

BOOK REVIEWS

The book by P. L. Sardesai makes one appreciate the processes that led to these changes in conceptualization in an elegant manner, while strictly adhering to the pedagogical order that is necessary in introducing the challenging concepts of special relativity to the undergraduate student. Therefore, while one has to arrange concepts in a textbook in a manner which may not necessarily reflect their chronological development, Sardesai does take care to reveal the interesting twists and turns in the history of science in the 19th and early 20th centuries which provided the context for SR.

Written, as he says in the preface, for an Indian student who may find many other excellent texts on the subject by foreign authors too highbrow, and who may be in the end at a loss when it comes to developing problem-solving skills, the author has provided an ample number of illustrative examples and problems. One gets a feeling while going through the chapters, that the author's endeavour to enable the average student to master the elements of SR, makes him take great care in imparting lucidity to the concepts he explains. After introducing LT, the author moves on to explaining coincidence, colocality and simultaneity, as they are defined in SR. While coincidence implies that two events happen at the same place and at the same time, colocal events are those that happen at the same place, but not necessarily at the same time. Simultane-

ous events are those that happen at the same time, but not necessarily at the same place. What happens to these notions when we re-examine them from the point of view of an observer in another inertial frame related through a LT? While coincidence remains valid for all inertial frames, colocality and simultaneity lose their meaning when going from one frame to another! That is, events that are measured to determine that they happen either at the same place or at the same time, are found to happen at different places (in case of colocal events) or at different times (in case of simultaneous events). While colocality is not obeyed even in the Galilean transformations, violation of simultaneity is unique to SR. These notions that seem to defy the intuition of a student uninitiated in SR, are clearly presented here and as this reviewer found, not as explicitly treated in many other texts on SR. This sets the stage for introducing the concepts of world line of a particle through space-time diagrams and from a use of the space-time diagram, the important principle of causality.

The treatment of mass-energy relationship and relativistic mechanics follows a chapter on the consequences of SR in optical effects in which, apart from examining Fizeau's experiment in detail, the chapter offers a complete derivation of the relativistic Doppler effect. This brings out clearly that in relativistic Doppler effect, there is a shift observed in the wave-

length even when the observer is stationed orthogonal to the moving emitter, unlike in the non-relativistic case. This is an aspect glossed over in many classroom situations where the Doppler effect is being explained, and keeping relativistic aspects in mind is necessary for the teacher to present a complete picture. The concepts of Minkowski space and the four-vector, which help to present SR in a unified manner are introduced only after the basics are well entrenched. Relativistic mechanics is revisited here through the concepts of four-momentum and four-force (Minkowski force). The final chapter establishes the Lorentz invariance of the Maxwell's equations.

Perhaps an addition in the earlier chapters of the book that would have enriched the content is the introduction of the γ factor in the LT through Bondi's k -calculus, which is appealing in its treatment that makes use of simple space-time diagrams. However, this omission causes no serious loss to the excellent manner in which the subject is developed. At its price, this book is bound to be well received as a user-friendly and economic buy that provides an accurate and elegant treatment of this important theory.

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Science wallpaper for high school and undergraduate students



The National Council for Science and Technology Communication (Department of Science and Technology, Technology Bhavan, New Mehrauli Road, New Delhi 110 016) brings out a fortnightly science wallpaper for high school and undergraduate students called *Kyon aur Kaise* (Why and How). There are 18 issues annually to coincide with the school academic year from July to April and at present there are editions in English and Hindi. The annual subscription is Rs 120 (single copy Rs 10). The contents are chosen and structured to stimulate students, emphasizing the

scientific methodology of raising questions and seeking answers. Some of the highlights are: This Fortnight in Science, Experiments that Changed the World, Nature Watch, etc. It provides a forum for students to air their views and opinions on a wide range of scientific and social issues that they confront in everyday life. Eklavya, an Institute for Educational Research and Innovative Action, has taken up the editorial design and production responsibility. The email address is eklavyamp@vsnl.com and postal address is E-7, HIG-453, Arera Colony, Bhopal 462 016.