

A run through quantum mechanics

R. B. Jones

Quantum Mechanics.

By P. C. W. Davies.

Routledge & Kegan Paul: 1984.

Pp. 139. Pbk £3.95, \$9.95.

PAUL DAVIES'S *Quantum Mechanics*, the first of a series of books entitled *Student Physics*, displays the fast-moving and concise style which has been an attractive feature of his previous science writing. But what has hitherto been a virtue appears on this occasion as a vice. There is insufficient technical detail for the book to be considered as the main text for a first course in quantum mechanics; moreover it does not include enough applications to suit the diverse requirements of most undergraduate physics degree courses.

In just over a hundred pages of text, Professor Davies touches on many standard topics and techniques, including one-dimensional potential well and barrier problems, three-dimensional bound state problems, the simple harmonic oscillator and orbital angular momentum (each done

by both differential equation and operator methods), time-independent and time-dependent perturbation theory and the variational principle. Many particle systems, degenerate perturbation theory and angular momentum addition have about a page each, while three-dimensional scattering and the non-relativistic electron in an electromagnetic field described by a vector potential are not mentioned at all.

Not only is technical detail missing, however, but the laconic discussion of basic principles may mislead the typical student. In connection with the two-slit experiment, saying that "the particle presumably only visits one slit" seems to impute a well-defined position to the particle in the absence of any measurement of its position. In conjunction with the energy-time uncertainty relation, the statement "the law of energy conservation can be slightly violated in quantum mechanics" is apt to confuse students.

In contrast with the miserly text there is, in an appendix, a generous selection of good exercises. The proper use of a sparse but readable book such as this is as a revision text, and for that purpose it will do very well. □

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Universal arguments

Michael Rowan-Robinson

Introduction to Cosmology.

By Jayant V. Narlikar.

Jones & Bartlett, 20 Park Plaza, Boston, MA: 1983. Pp. 470. \$30.

WHAT a pleasant surprise Jayant Narlikar's *Introduction to Cosmology* is. I thought that the book might turn out to be either a mathematical exercise, with little to do with physics and observation, or an example of the conspiracy theory of cosmology. In this theory, of which Fred Hoyle and Geoffrey Burbidge are eloquent advocates, the majority of cosmologists gang up to suppress the mountains of evidence unfavourable to Big Bang cosmology, while at the same time ignoring all the evidence which now, at last, supports the steady state theory.

Both of these fears are unfounded. Narlikar has written a marvellous advanced-level introduction to cosmology in which the mathematical, physical and observational aspects are expounded clearly, simply and in sufficient detail for almost all readers to find themselves drawn into areas they might have thought inacces-

sible. The many hundreds of exercises, complete with hints for their solution, will make this an invaluable course book at final-year undergraduate or postgraduate level, especially for the more theoretically minded students.

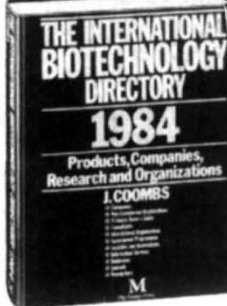
A good feature of the book is that some of the weaknesses and incompletenesses of the standard hot Big Bang theory are emphasized (more orthodox types will find this overdone). The more serious of the rival cosmological theories are outlined in some detail and Narlikar is reasonably frank about their shortcomings. He does not pretend, for example, that the steady state theory has much hope of being revived. In outlining the debate about the quasar redshifts, however, he does lay an eccentric emphasis on the non-cosmological interpretation, surely hardly tenable today.

Hardly surprisingly for a book with such a wide scope, it is not up to date in all areas. Neutrinos with non-zero rest-mass are mentioned several times, for example, but not their effect on the galaxy formation problem. There are also one or two small hiccups, like the luminosity of the Sun being given a factor of two too low, and Hubble being cited as having demolished the island universe theory, but these can easily be fixed in the second edition. All in all, this is probably the best cosmology textbook available at this level today. □

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● Jayant Narlikar's *Violent Phenomena in the Universe*, first published by Oxford University Press in 1982, has now been issued in paperback. A review of the book appeared in *Nature* 298, 103; 1982. Price of the paperback is £3.95.

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