metals and hydrogen atoms. For physicists, the small mass of the hydrogen atom and its readily available isotope, deuterium, added to the inherent interest of these interstitially loaded metals, presenting exciting possibilities for the investigation of tunneling states, high-frequency phonon bands, high-mobility atoms, electronic structure, and large isotope effects. Physicists continue to find good problems to solve in these systems, from those with hydrogen-to-metal atom ratios as small as 1 to 1000 to those with nearly stoichiometric compound ratios of 2.00 or 3.00, in which the hydrogen-vacancy concentration may be as small as 1 per 1000.

Research in metal-hydrogen systems brought together scientists and engineers from physics, chemistry, and metallurgy who soon found that they had much to learn from each other. Although advances in the field are periodically reviewed, Yuh Fukai identified a need for a coherent description of the basic bulk properties of metal-hydrogen systems, with emphasis on the physics of how these properties come about. In *The Metal-Hydrogen System* Fukai identifies the key questions that we need to ask and keeps these questions before the reader as each individual topic is explored. The book contains an abundance of experimental results, and there are two-thirds as many figures as pages, but Fukai did not intend his volume to serve only as a source of data or a comprehensive guide to the literature (although over 800 references are listed). Rather, for each topic, experimental results are presented only as they relate to the development of our understanding of the underlying physics.

The book begins with coverage of phase diagrams and statistical thermodynamics of elemental and alloy metal-hydrogen systems. An entire chapter is devoted to the effects of high temperature and high pressure on these systems. The reader may at first be surprised that a significant part of this chapter treats the properties of solid hydrogen, including the high-pressure insulator-metal transition. But Fukai's motivation is clear when one views the entire phase diagram of a binary metal-hydrogen system over the full range of each element. Using tentative phase diagrams for systems at the hydrogen end, Fukai points out that recent progress in high-pressure technology may allow metallic hydrogen or liquid metal-hydrogen alloys to be approached via high temperatures and pressures. The discussion of the siting of hydrogen atoms in metals places considerable emphasis on the hydrogen wave function and its extent beyond one site or over a set of several adjacent sites. Theoretical calculations are compared with experimental results from inelastic neutron scattering.

Fukai manages to tie all the material together with greater coherence than might be achieved in a multiauthored volume. The discussion is progressively developed from one chapter to the next, with frequent cross-references. Lucidly written and mathematically accessible, this is a useful review of the physics of metal-hydrogen systems.

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Books Received

Advances in Computer Methods for Systematic Biology. Artificial Intelligence, Databases, Computer Vision. Renaud Fortuner, Ed. Johns Hopkins University Press, Baltimore, MD, 1993. xiv, 560 pp., illus. $65. From a workshop, Napa, CA, Sept. 1990.

Advances in Economic Theory. Jean-Jacques Laffont, Ed. Cambridge University Press, New York, 1993. xii, 450 pp., illus. $54.95. Econometric Society Monographs, no. 21. From a congress, Barcelona, Aug. 1990.

AIDS. The Biological Basis. I. Edward Alcamo. Brown, Dubuque, IA, 1993. viii, 295 pp., illus. Paper, $36.25.

Bats. A Community Perspective. James S. Findley. Cambridge University Press, New York, 1993. xii, 167 pp., illus. $44.95. Cambridge Studies in Ecology.

Behaviour and Social Evolution of Wasps. The Communal Aggregation Hypothesis. Yosiaki Itô. Oxford University Press, New York, 1993. viii, 159 pp., illus. $52; paper, $24.95. Oxford Series in Ecology and Evolution.

The Child's Path to Spoken Language. John L. Locke. Harvard University Press, Cambridge, MA, 1993. xii, 518 pp., illus. $39.95.

Childhood Illness. The Psychosomatic Approach. Children Talking with Their Bodies. Bryan Lask and Abe Fosson. Wiley, New York, 1993. xviii, 156 pp., illus. Paper, $27.95. Wiley Series in Family Psychology. Reprint, 1989 ed.

Cosmo 101. The Four-Dimensional Universe. Michael R. Feltz. Cosmos Publishing, White Plains, NY, 1993. x, 166 pp., illus. Paper, $9.95.

Domestic Architecture, Ethnicity, and Complementarity in the South-Central Andes. Mark S. Aldenderfer, Ed. University of Iowa Press, Iowa City, 1993. x, 178 pp., illus. $47.95.

Dyslexia and Development. Neurobiological Aspects of Extra-Ordinary Brains. Albert M. Galaburda, Ed. Harvard University Press, Cambridge, MA, 1993. xxii, 378 pp., illus. $45. From a conference, Barcelona.

Ecology of *Cenchrus grass* Complex. Environmental Conditions and Population Differences in Western India. S. C. Pandeya and H. Lieth. Kluwer, Norwell, MA, 1993. viii, 234 pp., illus. $156. Tasks for Vegetation Science, 23.

Egypt During the Last Interglacial. The Middle Paleolithic of Bir Tarfawi and Bir Sahara East. Fred Wendorf, Romuald Schild, and Angela E. Close. Plenum, New York, 1993. x, 596 pp., illus. $95.

The Fullerenes. Harold W. Kroto, John E. Fischer, and David E. Cox, Eds. Pergamon, Tarrytown, NY, 1993. viii, 318 pp., illus. $53.95. Reprinted from *Carbon*, vol. 30, no. 8 and *Journal of Physics and Chemistry of Solids*, vol. 53, no. 11.

Fuzzy Thinking. The New Science of Fuzzy Logic. Bart Kosko. Hyperion, New York, 1993. xviii, 318 pp., illus. $24.95.

Gender Play. Girls and Boys in School. Barrie Thorne. Rutgers University Press, New Brunswick, NJ, 1993. xiv, 237 pp. $35; paper, $12.95.

Generalized Functions and Their Applications. R. S. Pathak, Ed. Plenum, New York, 1993. x, 306 pp. $85. From a symposium, Varanasi, India, Dec. 1991.

Human Gene Mutation. David N. Cooper and Michael Krawczak. Bios Scientific, Oxford, U.K., 1993 (U.S. distributor, Books International, McLean, VA). xiv, 402 pp., illus. $99.

In Defense of Garbage. Judd H. Alexander. Praeger, Westport, CT, 1993. xiv, 239 pp., illus. $22.95.

In Search of the Neanderthals. Solving the Puzzle of Human Origins. Christopher Stringer and Clive Gamble. Thames and Hudson, New York, 1993 (distributor, Norton, New York). 247 pp., illus. $29.95.

Jonas Salk. Victoria Sherrow. Facts on File, New York, 1993. viii, 134 pp., illus. $16.95. Makers of Modern Science.

The Jurassic of the Circum-Pacific. G. E. G. Westermann, Ed. Cambridge University Press, New York, 1993. x, 676 pp., illus. $195.

The Kondo Problem to Heavy Fermions. A. C. Hewson. Cambridge University Press, New York, 1993. xxii, 436 pp., illus. $89.95. Cambridge Studies in Magnetism.

McGraw-Hill Encyclopedia of Physics. Sybil P. Parker, Ed. 2nd ed. McGraw-Hill, New York, 1993. viii, 1624 pp., illus. $95.50.

Meanings of Sex Difference in the Middle Ages. Medicine, Science, and Culture. Joan Cadden. Cambridge University Press, New York, 1993. xii, 310 pp., illus. $54.95. Cambridge History of Medicine.

Messel. An Insight into the History of Life and of the Earth. Stephan Schaal and Willi Ziegler, Eds. Clarendon (Oxford University Press), New York, 1992. vi, 322 pp., illus. $75. Translated from the German edition (Frankfurt am Main, 1988) by Monika Shaffer-Fehre.

Nanotechnology Playhouse. Building Machines from Atoms. Christopher Lampton. Waite Group, Corte Madera, CA, 1993. x, 131 pp., illus., + diskette. Paper, $23.95.

Neuropeptide Analogs, Conjugates, and Fragments. P. Michael Conn, Ed. Academic Press, San Diego, CA, 1993. xviii, 396 pp., illus. $85. Methods in Neurosciences, vol. 13.

Optimum Experimental Designs. A. C. Atkinson and A. N. Donev. Clarendon (Oxford University Press), New York, 1992. xvi, 328 pp., illus. $67.50. Oxford Statistical Science Series, 8.

Parallel Computational Geometry. Selim G. Akl and Kelly A. Lyons. Prentice Hall, Englewood Cliffs, NJ, 1993. viii, 215 pp., illus. $57.95.

Passport to Magonia. On UFOs, Folklore, and Parallel Worlds. Jacques Vallee. Contemporary Books, Chicago, IL, 1993. xii, 372 pp., illus. Paper, $14.95. Reprint, 1969 ed.

The Rorschach. A Comprehensive System. Vol. 1, Basic Foundations. John E. Exner. 3rd ed. Wiley, New York, 1993. xxiv, 642 pp., illus. $62.95. Wiley Series on Personality Processes.

Russian/Soviet and Western Psychiatry. A Contemporary Comparative Study. Paul Calloway. Wiley, New York, 1993. xxii, 266 pp. $34.95.

Scanning Tunneling Microscopy. H. Neddermeyer, Ed. Kluwer, Norwell, MA, 1993. xii, 266 pp., illus. $122. Perspectives in Condensed Matter Physics, vol. 6.

Science and the Canadian Arctic. A Century of Exploration, 1818–1918. Trevor H. Levere. Cambridge University Press, New York, 1993. xiv, 438 pp., illus. $64.95.

Social Facilitation. Bernard Guerin. Cambridge University Press, New York, 1993. viii, 244 pp., illus. $54.95. European Monographs in Social Psychology.

Thermodynamics of Light Energy Conversion. L. N. Bell and N. D. Gudkov. SPB Academic, The Hague, 1993. xvi, 204 pp., illus. Paper, $50.

Transgenesis Techniques. Principles and Protocols. David Murphy and David A. Carter, Eds. Humana, Totowa, NJ, 1993. xii, 467 pp., illus. Spiral bound, $69.50. Methods in Molecular Biology, 18.

Tuberculosis. A Comprehensive International Approach. Lee B. Reichman and Earl S. Hershfield, Eds. Dekker, New York, 1993. xxvi, 752 pp., illus. $195. Lung Biology in Health and Disease, 66.

Whistler-Mode Waves in a Hot Plasma. Sergei Sazhin. Cambridge University Press, New York, 1993. x, 259 pp., illus. $69.95. Cambridge Atmospheric and Space Science Series.

Who's Who in Space. Michael Cassutt. 2nd ed. Macmillan, New York, 1993. xviii, 439 pp., illus. $75.