

BOOK REVIEWS

Why a Textbook?

The Special Theory of Relativity. By H. Muirhead. Pp. xi+163. (Macmillan: London and Basingstoke, September 1973.) £3.95 boards; £2.45 paper.

DR MUIRHEAD describes this as "a textbook on special relativity from the high-energy physicist's point of view". He expresses surprise that "no undergraduate textbooks on special relativity have been written by high-energy nuclear physicists". Although his own attempt is enterprising and courageous, I hope it is not too unkind to suggest that it rather demonstrates why this should be the case. For the problems of high-energy physics for which special relativity concepts are important are problems for which much more difficult quantum concepts are even more characteristically important. By the time a student is ready to tackle the quantum ideas, he ought to be able to use special relativity almost without thinking. To attempt to teach special relativity to undergraduates with emphasis on applications to high-energy physics, with all respect to an expert in such physics, does appear to be doing things the wrong way round. The attempt inevitably results in the need to say of one topic that it "can only be properly appreciated within the framework of quantum mechanics", of another that "the story is complicated and we shall not pursue it here", and so on. Thus at best the student can only half understand what he is reading about. Actually Dr Muirhead does his best to cope with this situation by providing a set of carefully chosen "problems" at the end of each chapter, so that the student can at any rate test his understanding. And, of course, not every application discussed has a bias towards high-energy physics; for instance section 3.6, "The visual appearance of rapidly moving bodies", is an interesting simple topic that happens not to find a place in most textbooks and it seems to have inspired the publisher's attractive jacket design.

As a text on special relativity, a reviewer is bound to remark upon some shortcomings. There is no clear pattern to the mathematics; some deals with space and 3-vectors together with time, some with space-time and 4-vectors, and there is fragmentary use of matrices and tensors. Some of the derivations are laboured and confusing, as for example that of the Lorentz force in section 6.5. While the printing is clear, the layout is in some respects curiously inelegant,

and there are numerous misprints—on page 125 a publishing house is called →ergamon →ress. A book of this sort makes one wonder why any textbook on special relativity is still needed. For special relativity is not a department of physics but a basis for nearly all physics. Almost everything that is known about it has been known for nearly seventy years; so one would think that by now it ought to have been absorbed into the general formulation of physics as a whole. How is it, then, that students still have to learn special relativity much as their predecessors have done over the past seventy years? They first become imbued with all the ideas of classical physics, and afterwards some of them acquire some small text that conveys to them how certain of these ideas may be somewhat unsatisfactory although this may be unimportant unless they have to play around with speeds approaching light-speed. And nearly every such text, that under review being no exception, starts with the same sort of historical introduction that has been the fashion from the start. So the reader's mind is conditioned to find relativity surprising and not quite "natural".

A simple partial answer is, naturally, that non-relativistic physics is so successful for most of what interests most people that these people have no practical need for anything else. And the comparatively few who do need relativity for practical purposes can get along by learning to use "relativistic equations of motion" without troubling about the rest of the subject.

To go a little deeper, while relativistic electromagnetism can be made simpler than non-relativistic, relativistic mechanics is much less simple than non-relativistic and, of course, the electromagnetic field may be observed only through its mechanical effects. Since then relativistic mechanics is not included in most elementary treatments of mechanics, one must rather grudgingly admit that a textbook of special relativity is still needed. Only let it be of some logical form and mathematical elegance, and without a historical introduction!

Maybe the best preparation for learning special relativity would be provided if someone nurtured upon relativity would write a textbook of general classical physics. He could have fun formulating postulates on rigid bodies, clocks, electromagnetic fields, and so on, so as to construct a self-consistent system yielding all pre-relativity physics—even including the paradox that if two twins separate and meet again after

completely different careers their ages must nevertheless be the same. Most readers would then turn with relief to relativity physics.

W. H. MCCREA

Brainwaves

Explorers of the Brain. By Leonard A. Stevens. Pp. 330 (14 plates). (Angus and Robertson: London and Sydney, 1973.) £2.95.

I FIND this book very attractive. It is a most readable and lively text enriched by a wealth of stories and anecdotes that are surprisingly accurate in all the fields in which I can check them. The author has made a remarkably erudite study of the history of brain exploration from Greek times to the present. He has travelled very widely in the United States, visiting a large number of laboratories which he lists in the acknowledgments section. Understandably his writing is coloured by the experiences he has had and the advice he has been given in these various centres for brain research. Nevertheless when he is dealing with important work in other countries, he is also very well informed. I am able to judge this in some fields in which I have personal experience as, for example, the Loewi-Dale story of chemical transmission and the Hodgkin-Huxley-Katz-Cole-Curtis story of the action potentials of giant axons. He gives a very well informed account of the EEG and the role of Hans Burger in this remarkable discovery.

Of particular value is his account of Ramón y Cajal whom he quite rightly makes one of the heroic explorers of the story. As in the case of Ramón y Cajal the chapter often starts with some remarkable event vividly told, and then it runs through a flashback of the scientific discoveries that led to this initial vivid scene. In this dramatic way, he is able to hold the interest of the reader.

Of course, in such a wide field as brain research, there must be many omissions of distinguished investigators. For example, there is no mention of Lucas, Zotterman, Mountcastle, Hubel, Wiesel, or Kuffler. In part these omissions arise because the very important afferent side of nervous pathways has been virtually ignored. On the other hand, there are superficially exciting scientific claims that have an undue treatment in the text. No doubt the author feels that these stories are valuable in his efforts to stress the play and interplay of scientific ideas in the growing fringes of brain investigations.