distinguished older astrophysicists have written the prefatory chapter describing the personal perspective gained in a lifetime in astrophysical research—the current volume contains an essay by A. E. Whitford.

—PER H. ANDERSEN

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Sound, Structures, and Their Interaction. Second edition. M. C. Junger, D. Feit. 448 pp. MIT P., Cambridge, Mass., 1986. ISBN 0-262-10034-7. \$45.00. Text

Theoretical Acoustics. P. M. Morse, K. U. Ingard. 927 pp. Princeton U. P., Princeton, N. J., 1986. ISBN 0-691-02401-4. \$75.00. Reprint of 1968 McGraw-Hill text

Astronomy, cosmology and space physics

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Astronomy and Astrophysics Abstracts, Vol. 39: Literature 1985, Part 1. S. Böhme, U. Esser, W. Fricke, H. Hefele, I. Heinrich, W. Hofmann, D. Krahn, V. R. Matas, L. D. Schmadel, G. Zech, eds. 1149 pp. Springer-Verlag, New York, 1986. ISBN 0-387-16032-9. \$79.00. Reference

Astronomy and Astrophysics Abstracts, Vol. 40: Literature 1985, Part 2. S. Böhme, U. Esser, W. Fricke, H. Hefele, I. Heinrich, W. Hofmann, D. Krahn, V. R. Matas, L. D. Schmadel, G. Zech, eds. 1096 pp. Springer-Verlag, New York, 1986. ISBN 0-387-16655-6. \$95.00. Reference

Astronomy and Astrophysics Abstracts, Vol. 41: Literature 1986, Part 1. S. Böhme,

U. Esser, H. Hefele, I. Heinrich, W. Hofmann, D. Krahn, V. R. Matas, L. D. Schmadel, G. Zech, eds. 1114 pp. Springer-Verlag, New York, 1986. ISBN 0-387-17252-1. \$110.00. Reference

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Data Analysis in Astronomy II. *Ettore Majorana International Science Series: Physical Sciences* 27. Proc. Wksp., Erice, Italy, April 1986. V. Di Gesù, L. Scarsi, P. Crane, J. H. Friedman, S. Levialdi, eds. 399 pp. Plenum, New York, 1986. ISBN 0-306-42473-8. \$69.50

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