

KAMESHWAR C. WALI: *Chandra. A Biography of S. Chandrasekhar*. Chicago, London: The University of Chicago Press, 1991. x, 341 pp.

This is *not* a scientific biography in the style of, e.g., Pais's celebrated book on Einstein, but rather a personal portrait of one of the most famous Indian scientists: Subrahmanyan Chandrasekhar, born in 1910, Nobel laureate of 1983 and famous among astronomers, astrophysicists and physicists for his pathfinding contributions to various fields of applied mathematics, physics and astrophysics. The author, also an Indian, has written a thoroughly non-technical book about a scientist, whose contributions can hardly been understood and appreciated to their full value and beauty by someone outside these fields. But, indeed, Wali has achieved his aim of portraying 'Chandra', as colleagues, friends, students and family members use to call him, without the use of a single formula throughout the entire book. For

all those who want to learn more about technical details of Chandrasekhar's work, Wali simply refers to the six volumes of Chandra's *Selected Papers* also published by the University of Chicago Press (see p. 11 and p. 309, fn. 9).

At first, the reviewer was very sceptical of this endeavor – can a scientist whose contributions center on highly specialized fields of high math be understood without speaking in this same language – can his aims, which in Chandra's case very much focus around the elegance of the presentation, be made plausible without a draft of the technical content of at least some of his monographs or textbooks, be it on the *Study of Stellar Structure*, on *Stellar Dynamics* or on *Radiative Transfer*, each of which initiated a new field of research? This book demonstrates how it can be done: in his introductory chapter, for instance, Wali quotes some of Chandra's colleagues, all of whom somehow emphasize the importance of Chandra's characteristic style of "thoroughness, lucidity and accuracy", his "wonderful feeling for the essential, and a feeling for beauty". These remarks about Chandra's personal style and other contemporary statements about the "rewarding aesthetic experience to listen to Chandra's lectures" are then corroborated by some quotes from conversations the author had with Chandra about his 'style' as well as some observations about the actual composition of some of his textbooks (p. 25 f.).

In some cases though, the reviewer would have liked the inclusion of a key formula as for instance the one describing the famous Chandrasekhar limit that led to the later discovery of neutron stars and black holes. But instead of citing the formula, Wali gives a very detailed account of the dramatic history¹ of why it took the community so long to accept this surprising but straightforward result of a deduction which Chandra made at the age of nineteen on a steam boat from Bombay to Venice, on his way to Cambridge, England, where he would study as a student from 1930 on and as a Fellow of Trinity College in 1933/34. A straightforward combination of Einstein's relativity theory and Sommerfeld's quantum theory lead him to the result that there was a limit to the mass of a star which would evolve into a white dwarf as Eddington had described it in his *Internal Constitution of the Stars* (1926). Although he was quite sure about his result and although many physicists (such as Pauli, Dirac and Rosenfeld) and astrophysicists privately responded positively to the claims of this foreign newcomer, his result was not accepted by the community for many decades because of a surprising and unfair reaction by Eddington, who ridiculed Chandra's claims by claiming that "there should be a law of nature to prevent a star from behaving in this absurd way" (p. 125). After giving us this detailed account of how Eddington became such a victim of "cocksureness" (p. 142), Wali adds some quotes from conversations with Chandra about this event: it is amazing to see how unemotional Chandra comments upon this harmful episode of his life (p. 142 f.), regretting that it took nearly thirty years before the full significance of Chandra's formula was realized and that Eddington had missed the discovery of black holes which he, because of his mastery of general relativity, could have made in the mid-30s, according to Chandra². It is incredible to hear that the personal relations between Eddington and Chandra apparently were not hampered by this incident and that they

¹ Cf. a brief account given by Chandrasekhar himself in his "Richtmyer Memorial Lectures", *AJP*, 37 (1969), 577-584.

² See p. 143. When Chandra then continues by saying: "if Eddington had done that, he would stand today as the greatest theoretical astronomer of this century", this is a very delicate comment on why he chose to call his own book on him, *Eddington: The Most Distinguished Astrophysicist of his Time!*

continued to have common biking tours and private conversations (138, 142 ff.) in spite of their open conflicts at the meetings of the Royal Astronomical Society.

Apart from this dramatic and for Chandra nothing less than traumatic incident of his very early career, Wali reports about many other interesting periods in Chandrasekhar's life: be it his experiences at school in Madras (chapter 3: "Determined to Pursue Science"), or his student years at Cambridge giving a quite unusual perspective on the English university system as seen by a member of the poor Commonwealth states³ or his observations at a brief stay in Copenhagen, revealing quite a different side of Bohr⁴. He also has a chapter on Chandra as editor of the *Astrophysical Journal* 1952-1971: "The Autocrat of the Editor's Desk", pp. 206 ff. giving nice samples from his editorial correspondence and making quite clear why in retrospect Chandrasekhar considered this job as a "mistake" and as a "distortion" of his personal life, isolating him from his colleagues (208, 228).

We also find quite unexpected details of great interest for history of science in different areas. To give only one example, Chandra tells us about his impressions during the Nobel prize ceremony for Dirac and Heisenberg in 1932: "I was sitting in the last row of the lecture hall. Max Born was next to me. The hall was packed full, and, as the great luminaries – Rutherford, Aston, Chadwick, Dirac, Heisenberg and others – walked in, everyone stood up and applauded. Born was in tears; he said: 'I should be there, I should be there'" (p. 295). So this *Hinterbänkler* perspective sheds quite a different light on the prestigious event and on the way some people "eat their hearts out" over getting it. Since Chandra's arenas of work are not in the "limelight of science", he never expected the prize which he finally got in 1983 (with some 40 years delay). And more than that: "I never expected it, and in many ways, I would have much preferred not to have received it [...]. I find it a distortion of my life" (p. 297).

But this book contains much more than mere science: for instance, Wali gives a very detailed report about Chandra's and his wife Lalitha's family traits (chapters 2 and 8), very interesting from the point of view of a social historian as well as for the historian of science, since one of Chandra's uncles is C.V. Raman, Nobel laureate of 1930 who served as a kind of challenge for the young Subrahmanyan to meet. We also learn a lot about the late British ruled India, about patterns of upbringing, education and living, marriage and grieving. Wali also tells us about the occasional racial discrimination which Chandra suffered as a dark-skinned Indian, e.g., during his time at the Aberdeen Proving Grounds, where Chandra, research associate at the Yerkes Observatory, at Williams Bay, Wisconsin, from 1937 on, helped to solve ballistic problems after the USA had entered the war in December 1941 (see pp. 194 f.). Because at that time he was not yet a naturalized citizen of the United States⁵, he was excluded from classified research as in the Manhattan project.

Wali's book is a biography about a scientist who is still alive – some interesting facets of this book are connected to this: first of all, Wali gives the transcripts of some of the interviews he had with Chandra as an appendix, both as a complementary addition to his own text and as a chance for the reader to check some of the conclusions and assertions

³ See e.g., the remarks about Chandra's humiliating experiences at the High Commissioner's Office, p. 77.

⁴ Bohr frankly told Chandrasekhar that he "cannot be really sympathetic to work in astrophysics" and excluded him from his after-tea conversations with favorite physics students such as Placzek, Weisskopf or Rosenfeld in his upstairs study (see p. 102 f.).

⁵ But only until 1952. Cf. pp. 231 ff. for the negative repercussions of this naturalization at his family and friends in India.

made in the main text ⁶. Second of all and more interesting still, Chandra himself actually asked the author to add a few footnotes to clarify certain points, e.g., the importance of the contributions of R. Lebovitz for his own work *On Ellipsoidal Figures of Equilibrium* (see p. 26).

Only occasionally is the information about many persons mentioned in the book really insufficient, such as in the case of the director of the Kodaikanal Observatory “one Mr. Royds, an Englishman” (p. 153) – at least the first name (Thomas) would have been at place here, or incorrect as on p. 94, where not only one but several German scientists are misspelled, the correct spelling being: Bonhoeffer (without an additionnal ‘h’), Harteck (with a ‘c’) and where the “death blow to Eddington’s theory” is erroneously retranslated into German as “Tod-Stop zu den Eddingtonsche Theorie”. In general, Wali’s biography of Chandrasekhar will serve to be a very useful source for historians of physics and astrophysics as well as an interesting book for a much wider audience.

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⁶ In the footnotes, he also mentions an unpublished manuscript by Chandrasekhar, “A Scientific Autobiography, 1943-1983”, which might have been worth adding as another appendix, complementary to Wali’s text.