

tribute, remarkable for its spontaneity, from a peer in the profession.

Does Jayaraman refer to the controversies that Raman got involved in the course of his scientific work? He has not avoided them, even in the brief compass of his book. In regard to the controversy between Raman and Max Born, in the area of lattice dynamics, it is interesting that Born has linked the unreasonableness and bitterness of Raman's stand and attitudes to some of the unfortunate happenings during Born's visit to India and sojourn at the Indian Institute of Science in 1935. Was there an element of providence in the use of the mercury arc, on a rainy day, that contributed to the discovery of the Raman effect? There is a passing reference to this, in the section relating to K. R. Ramanathan. Elsewhere in the same chapter Jayaraman has rightly emphasized that to suggest anything by way of detraction from Raman's singular and 'monumental contribution to

science' 'sounds so sad and utterly futile'.

There is a dictum in Sanskrit which states: 'One may speak out the truth only when it is pleasant. One may never give expression to an unpleasant truth.' It is a dictum that Raman did not practise. In his perception of adherence to truth, he never thought it proper to conceal his mind or his 'true' feelings, he never considered prudence as the better part of valour. From the beginning till the end, there was a charming innocence, a forthright purity of character, untouched by worldly norms—no guise, no guile. As Jayaraman puts it, 'He was a very simple man, quite childlike, sometimes even childish!' C. Rajagopalachari had once observed: 'Raman is like a brilliant cut diamond. If you rub it on the wrong side, it will cut your finger.'

Coming back to the enduring quality of Raman's work, and the brilliance and charm of his energetic and magnetic personality, which endeared him to many and provided strong inspiration and gui-

dance to all his professional colleagues, it is apt to conclude, again in the words of Jayaraman: 'No single person has done so much for Indian science as Raman. Through personal example of the highest dedication to science, through his success as a teacher-cum-leader in training generations of physicists, who in turn have created independent schools of research, through creating scientific institutions and facilities for research and founding scientific academies and journals for the dissemination and propagation of science, and through his gift of eloquence which served to inspire and stimulate a widespread interest in science, Raman, as a single individual, tremendously influenced the progress of science in India. Raman is comparable only to Raman.'

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Bookshelf

Books that appear to be of interest to a wide readership will be listed in this column. — Ed.

Harvard University Press, 79 Garden Street,
Cambridge, MA 02138, USA

A DICTIONARY OF ETHOLOGY

Klaus Immelmann and Colin Beer

This important dictionary provides concise definitions of historical, enduring and current ethological terms. Additionally, the authors devote attention to terms from related disciplines, particularly evolutionary biology, physiology, ecology, and sociobiology are included.

\$35.00

FOR THE LOVE OF ENZYMES: The Odyssey of a Biochemist

Arthur Kornberg

One of the world's greatest biologists retraces his major research campaigns in enzymology. In the telling, Kornberg's story offers both a primer on how important science is done and a captivating look at some of the century's most significant challenges in biochemistry.

\$29.95

GENETHICS: The Clash between the New Genetics and Human Values

David Suzuki and Peter Knudtson

\$25.00

THE ORIGINS OF IGNEOUS ROCKS

Paul C. Hess

This comprehensive work traces the evolution of igneous rocks from site of origin to place and residency; probes the clues that the distribution of igneous rocks provide for understanding plate tectonics and focuses on a number of unresolved problems critical to igneous petrology.

\$65.00

COSMIC RAYS

Michael W. Friedlander

Engaging tale of this peculiar rain of charged particles begins with their discovery early in this century and goes on to describe impressive attempts by scientists to fill in the gaps in our knowledge.

\$27.50

THE STRUCTURE AND INTERPRETATION OF QUANTUM MECHANICS

R. I. G. Hughes

The book provides an account of the philosophical foundations of quantum theory that should become a basic text for scientists and non-scientists alike. It offers the first detailed and accessible analysis of the Hilbert-

space models used in quantum theory and explains why they are so successful.

\$39.50

THE DARK ABYSS OF TIME: The History of the Earth and the History of Nations from Hooke to Vico, by Paolo Rossi

Translated by Lydia G. Cochrane

"Rossi has made a major foray into a vast and unexplored territory in the literature of early modern science, pointing a way that others will want to follow."—James A. Secord, *Nature*

Pbk \$14.95

A HANDBOOK OF BIOLOGICAL ILLUSTRATION, Second Edition

Frances W. Zweifel

Full of practical advice and examples of materials and techniques for biologists who must create their own illustrations.

Pbk \$9.95

KEPLER'S GEOMETRICAL COSMOLOGY

J. V. Field

A detailed examination of Kepler's search for

BOOK REVIEWS

the geometrical plan according to which the universe was created.

Cloth \$37.50

DISCOVERING ALVAREZ: Selected Works of Luis W. Alvarez with Commentary by His Students and Colleagues.

Edited by W. Peter Trower

"A splendid book . . . These commentaries not only make clear what Alvarez's contributions . . . have been, especially in basic ideas, but they also show the admiration and affection with which he is regarded."—Robert L. Walker, *Science*.

Hbk \$37.50

The University of Chicago Press, 5801 South Ellis Avenue, Chicago, IL 60637, USA

SIDEREUS NUNCIUS, OR THE SIDEREAL MESSENGER by Galileo Galilei

Translated with Introduction, Conclusion, and Notes by Albert Van Helden

The first modern, complete translation of Galileo's *Sidereus Nuncius*. Van Helden places Galileo's ingenious improvements of the rudimentary spyglass and his dramatic astronomical discoveries in political, technical, religious, and intellectual context and provides helpful references and explanations of terms.

Pbk \$7.95

THE PHYSICS OF TIME REVERSAL

Robert G. Sachs

"Time reversal is a topic of great and continuing interest and is the subject of this excellent monograph. . . . It necessarily deals also with the other symmetries, *C* and *P*, linked to it through the CPT theorem and with that theorem itself, and with a wide range of themes in nuclear and particle physics, and, more."—Sam Treiman, *American Journal of Physics*.

Pbk \$23.00

LIGHT

Michael I. Sobel

Rainbows and exploding stars, ancient Greek optics and twentieth-century lasers—these are but a few facets of this entertaining exploration of light and its role in all areas of science and technology.

"As a guide along the path of light Mr Sobel is excellent"—James Cornell, *New York Times Book Review*.

Pbk \$14.95

THE RISE OF THE WAVE THEORY OF LIGHT: Optical Theory and Experiment in the Early Nineteenth Century

Jed Z. Buchwald

Buchwald revises standard interpretations of the rise of the wave theory, contending that a historical distinction exists between the wave theory's physical and mathematical aspects.

Pbk \$24.95

SELECTED PAPERS

S. Chandrasekhar

Volume 1, Stellar Structure and Stellar Atmospheres

Volume 2, Radioactive Transfer and Negative Ion of Hydrogen

Foreword by T. W. Mullikin

The first two of six volumes collecting significant papers of the distinguished astrophysicist and Nobel Laureate S. Chandrasekhar, who has chosen papers that trace the development of his ideas and that supplement the work summarized in his earlier books.

Pbk \$29.95

TRUTH AND BEAUTY: Aesthetics and Motivations in Science

S. Chandrasekhar

Seven essays of the distinguished astrophysicist S. Chandrasekhar, who addresses aesthetics, creativity, and motivations in the pursuit of science.

Hbk \$23.95

The Cornell University Press, 124 Roberts Place, Ithaca, NY 14850, USA

THE SEA AND THE ICE: A Naturalist in Antarctica

Louis J. Halle

With a new Foreword by Frank H. T. Rhodes

"A voyage to the Antarctic by a naturalist who writes a consistently graceful and witty prose. . . . A thoroughly pleasurable book"—*New York Times Book Review*.

\$12.95

University of California Press, 2120 Berkeley Way, Berkeley, CA 94720, USA

DISENCHANTED NIGHT: THE INDUSTRIALIZATION OF LIGHT IN THE 19TH CENTURY

Wolfgang Schivelbusch

Turning the night to day was the goal of many a 19th-century dreamer in love with the possibilities of illumination. Wolfgang Schivelbusch examines the impact of artificial light and the movement away from the flame as its main source. Schivelbusch discusses the implications of lighting on city life, bourgeois culture, and entertainment. The transition from the traditional fire, with all of its deep subconscious meanings, to other forms of artificial light changed the way society viewed the world.

\$22.50

Chapman and Hall, 37 Essex Street, London WC2, UK

DID DARWIN GET IT RIGHT? ESSAYS ON GAMES, SEX AND EVOLUTION

John Maynard Smith

John Maynard Smith addresses many basic

questions about life and science. This collection of short essays is meant for general readership—the aim being to make complicated issues more accessible and comprehensible to everyone. He discusses such topics as the nature of reproduction, how the brain works, the evolution of social behaviour, and evolutionary biology.

\$22.95

Norton, 500 fifth Ave, New York 10110, USA

IDEAS AND INFORMATION: MANAGING IN A HIGH-TECH WORLD

Arno Penzias

Nobel Prize winner Arno Penzias thinks the world can be a better place if we can learn to harness the technology around us. It is an attempt to demystify computer technology. Penzias breaks down the worries that some have with (seemingly) overwhelming technological advances into simply stated questions. The answers to these questions form the basis for Penzias's belief that the computer cannot replace people in any 'meaningful' way; the computer can free humans from the more mundane tasks, leaving them to tackle bigger, more important problems.

\$17.95

Indian Academy of Sciences, C. V. Raman Avenue, P.B. No. 8005, Bangalore 560 080, India

Distributed by Oxford University Press

JOURNEY INTO LIGHT: LIFE AND SCIENCE OF C. V. RAMAN

G. Venkataraman

"An extremely balanced biography."—M. Krishnamurthi, *The Hindu*

"The life and science of C. V. Raman have found their chronicler."—R. Nityananda, *Deccan Herald*

"A model of scientific biography. Discusses matters in great detail and with sensitivity."—M. V. Berry, *Nature*

"Stands out for providing insight into the evolution of a natural philosopher and scientist."—K. G. Ramanathan, *Science*

"Excellent explanations of the physics of Raman's work."—*Scientific American*

"Readers will be fascinated by the strengths and weaknesses of a great man and will gain an abiding affection for India."—David Buckingham, *Physics World*

"Powerfully illuminates scientific politics in the last days of British India and one man's heroic efforts to live by science alone."—Colin Russell, *The Times Higher Education Supplement*

"Will inspire young readers with its portrayal of Raman's strong passion for science and the way he pursued it in the face of great odds. Will satisfy historians of science with its careful exposition of scientific ideas and its lively descriptions of contemporary social and political events. Will please practising scientists with its record of a master at work."—A. K. Ramdas, *Physics Today*

Benjamin Peary Pal

An obituary by *M. S. Swaminathan*



Benjamin Peary Pal
(1906–1989)

The passing away of B. P. Pal on 14 September 1989, in New Delhi, marks the end of one of the brightest chapters in the history of Indian science in general and Indian agricultural science in particular. Pal was a scientist with an unusual combination of characteristics—depth in the discipline of genetics and plant breeding, width in his grasp of the critical issues in Indian agriculture, courtesy and compassion in his personal behaviour, a sense of beauty and harmony with nature, absence of any feeling of 'retrospective jealousy' in dealing with fellow scientists, and, above all, an inimitable store of wit and remarkable wisdom. His interests were wide and varied. He was a Sunday painter of rare distinction and a lover of classical music, both Indian and Western. In short, he was truly the 'Homi Bhabha' of Indian agriculture.

Pal was born on 26 May 1906 at Mukandpur in Punjab and had his early education in Rangoon. After obtaining an MSc in Botany in 1929, he proceeded to Cambridge, UK, where he obtained a PhD in 1933. His PhD thesis work, carried out under the guidance of Sir Roland Biffen and Sir Frank En-

gledow, is still a classic, since it was one of the earliest studies on the potential for exploitation of hybrid vigour in wheat, a self-pollinated crop. He joined the staff of the Indian (then Imperial) Agricultural Research Institute (IARI), in Pusa, Bihar, in 1933, and became Imperial Economic Botanist in 1937. He moved to New Delhi when the Institute was moved there in 1936 because of the damage to the original Institute buildings in Pusa during the severe Bihar earthquake of 1934.

Pal's contributions can be broadly classified into five major categories—research, education, extension, institution building and international cooperation. In each of these areas his work was marked by a tireless striving for relevance and excellence.

In the field of research, his well-known work relates to the breeding of wheat varieties with multiple resistance to diseases like stem, leaf and stripe rusts and loose smut. In later years, when he became a research administrator, he continued his personal breeding work in roses and bougainvilleas. Because he understood the significance of

biological diversity for the achievement of sustainable advances in biological productivity, he initiated a systematic search for new genes. This work led to the establishment of the Plant Introduction Division at IARI and subsequently to the organization of the National Bureau of Plant Genetic Resources by the Indian Council of Agricultural Research (ICAR). He also started well-planned breeding efforts in many crops, including potato, tomato and tobacco, introduced statistical methods in selection procedures, and developed symbiotic partnerships with eminent plant pathologists like the late K. C. Mehta of Agra University.

In education, Pal's signal service has been the establishment of the Postgraduate School at IARI in 1958. Realizing that India would need vast numbers of PhD scholars to provide well-trained staff for our agricultural universities, Pal organized the IARI Postgraduate School, which was conferred the status of a deemed university by the University Grants Commission in 1958. The IARI Postgraduate School has so far provided to the country about 4000 PhD and MSc scholars and