'The Earth but a Satellite of the Sun'

from Dr. R. d'E. Atkinson

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I HAVE read Professor Taylor's article[1] with great enjoyment. There are, however, two matters of fact on which, though they do not affect her main thesis, the record should, I think, be set right. (a) The earliest experimental proof of the Earth's revolution round the Sun was neither Bessel's detection of the relative parallax of 61 Cygni, nor Henderson's determination of the absolute parallax of α Centauri (both of which occurred in 1838) but Bradley's very beautiful discovery of aberration in 1725, together with his slightly later explanation. The discovery was made in a deliberate search for parallaxes; and although that particular proof of the Earth's movement was not then achieved, it was at once recognized that aberration provided a different and equally cogent one. Bradley's work was indeed resisted, in some quarters and for a short while, for reasons which Professor Taylor will by no means find unexpected. His later discovery of one term in the nutation was also a discovery of something which would have embarrassed Ptolemy, and delighted Newton; it certainly tended to confirm the picture, if that were needed. By the time parallaxes actually were discovered, though there still were individuals, sometimes of high rank, whose prejudices were stronger than their intellects, the only point of genuine doubt was the question how far away the nearest stars really were. (b) It is not correct that stellar parallaxes range from a tenth to three-quarters of a second; this would imply that even the furthest stars are only 32·6 light years away. The vast majority of all parallaxes, even within our own galaxy, are certainly less than 1/10,000 of a second, and are still far byond the range of direct measurement. Professor Taylor may perhaps have meant that the values are observable down to 0·1″, but even this would be misleading. There are only 165 known parallaxes of 0·100″ or more, but the values are reasonably significant, especially for statistical work, down to 0·025″ or so, and as of 1950 there were 2230 of these catalogued. The distances are increasingly unreliable of course, as one goes further; but the useful information which those beyond 0·1″ give is probably greater than that from the relatively few nearer ones.

Professor E. G. R. Taylor writes:

Dr. Atkinson's kind note is a reminder that it was the generation that learned from Sir Isaac Newton who, early in the eighteenth century, began to draw what has been termed the 'iron curtain of advanced mathematics' between the scientist and the ordinary educated man or woman. Bradley came into my reading in practical fashion when I studied the Discourse of de Maupertuis, delivered in 1737, 'Upon the Measure of a Degree of the Meridian at the Polar Circle'. This was the measure which established the spheroidal shape of the Earth. According to Newton's reasoning, the globe was flattened at the poles, whereas from Cassini's measurements it appeared to be flattened at the equator. 'And it is of some consequence to navigators (the French philosopher remarked) not to fancy they are sailing upon one of these spheroids, while they are really sailing upon the other.' The essential operation was the measurement of the

meridian altitude of a fixed star from the north and south extremities of a care-fully surveyed base line. The party could not make the observations simul-taneously and so the correction for aberration was to be used. The apparent cyclic change of declination which Bradley had observed 'proceeds from two motions combined, that of the Rays of Light that come from the Star, and that of the Earth in its Orbit', wrote M. de Maupertuis, referring the reader to *Phil. Trans.* No. 406. But alas! this reader did not follow the reference up, nor realize the implications of a phrase appearing a little later in the Discourse: 'yet for the sake of such as may scruple to admit Mr. Bradley's Theory . . . we wish'd that this correction might be very small'. And so the time-interval between the observations was shortened as far as possible, while further to satisfy those whom the Earth's motions made uneasy, the final calculations were also given with and without any correction for aberration. But even more emphati-cally the latter figures made clear that 'the Earth is a spheroid flattened towards the Poles' as de Maupertuis put it.

In respect of Dr. Atkinson's second point also it is clear that we find only what we know how to look for. I turned up the *Nautical Almanac* (1951) and found under Stellar Parallax a list of eleven well known stars whose *Mean Place* had been corrected for parallax in the tables. The corrections ran from β Geminorum (Pollux) 0·100″ to α Centauri 0·756″, from which I unwarrantably generalized with no thought of galaxies or light-years.

REFERENCES

1 Taylor, E. G. R. (1958). The Earth but a satellite of the Sun. This *Journal*, 11, 150.
2 The following general reference should have been included in those given in the original article. Taylor, E. G. R. (1943). *Ideas on the Shape, Size and Movements of the Earth*. P. S. King and Staples for the Historical Association.