

conductor surfaces and interfaces. As noted in the foreword of this monograph by Winfried Mönch, the subject uniquely combines aspects of physics and chemistry in addressing important questions on which new technologies may be based. This is particularly the case in microelectronics and optoelectronics where, with a view towards advanced applications, there has been a concerted effort to develop a fundamental, atomistic understanding. Progress in both theoretical sophistication and the development of experimental probes, notably scanning tunneling microscopy, have led to other advances that make possible the fabrication and eventually the use of epitaxial, atomic-scale structures in devices.

For example, several monographs and edited volumes by Simon Min Sze and others have already been devoted to discussion of microelectronics device theory, fabrication and application. Similarly, surface physics has been discussed in other texts, such as *Physics At Surfaces* by Andrew Zangwill (Cambridge, 1988). Mönch's monograph is unique, however, because his focus on the fundamental aspects of semiconductor surfaces and interfaces develops the subject from the point of view of a surface scientist who himself has made several important contributions in this area. In this regard, it builds a bridge from surface science to electronic-device applications.

The book starts with a brief but well-developed historical introduction, extending back to the discovery of rectification in 1874. The subsequent set of chapters presents the theoretical aspects of semiconductor surfaces, including space charge, surface states, band bending and surface photovoltage effects. This segment is properly completed with a chapter discussing interface states existing in metal-semiconductor and semiconductor-semiconductor structures.

The next group of chapters catalogues the properties unique to each class of semiconductor surface, thoroughly discussing the theoretical and experimental background and the general implications of those properties. The well-known structural reconstructions associated with semiconductor surfaces, including their unique electronic and vibrational properties, become the central focus, and the physical insights into the driving forces of the reconstructions are described quite clearly. Of particular interest is the description of recent work in the study of various structural phases of Si(111) and Ge(111) surfaces, especially thermally

driven phase transitions probed by various structural and spectroscopic techniques.

This segment is followed by a discussion of deposition of metallic and nonmetallic species on semiconductor surfaces. Here, the author provides an excellent background on adsorbate-induced semiconductor surface reconstructions, as well as an atomistic view of adsorption. The latter serves as a basis for semiconductor surface processing, and the two chapters that follow are devoted to oxidation and passivation, respectively.

Theoretical and practical aspects of semiconductor interfaces are discussed in the book's final chapters. For metal-semiconductor interfaces, a general overview of the observed deviations from the Schottky-Mott theory is presented. To assess the Schottky-barrier heights of atomically abrupt epitaxial interfaces, the author discusses the relevance of both interfacial geometric and electronic structures. To complete the monograph, semiconductor heterojunctions are discussed briefly.

Semiconductor Surfaces and Interfaces provides a readable and comprehensive discussion of its subject. With its extensive set of references, the book could serve as an excellent text for a graduate-level course in surface science, where the emphasis would be on electronic materials, or as a reference book for scientists in the field. While the book is virtually up to date, a new edition might include related recent progress in, for example, the manipulation of atoms on semiconductor surfaces and probing of the resulting local electronic structure; the use of variable-temperature scanning tunneling microscopy to monitor phase transitions on the atomic scale; and the theoretical and experimental treatment of the Schottky-barrier problem at disordered interfaces.

N. JOHN DiNARDO
Drexel University

Philadelphia, Pennsylvania

NEW BOOKS

Astronomy and Astrophysics

High-Energy Solar Phenomena—A New Era of Spacecraft Measurements. *AIP Conference Proceedings* 294. Proc. Wksp., Waterville Valley, N. H., March 1993. J. M. Ryan, W. T. Vestrand, eds. AIP, New York, 1994. 246 pp. \$110.00 *hc* ISBN 1-56396-291-8

Solar and Planetary Dynamos. M. R. E. Proctor, P. C. Matthews, A. M. Rucklidge, eds. Cambridge U. P., New York, 1994. 366 pp. \$49.95 *hc* ISBN 0-

521-45470-0

The Physics of Stars. A. C. Phillips. Wiley, New York, 1994. 208 pp. \$59.95 *pb* ISBN 0-471-94155-7

Very High Energy Cosmic-Ray Interactions. *AIP Conference Proceedings* 276. Proc. Symp., Ann Arbor, Mich., June 1992. L. Jones, ed. AIP, New York, 1993. 736 pp. \$145.00 *hc* ISBN 1-56396-038-9

Biophysics and Medical Physics

Biomedical Particle Accelerators. W. H. Scharf. AIP, New York, 1994. 731 pp. \$85.00 *hc* ISBN 1-56396-089-3

Chaos and Nonlinear Systems

Topics in Nonlinear Dynamics with Computer Algebra. *Computation in Education: Mathematics, Science and Engineering, Vol. 1.* R. H. Rand. Gordon and Breach, Langhorne, Penna., 1994. 229 pp. \$22.00 *pb* ISBN 2-88449-114-7

Chemical Physics

Chemical Physics of Free Molecules. N. H. March, J. F. Mucci. Plenum, New York, 1993. 393 pp. \$49.50 *hc* ISBN 0-306-44270-1

Chemistry of Non-Stoichiometric Compounds. K. Kosuge. Oxford U. P., New York, 1993. 262 pp. \$75.00 *hc* ISBN 0-19-855555-5

Low Energy Ion-Surface Interactions. *Wiley Series in Ion Chemistry and Physics.* J. W. Rabalais, ed. Wiley, New York, 1994. 594 pp. \$120.00 *hc* ISBN 0-471-93891-2

Molecular Magnetism. O. Kahn. VCH, New York, 1993. 380 pp. \$95.00 *hc* ISBN 1-56081-566-3

Quantum Chemistry and Technology in the Mesoscopic Level. Proc. Symp., Fukui, Japan, August–September, 1993. H. Hasegawa, ed. The Physical Society of Japan, Tokyo, Japan, 1994. 270 pp. 9000 Yen *hc* ISBN not listed

Ultrafast Reaction Dynamics and Solvent Effects. *AIP Conference Proceedings* 298. Proc. Wksp., Royaumont, France, May 1993. Y. Gauduel, P. J. Rossky, eds. AIP, New York, 1994. 564 pp. \$165.00 *hc* ISBN 1-56396-280-2

Computers and Computational Physics

An Introduction to Source Coding. R. Veldhuis, M. Breeuwer. Prentice-Hall, Englewood Cliffs, New Jersey, 1993. 264 pp. \$45.00 *pb* ISBN 0-13-489089-2

Cellular Automata and Complexity: Collected Papers. S. Wolfram. Addison-Wesley, Redwood City, Calif., 1994. 596 pp. \$45.25 *pb* ISBN 0-201-62664-0

Image Processing in C: Analyzing and Enhancing Digital Images. D. Phillips. R&D (Prentice-Hall), Lawrence, Kansas, 1994. 724 pp. \$40.00 *pb* ISBN 0-13-104548-2

Condensed Matter Physics

Ferromagnetic Materials: Structure and Properties. R. A. McCurrie. Academic, San Diego, Calif., 1994. 297 pp.

\$45.00 *hc* ISBN 0-12-482495-1

New Methods for Modelling Processes Within Solids and at Their Surfaces. C. R. A. Catlow, A. M. Stoneham, J. M. Thomas, eds. Oxford U. P., New York, 1993. 183 pp. \$52.50 *hc* ISBN 0-19-853988-6

Qualitative Methods in Continuum Mechanics. *Pitman Monographs and Surveys in Pure and Applied Mathematics No. 72.* R. V. Goldstein, V. M. Entov. Longman (Wiley), New York, 1994. 279 pp. \$130.00 *hc* ISBN 0-582-08372-9

The Physics of Liquid Crystals. *International Series of Monographs on Physics No. 83.* Second edition. P. G. de Gennes, J. Prost. Oxford U. P., New York, 1993. 597 pp. \$90.00 *hc* ISBN 0-19-852024-7

The Surface Science of Metal Oxides. V. E. Henrich, P. A. Cox. Cambridge U. P., New York, 1994. 464 pp. \$84.95 *hc* ISBN 0-521-44389-X

Cosmology and Relativity

A Model of the Universe: Space-Time, Probability, and Decision. *Clarendon Library of Logic and Philosophy.* S. McCall. Clarendon (Oxford U. P.), New York, 1994. 328 pp. \$45.00 *hc* ISBN 0-19-824053-8

Global Aspects in Gravitation and Cosmology. *International Series of Monographs on Physics No. 87.* P. S. Joshi. Oxford U. P., New York, 1993. 377 pp. \$67.50 *hc* ISBN 0-19-853966-5

Introduction to Cosmology. M. Roos. Wiley, New York, 1994. 206 pp. \$39.95 *pb* ISBN 0-471-94298-7

Fluids

Computational Methods for Fluid-Structure Interaction. *Pitman Research Notes in Mathematics Series No. 306.* J. M. Crolet, R. Ohayon, eds. Longman (Wiley), New York, 1994. 281 pp. \$64.95 *pb* ISBN 0-582-23691-6

Geophysics

Fundamentals of Earthquake Prediction. C. Lomnitz. Wiley, New York, 1994. 326 pp. \$89.95 *hc* ISBN 0-471-57419-8

Mathematical Methods for Geo-Electromagnetic Induction. *Applied and Engineering Mathematics Series.* J. T. Weaver. Research Studies (Wiley), New York, 1994. 316 pp. \$69.95 *hc* ISBN 0-86380-165-X

Oceanography and Acoustics: Prediction and Propagation Models. *AIP Series in Modern Acoustics and Signal Processing.* A. R. Robinson, D. Lee, eds. AIP, New York, 1994. 257 pp. \$65.00 *hc* ISBN 1-56396-203-9

History and Philosophy

A Memoir on The Physical Review: A History of the First Hundred Years. P. Hartman. AIP, New York, 1994. 212 pp. \$10.00 *pb* ISBN 1-56396-282-9

e: The Story of a Number. E. Maor. Princeton U. P., Princeton, New Jersey, 1994. 223 pp. \$24.95 *hc* ISBN 0-691-03390-0

Einstein Lived Here. A. Pais. Oxford

U. P., New York, 1994. 282 pp. \$25.00 *hc* ISBN 0-19-853994-0

Minds for the Making: The Role of Science in American Education, 1750-1990. S. L. Montgomery. Guilford, New York, 1994. 316 pp. \$18.95 *pb* ISBN 0-89862-188-7

Scientific Nihilism: On the Loss and Recovery of Physical Explanation. D. Athearn. SUNY P., Albany, New York, 1994. 387 pp. \$21.95 *hc* ISBN 0-7914-1807-3

The Faith of a Physicist. J. Polkinghorne. Princeton U. P., Princeton, New Jersey, 1994. 211 pp. \$24.95 *hc* ISBN 0-691-03620-9

Vacuum Science and Technology: Pioneers of the 20th Century. *History of Vacuum Science and Technology, Vol. 2.* P. A. Redhead, ed. AIP, New York, 1994. 229 pp. \$35.00 *pb* ISBN 1-56396-248-9

Instrumentation and Techniques

Advanced Light Microscopy, Vol. 3: Measuring Techniques. M. Pluta. Elsevier, New York, 1993. 702 pp. \$242.75 *hc* ISBN 0-444-98819-X

Field Emission and Field Ionization. *American Vacuum Society Classics.* R. Gomer. AIP, New York, 1993. 195 pp. \$35.00 *pb* ISBN 1-56396-124-5

Handbook of Electron Spin Resonance: Data Sources, Computer Technology Relaxation, and ENDOR. C. P. Poole Jr, H. A. Farach, eds. AIP, New York, 1994. 660 pp. \$115.00 *hc* ISBN 1-56396-044-3

The Physical Basis of Ultrahigh Vacuum. *American Vacuum Society Classics.* P. A. Redhead, J. P. Hobson, E. V. Kornelsen. AIP, New York, 1993. 498 pp. \$35.00 *pb* ISBN 1-56396-122-9

Vacuum Sealing Techniques. *American Vacuum Society Classics.* A. Roth. AIP, New York, 1994. 845 pp. \$35.00 *pb* ISBN 1-56396-259-4

Vacuum Technology and Space Simulation. *American Vacuum Society Classics.* D. H. Holkeboer, D. W. Jones, F. Pagano, D. J. Santeler. AIP, New York, 1993. 339 pp. \$35.00 *pb* ISBN 1-56396-123-7

Materials Science

Superconductivity and Its Applications. *AIP Conference Proceedings 273.* Proc. Conf., Buffalo, NY, September 1992. H. S. Kwok, D. T. Shaw, M. J. Naughton, eds. AIP, New York, 1993. 666 pp. \$150.00 *hc* ISBN 1-56396-189-X

Nuclear Physics

Introduction to Relativistic Heavy Ion Collisions. L. P. Csernai. Wiley, New York, 1994. 310 pp. \$84.95 *hc* ISBN 0-471-93420-8

Particle Physics

CEBAF 1992 Summer Workshop. *Particles and Fields Series No. 51.* Proc. Wksp., Newport News, Va., 1992. F. Gross, R. Holt, eds. AIP, New York, 1993. 609 pp. \$150.00 *hc* ISBN 1-56396-067-2

Prairie View Summer Science Academy. *AIP Conference Proceedings No. 291.* Proc. Conf., Prairie View, Tex., June 1992. J. F. Krizmanic, J. Lindesay, eds. AIP, New York, 1994. 91 pp. \$95.00 *hc* ISBN 1-56396-133-4

Physical Electronics

Handbook of Electron Tube and Vacuum Techniques. *American Vacuum Society Classics.* F. Rosebury. AIP, New York, 1993. 597 pp. \$35.00 *pb* ISBN 1-56396-121-0

Plasmas and Fusion

Basic Data of Plasma Physics: The Fundamental Data on Electrical Discharges in Gases. *American Vacuum Society Classics.* S. C. Brown. 336 pp. \$35.00 *pb* ISBN 1-56396-273-X

Ionized Gases. *American Vacuum Society Classics.* A. von Engel. AIP, New York, 1994. 325 pp. \$35.00 *pb* ISBN 1-56396-272-1

Space Physics

Space Nuclear Power and Propulsion, Parts 1-3. *AIP Conference Proceedings No. 301.* Proc. Symp., Albuquerque, NM, January 1994. M. S. El-Genk, M. D. Hoover, eds. AIP, New York, 1994. 1596 pp. \$285.00 *hc* ISBN 1-56396-305-1

Texts and Popularizations

Homework and Test Questions For Introductory Physics Teaching. A. B. Arons. Wiley, New York, 1994. 279 pp. \$31.95 *pb* ISBN 0-471-30931-1

Hunting for Stars. M. Maurette. McGraw-Hill, New York, 1993. 186 pp. \$11.95 *pb* ISBN 0-07-041029-1

Modern Physics from α to Z^0 . J. W. Rohlfs. Wiley, New York, 1994. 646 pp. \$70.95 *hc* ISBN 0-471-57270-5

Technical Physics. Fourth edition. F. Bueche, D. L. Wallach. Wiley, New York, 1994. 680 pp. \$66.95 *hc* ISBN 0-471-52462-X

The Making of A Soviet Scientist: My Adventures in Nuclear Fusion and Space From Stalin to Star Wars. R. Z. Sagdeev. Wiley, New York, 1994. 339 pp. \$24.95 *hc* ISBN 0-471-02031-1

The Quark and the Jaguar: Adventures in the Simple and the Complex. M. Gell-Mann. Freeman, New York, 1994. 392 pp. \$23.95 *hc* ISBN 0-7167-2581-9

Universe Down to Earth. N. D. Tyson. Columbia U. P., New York, 1994. 277 pp. \$29.95 *hc* ISBN 0-231-07560-X

Miscellaneous

Animation How-To CD. J. Bowermaster. Waite Group, Corte Madera, Calif., 1994. 482 pp. \$34.95 *hc* ISBN 1-878739-54-9

Designing Social Inquiry: Scientific Inference in Qualitative Research. G. King, R. O. Keohane, S. Verba. Princeton U. P., Princeton, New Jersey, 1994. 245 pp. \$19.95 *pb* ISBN 0-691-03471-0 ■