

Travelling through time

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Time Warps. By John Gribbin. Pp. 167. (Dent: London, Melbourne and Toronto; Delacorte/Eleanor Friede: New York, 1979.) Hardback £5.95, \$8.95; paperback available from Sphere (London) in September, 1980.

Time Warps, the most recent addition to Dr Gribbin's list of popular science books, is about time and time-travel. It is broad in its scope; it begins with a discussion of time-telling through the ages, ends with an excursion into Taoist philosophy and the *I Ching*, and touches on Special Relativity, black holes, precognitive dreams and reincarnation in between.

For the most part, the author does not claim to offer any new insights; rather, as he says, to present old ones in a logically ordered structure. These ideas have been collected either from other popular science books, or from science fiction literature, and the book is liberally sprinkled with direct quotations from these sources. The author's own contribution consists of an explanation of déjà-vu experiences, all forms of dreams, and reincarnation in terms of travel "sideways in time". He postulates the simultaneous existence of all possible universes, and his theory is that dreams and similar phenomena arise from psychic contact with occurrences in some other universe, perhaps one very similar to our own. The beauty of this is that it explains not only dreams which come true, but also those which don't. Dr Gribbin may or may not be the first person to have thought of this idea, but as far as I know, he is the first to admit to it.

This book is aimed at a wide non-scientific audience. It is therefore particularly reprehensible that some of the most important scientific statements are wrong. For example, most of section II is based explicitly on the following incorrect argument. The steps are: (1) Einstein's Theory of General Relativity predicts that under some circumstances massive objects such as stars will collapse to form rotating black holes; (2) these black holes are described by the Kerr metric; and (3) one can therefore travel through a rotating black hole into a new universe. Statements (2) and (3) are false. The misunderstanding arises because the Kerr solution contains paths connecting the interior of a black hole with other regions of the solution, which could be

construed as new universes. Unfortunately, this solution is both vacuum (that is, it contains no matter) and stationary, so it does not represent a realistic collapse. Nor can it have a real observer moving in it (let alone a spaceship). Furthermore, perturbation analysis shows that solutions which resemble Kerr outside the horizon, but which could represent a realistic collapse and contain observers, cannot be extended through the inner horizon into a new universe. The point is that even infinitesimal deviations from the special symmetries of the Kerr solution (such as would be caused by the existence of a particle of matter) drastically alter the structure of the interior solution and destroy the supposed gateway to the new universe (see McNamara, *Proc. R. Soc.* **358**, 499; 1978). It is therefore generally believed that a rotating black hole singularity is not as Gribbin puts it "a different kettle of fish" from a non-rotating one—it is the same kettle. Travellers falling through the horizon could never escape and would eventually be crushed. Appropriately, the incorrect claims made in the book are accompanied by the wrong diagram: the Penrose diagram of a non-rotating charged black hole is shown.

The remaining passages about physics are, on the whole, accurate. These include good introductions to elementary quantum effects, and to the time dilation effects of Special and General Relativity, although even these are marred by a grotesque analogy between velocities and angles on a circle ($v < c; \theta < 360$), and also by the statement that time for an astronaut in closed orbit goes slower than time on Earth: it goes faster if the orbital radius is greater than one-and-a-half times the Earth's radius.

The passages not concerned with physics are characterised by their superficial and tendentious style. The description of Stonehenge as an astronomical computer, which opens section I, is typical. It is gleaned largely from the books by Hawkins (*Stonehenge Decoded*; Souvenir: London, 1967) and by Hoyle (*From Stonehenge to Modern Cosmology*; Freeman: San Francisco, 1972). No mention is made of the review by Professor R. J. C. Atkinson, entitled *Moonshine on Stonehenge* in which much of Hawkins' book is shown to be scientifically and archeologically unsound (*Antiquity*, 1966) or of the correspondence in the 1967 volume of *Antiquity*, where comments range from "dubious" to "untenable". The section then progresses to the subject of clocks, which is illustrated by a picture of a sundial, apparently capable of "all the accuracy

of a modern clock". It concludes with a discussion of time paradoxes and the meaning of time. The level of debate here, as typified by the subsection headed "Temporal Pigeon Holes and the Cosmic Postman", is most politely described as lightweight.

Clichés, polysyllabic humour, and other forms of turgid jocularity abound in this section. If you get past "Meanwhile, the poor man in the street was harried along, willy-nilly, into the 20th century", you are confronted with "intrepid circumterrestrial travellers", their "staid counterparts back home", the "change of date situation" and the fact that "even the common man and woman must come to grips with the subtleties of horological hairsplitting".

More serious, however, is the pernicious tendency to populate the book with 'goodies' (in whose work the author sees support for his theories) and 'baddies'. Thus the goodies are "respectable physicists, schooled in the best scientific tradition", "very solid members of the community", and "very sober scientists with impeccable academic credentials and years of research experience". On the other hand, we read that "Many theorists have an innate dislike for white holes, perhaps because they are only just coming to terms with the implications of black holes, and don't want to move too fast too soon"; that "archeologists cannot bring themselves to accept the subtleties which astronomers find in the Stonehenge computer"; that "there is not enough evidence yet to persuade the doubters" (for the existence of tachyons); and, incredibly, that Dr Gribbin sometimes wonders whether the "verbiage" in philosophical articles is not just "window dressing, to frighten off . . . people who are not 'philosophers'". Interested readers will find plenty more similar examples throughout the book.

Much the same can be said of section III, which purports to relate Eastern Philosophy to Western Science. To be fair, I think that this section will appeal to people with a taste for bizarre interpretations, and many readers will want to follow up the ideas in the bibliography provided. I cannot take these interpretations seriously, because they fail to explain the basic mechanisms and so seem to have no advantage over many less outlandish theories.

A glance at this review will reveal that *Timewarps* is likely to become a best-seller, and that many people will learn a lot of new ideas from it. It is a pity that it was not written with greater regard for accuracy. □

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