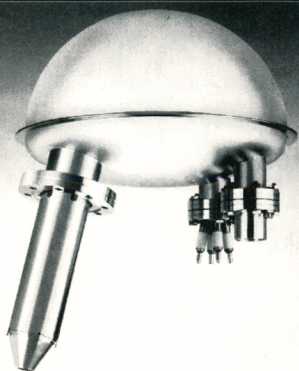


We wrote the book

Chapter 19



on Surface Science Instruments

Designing a new surface science center? Upgrading an old one? **VG Microtech** has the 'bolt-on' components for you... reliable instruments with top performance.

Energy Analyzers

- CLAM2 — with highest sensitivity and resolution
- VG100AX — combines low cost with excellent performance
- ARUPS10 — goniometer mounted for angle resolved studies

Excitation Sources

- Electron Guns X-Ray Sources
- Ion Guns UV Sources

Electron Diffraction Techniques

- RV LEED RHEED

For the highest quality surface science bolt-on components, technical support and US-based service, contact **VG Microtech's** exclusive distributor in North America

Kurt J. Lesker
Company

1515 Worthington Avenue
Clairton, Pennsylvania 15025 USA
Sales: 800-245-1656
Telephone 412-233-4200
Fax 412-233-4275

International

Canada: Tel 800-465-2476 Fax 416-588-2602
England: Tel 44-424-719101 Fax 44-424-421160
Hungary: Tel 361-183-5322 Fax 361-183-4369

AVS Show—Booth #600-605

Circle number 56 on Reader Service Card

Beyond the book's use in a course, more advanced readers may appreciate *Stellar Interiors* simply as an excellent introduction to astroseismology. I certainly did.

DAVID ARNETT

University of Arizona
Tucson, Arizona

Modern Techniques of Surface Science

David P. Woodruff
and Trevor A. Delchar
Cambridge U. P., New York, 1994.
second ed. 586 pp. \$89.95 hc
ISBN 0-521-41467-9

This is the second edition of the widely used *Modern Techniques of Surface Science*, first published in 1985. The authors, David P. Woodruff and Trevor A. Delchar, set the level of presentation for final-year undergraduates, graduate students and postgraduates in physics, chemistry and materials science. Their style makes this a very readable book. There are over 300 illustrations showing typical experimental data, schematic drawings of apparatus and the physical principles associated with the measurement process. The organization and an extensive index make it easy to locate the appropriate section for the technique of interest. In general the discussion of a specific technique or spectroscopy is self-contained. The book starts off with an introduction to surfaces and surface techniques, followed by eight chapters on various types of surface measurements.

In the preface the authors point out that, even though there is more activity in surface science now than when the first edition was published, a fundamental change has taken place: The proliferation of new techniques that was occurring in the early 1980s has stopped. Scientists and engineers are now exploiting existing methods to solve problems and the application of multiple methods to individual problems is quite common.

This "new and fully revised" edition claims to address this changing use of techniques and to include three techniques that were not covered in the first edition: atomic-scale scanning probe microscopy, inverse photoemission and x-ray diffraction methods applied to structural analysis. In my opinion, this edition falls short, very short, of those objectives.

A few examples will illustrate the origin of this harsh evaluation. There are some 120 figures presenting experimental data in the revised sec-

tions of the book. The average date of publication is 1976, and there are only three figures from the 1990s. Of the 22 illustrations of various ultra-high vacuum systems in these chapters, over 60% depict glass systems. Most of today's graduate students have never seen a working glass uhv system. But what is more important is that there is no serious effort to compare different techniques, although the authors describe this as one of the major changes in the field between the publication of the first edition and the second editions.

An example is the dispersion of the famous surface state on Cu(111), which exists in the neck of the Cu Fermi surface. Angle-resolved photoemission, inverse photoemission and scanning tunneling spectroscopy on the quantum corrals can all be used to measure the dispersion. But in *Modern Techniques of Surface Science* only inverse photoemission is mentioned in connection with the Cu(111) surface state, and no comparison is made to the other measurements.

There are other systems in which the surface structure has been determined by LEED (low-energy electron diffraction), x-ray scattering and double-alignment ion scattering. In most cases the different techniques give the same answer, but there have been cases where a disagreement between techniques led to a reevaluation of the data and ultimately to the correct answer.

A prime example is the structure determination of the c(2×2) configuration of CO on Ni(100), used by the authors to illustrate a LEED structural analysis. The first paper on LEED reported that the CO was bonded in a tilted configuration, while the symmetry observations in angle-resolved photoemission clearly indicated that the CO molecular axis was perpendicular to the surface. A reevaluation of the LEED data led to the conclusion that the CO was indeed standing straight up. This second LEED analysis is presented in figure 2.24 of the second edition. Woodruff and Delchar should have pointed out that modern surface techniques are still subject to interpretation, and consequently results obtained by two or more techniques can be inconsistent.

Anyone interested in reading about the modern techniques of surface science should wait for the third edition, in which, it is hoped, the authors and the publisher actually do what they said they were going to do in the second edition. In the meantime use the first edition of this book supplemented by existing re-

views of x-ray scattering, STM and inverse photoemission.

WARD PLUMMER
University of Tennessee
Knoxville, Tennessee
and Oak Ridge National Laboratory

NEW BOOKS

Astronomy and Astrophysics

Airborne Astronomy Symposium on the Galactic Ecosystem: From Gas to Stars to Dust. *Astronomical Society of the Pacific Conference Series, Vol. 73* Proc. Conf., Moffett Field, Calif., July 1994. M. R. Haas, J. A. Davidson, E. F. Erickson, eds. Astronomical Society of the Pacific, San Francisco, 1995. 737 pp. \$40.00 hc ISBN 0-937707-92-9

Extragalactic Background Radiation. *Space Telescope Science Institute Symposium Series, Vol. 7* Proc. Mtg., Baltimore, Md., May 1993. D. Calzetti, M. Livio, P. Madau, eds. Cambridge U. P., New York, 1995. 293 pp. \$59.95 hc ISBN 0-521-49558-X

The Formation and Evolution of Galaxies. *Fifth Canary Islands Winter School.* Proc. Sch., Puerto de la Cruz, Spain, December 1993. C. Muñoz-Tuñón, F. Sánchez, eds. Cambridge U. P., New York, 1994. 537 pp. \$64.95 hc ISBN 0-521-49575-X

Guide to the Sun. K. J. H. Phillips. Cambridge U. P., New York, 1995. 386 pp. \$15.95 pb ISBN 0-521-39788-X

Magnetic Fields of Celestial Bodies. *Astrophysics and Space Science Library, Vol. 198.* Y. Shi-hui. Kluwer, Norwell, Mass., 1994. 340 pp. \$149.00 hc ISBN 0-7923-3028-5

Millisecond Pulsars: A Decade of Surprise. *Astronomical Society of the Pacific Conference Series, Vol. 72.* Proc. Conf., Aspen, Colo., January 1994. A. S. Fruchter, M. Tavani, D. C. Backer, eds. Astronomical Society of the Pacific, San Francisco, 1995. 442 pp. \$40.00 hc ISBN 0-937707-91-0

Multi-Feed Systems for Radio Telescopes. *Astronomical Society of the Pacific Conference Series, Vol. 75.* Proc. Wksp., Tucson, Ariz., May 1994. D. T. Emerson, J. H. Payne, eds. Astronomical Society of the Pacific, San Francisco, 1995. 366 pp. \$40.00 hc ISBN 0-937707-94-5

Progress in the Search for Extraterrestrial Life. *Astronomical Society of the Pacific Conference Series, Vol. 74.* Proc. Symp., Santa Cruz, Calif., August 1993. G. S. Shostak, ed. Astronomical Society of the Pacific, San Francisco, 1995. 592 pp. \$40.00 hc ISBN 0-937707-93-7

Science with Astronomical Near-Infrared Sky Surveys. Proc. Wksp., Les Houches, France, September 1993. N. Epchtein, A. Omont, B. Burton, P. Persi, eds. Kluwer, Norwell, Mass., 1994. 281 pp. \$135.00 hc ISBN 0-7923-3029-3

Stability of Collisionless Stellar Systems: Mechanisms for the Dynamical Structure of Galaxies. *Astrophysics and Space Science Library, Vol. 185.* P. L. Pal-

FREE Balzers Wrote the Book on Vacuum Accessories

From fittings to flanges, page by page you'll discover the highest quality vacuum accessories...all backed by Balzers technical and service support.

- In-stock items shipped within 48 hours
- Competitively priced
- Major credit cards accepted
- Over 800 products for your vacuum needs including:

Fittings
Flanges
Construction Components
Valves
Compact Gauges
Residual Gas Analyzers



balzers

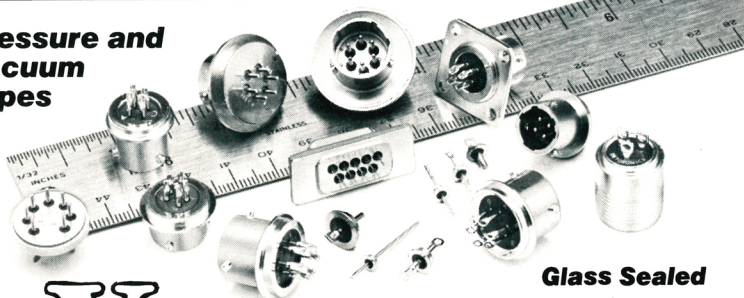
Balzers
8 Sagamore Park Road
Hudson, NH 03051
Telephone: 603-889-8888
Fax: 800-555-3173

Call 800-555-3172 for your
FREE Balzers catalog today!

See us at the AVS Show, Booth #413 Circle number 57 on Reader Service Card

HERMETICALLY SEALED CONNECTORS

Pressure and Vacuum Types



Glass Sealed

You say what type, we deliver!

- ☐ CARBON, STAINLESS STEELS, SPECIAL ALLOYS
- ☐ SOLDER, PANEL OR WELD MOUNT
- ☐ STANDARD CONTACTS, THERMOCOUPLE, P.C., EYELET OR YOUR DESIGN
- ☐ FOR MILITARY, COMMERCIAL, INDUSTRIAL

Call us to discuss your standard or custom requirements for Connectors and Headers to operate over a wide temperature range, even in severe environments.

SINCE 1959 - Standard and Modified Designs of Connectors, as well as Headers and Terminals.

DETORONICS

10660 E. RUSH ST. • SO. EL MONTE, CA 91733 • PHONE (818) 579-7130 • FAX (818) 579-1936

Circle number 58 on Reader Service Card