MAN OF THREE CULTURES: A PERSONAL PORTRAIT

Chandra: A Biography of S. Chandrasekhar

Kameshwar C. Wali
U. Chicago P., Chicago, 1990. 360 pp. $29.95 pb
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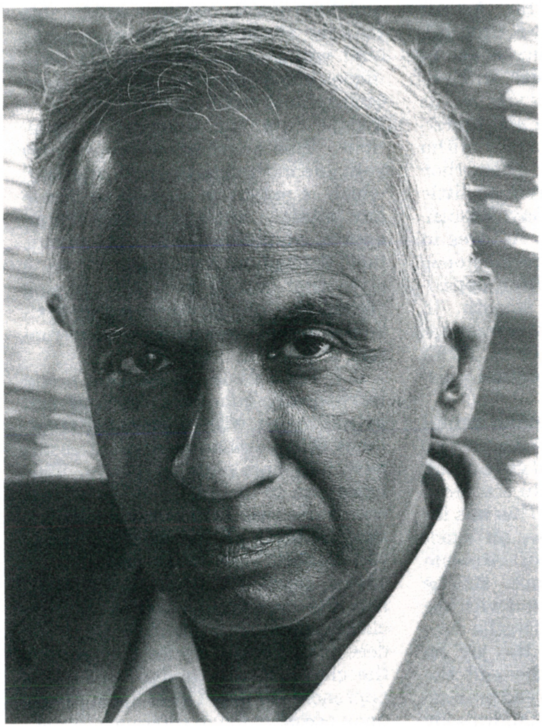
Reviewed by Freeman J. Dyson

For more than ten years, Kameshwar Wali interviewed Chandra's friends, collected Chandra documents and visited the places where Chandra has lived. He was researching his biography so thoroughly that I was afraid the book would never be written. Now here it is. It was worth waiting for. Wali has given us a magnificent portrait of Chandra, full of life and color, with a deep understanding of the three cultures—Indian, British and American—in which Chandra was successively immersed.

Chandra is one of the greatest theoretical physicists who ever lived. He has contributed mightily to the theory of stellar structure, radiation transport, dynamical friction, hydrodynamical stability, general relativity and black holes. He usually works in a given field for about a decade, beginning with the solution of one or two major problems, continuing with a string of journal papers and finishing with a polished presentation of the whole subject in the form of a book, before moving on to the next field.

Wali wisely decided to write a personal biography, not a scientific biography. Chandra's scientific biography is already written in his books, decade by decade. If Wali had attempted to summarize the technical substance of Chandra's work, the result would have been only a paraphrase of Chandra's own summaries.

Freeman Dyson of the Institute for Advanced Study in Princeton, New Jersey is a theoretical physicist who has worked on a variety of physical and astronomical topics loosely connected to Chandrasekhar's work.



K. G. SOMSEKHAR

Chandrasekhar, a major contributor to the theories of stellar structure, radiation transport, dynamical friction, hydrodynamical stability, general relativity and black holes, is described as a man able to understand three different cultures—Indian, British and American.

By concentrating upon the man rather than the science, Wali has written a book that everybody can read. It gives to the general public a dramatic and vivid picture of the clash of three cultures within the soul of a sensitive individual. I wish I had the job of reviewing this book for the *New York Times* rather than for PHYSICS TODAY. If the book is only read by physicists, then Wali's devoted labors were in vain.

Chandra has a fine prose style and a life-long love of literature. It was a characteristic Chandra touch to end his Nobel Prize banquet speech in Stockholm with a quotation from Virginia Woolf's *The Waves*. Wali shares Chandra's sense of style. This book, considered as a work of art, meets the master's high standards.

The central difficulty of scientific biography is the fact that the early part of a scientist's life is inevitably more dramatic and exciting than the later part. Almost all biographies of scientists run into this difficulty. After the early struggles and triumphs, the hero or heroine settles down to ordinary professional life and there is a feeling of anticlimax. The later chapters tend to be dull and perfunctory. Wali has brilliantly avoided this trap. He held in reserve the verbatim records of long conversations between himself and Chandra, discussing general issues of politics and history as well as Chandra's detailed recollections of incidents in his life. The final chapter 12 consists of extracts from these spoken records. As a result of this literary strategem, the brief chapter 11 describing Chandra's later years is not felt as an anticlimax, because the conversations in chapter 12 bring us back to Chandra in the full vigor of his personal style.

I mention three episodes in the book that I found particularly moving: first, the story of Subbalakshmi—the aunt of Chandra's wife, Lalitha—who rose from the tragedy of child-widowhood to become a leader of women's liberation in India and played a major role in Lalitha's life; second, the extraordinary friendship between Chandra and Sir Arthur Eddington, which flowered after Eddington had almost succeeded in wrecking Chandra's career with vicious and intemperate attacks on his work; and third, the love and understanding that Chandra and Lalitha developed for America after they decided to settle in the remote little community at Williams Bay, Wisconsin. In each of the three cultures in which he lived, Chandra formed deep attachments and met bitter opposition. His way was never smooth. In the end he has made his permanent home and found his peace in, of all places, Chicago. This biography explains why.

I remember vividly the first time I met Chandra. He came to Ann Arbor in the summer of 1950 and gave a talk about the polarization of the scattered light in the daytime sky. This was for him a five-finger exercise, an exact analytic solution of a physics problem of no particular importance. But he held the audience spellbound with the elegance of his mathematics, the clarity of his language and the joy he made us feel when at the end the observed polarizations agreed precisely with his predictions. Chandra's joy in the beauty of science also shines through the pages of Wali's book. This joy is the central core of Chandra's life, and Wali has made it accessible to all who can read.

The Physics of Vibration

A. B. Pippard
Cambridge U. P., New York, 1989. Omnibus edition. 639 pp. $65.00 hc
ISBN 0-521-37200-3

In *The Physics of Vibration* (omnibus edition), A. B. Pippard brings together his thorough classical and quantum treatments—previously published separately—of "almost anything that fluctuates in time more or less periodically." This field takes in topics that range from mechanical oscillators to electrical circuits to electromagnetic waves in cavities to nmr to masers.

It is the author's stated intention to make this book valuable to readers who range in sophistication from a student who has completed the elementary sequence in physics to a researcher in a relevant field. To this end the depth of the treatment and the amount of physics background assumed varies widely from topic to topic. However, a consistent level of mathematical sophistication is maintained throughout, and any student with a respectable grasp of calculus and differential equations will be able to work through all the arguments (and will learn some valuable techniques along the way). Extensive use of graphical techniques helps to give insight into the differential equations. This approach is particularly valuable in the treatment of stability, which is extensive enough to please any physicist (though perhaps not an applied mathematician). The text is lucid throughout and has an engaging style that avoids both the grating "folksiness" of many elementary textbooks and the excessively dull, formal tone of most monographs.

It is the author's thesis that many intrinsically quantum problems can be addressed with a classical treatment that gives an equivalent result as well as more physical insight. This leads him to include in part 2 of this book extensive discussions of the classical features of the quantum vibrator, applications of the impulse–response approach to quantum systems and the ammonia maser as both a classical and a quantum system. He does not, however, neglect to point out the circumstances under which this approach will fail. Other authors will upon occasion make reference to classical approaches when presenting quantum analyses, but few develop the point to the degree found in this volume. This complements part 1 of the book, in which Pippard demonstrates with numerous examples the unity of a wide variety of mechanical and electrical phenomena when considered as classical vibrators—another point often mentioned but rarely developed fully by other authors. Careful attention to consistent notation and vocabulary makes the unity more apparent than would be expected in a comparison of separate treatments.

Different parts of this book will prove valuable to different readers. The simpler treatments, particularly those in part 1, would enlighten an upper-level undergraduate in physics or engineering through either self-study or inclusion as examples in classroom lectures. In many cases the author describes simple experiments that he has performed to better understand the phenomena. These could prove useful as lecture demonstrations, but they have the advantage of also being amenable to truly quantitative analysis in an instructional laboratory setting. Some of the examples, though they effectively demonstrate the physical principle in question, may seem somewhat quaint to a student (or even a younger professional): Moving-coil galvanometers and thyratrons are now found primarily in (slightly dusty) lecture demonstrations rather than in research laboratories.

Other portions of the book may serve the researcher seeking to learn about a new field in preparation for study of the literature. This is particularly true of the section on nmr and the chapters on two-level systems and line broadening. Extensive cross-references to other relevant portions of the text appear in the margins making it easier to use for this purpose. The bibliography is not large and concentrates primarily on more extensive pedagogical treatments of the topics, with a sprinkling of references to the research literature for examples. These references mostly appeared before 1977 (parts 1 and 2 of this edition having been originally published in 1979 and 1983) and include a modestly small but select group of references to the author's own well-known work in electronic states in solids.

In sum, this is a well-written book that would prove of use to an instructor of intermediate and advanced physics or engineering, as well as to a researcher seeking basic physical insights about an oscillatory system before turning to the primary literature.

LAURIE E. MCNEIL
University of North Carolina, Chapel Hill

Quark–Gluon Plasma

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World Scientific, Teaneck, N. J., 1990. 712 pp. hc
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An exciting prospect in subatomic physics is the possibility of producing a new state of matter at extremely high temperature and density. This new state, the quark–gluon plasma, would be created in collisions of extremely energetic nuclei. The conditions of high density and temperature would allow the ordinary particles of subatomic physics to dissolve into