Books


The general theory of relativity was advanced by Einstein in a series of papers published between about 1911 and 1916. It is a theory of gravitation, the first to improve on Newton's theory which had held sway for over 200 years. As a physical theory it is held to be one of the most elegant and powerful ever developed. Since it is a gravitational theory, its natural field of application is Astronomy and in particular, cosmology. In spite of the importance of general relativity however, its mathematical complexity has prevented many from attempting to understand it. This book therefore which aims at amateur astronomers and other less technical readers is to be welcomed.

When I say that a book for the non-technical reader introduces in its second chapter the notion of a four-dimensional space-time continuum and then in its third chapter discusses parallel transport of vectors and its relationship to intrinsic curvature, doubts about the author's intentions would be justified. Let me be frank. This is how I felt after reading the opening three of the book's thirteen chapters. Yet I was soon won over by the clever use of analogy and simplifying diagrams. By the time I had finished I had to admit that the book attained its stated goals very well indeed.

The first four chapters are devoted to the basic notions underlying general relativity and their experimental verification. Mentioned here is Einstein's explanation of the excess advance of Mercury's perihelion. This effect had been noted more than a century previously and attempts to explain it using Newtonian gravitation gave rise to the search for a planet or planetoids inside Mercury's orbit. Einstein's theory predicted a shift precisely in agreement with that observed. Similarly the bending of starlight passing close to the Sun and the retardation, viewed as a red-shift, of photons leaving the surface of both the Sun and, more strikingly, of white dwarfs is explained.

Three subsequent chapters are devoted to the almost ubiquitous black hole and its close relative the white hole. The strength of the claim that the X-ray source Cygnus X-1 is a black hole is carefully measured. A concept which I find fascinating was that of a "worm hole". This permits one, in theory at least, to travel from one part of the Universe to another in less than the light travel time (the "space-warp" of science-fiction fame?).

Much of the remaining chapters concern current research into areas such as Quasars, "exploding" galaxies, gravitational waves and the creation and ultimate fate of the Universe.

The book is well-illustrated and in contrast to many recent paperbacks looks as though it will stand quite a bit of handling. So full-marks for an excellently produced book on a subject whose appreciation is often regarded as beyond the lay reader.


Armagh,
February, 1978

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146 I.A.J. Vol. 13

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