

XC. *On the Einstein Spectral Shift.*
By Sir OLIVER LODGE*.

REFERRING to the interesting paper by Prof. H. J. Priestley on p. 747 of last month's *Phil. Mag.*, I interpret a sentence in the second paragraph as intending to say that if the Einstein interval ds is transmitted by radiation, instead of the time period dt , then the shift of spectral lines will occur when not the source but the observer is immersed in a strong gravitational field. His further argument is (A) that this transmission of ds is a natural consequence of the principle of equivalence, which makes $ds=0$ along a ray even in a gravitational field, and (B) that the confirmed gravitational deflexion of a ray can be equally well obtained without depending on the principle of least time, or any other pre-relativity physics, and therefore without admitting the constancy of time period which that principle apparently implies.

But, I venture to ask, does Prof. Priestley succeed in establishing proposition B?

He says truly that, since $ds=0$ along a ray,

$$dr^2 + \gamma r^2 d\theta^2 = \gamma^2 dt^2 \quad \dots \quad (7)$$

for light; and he also claims to obtain

$$r^2 \frac{d\theta}{dt} \text{ proportional to } \gamma. \quad \dots \quad (8)$$

instead of being merely indeterminate as the ratio of two infinities; wherefore, combining these equations and putting $1/r=u$, he gets

$$\left(\frac{du}{d\theta}\right)^2 + \gamma u^2 = \text{constant.}$$

Whence on differentiation (remembering the variability of γ)

$$\frac{d^2u}{d\theta^2} + u = 3mu^2, \quad \dots \quad (9)$$

an equation which may be trusted to behave properly. It is indeed the usual progressing gravitational equation without the constant term responsible for an orbit.

* Communicated by the Author.

But is his obtaining of (8), by aid of

$$\gamma \frac{dt}{ds} = k \quad \text{and} \quad r^2 \frac{d\theta}{ds} = h,$$

legitimate for the case when $ds=0$?

I ask in no controversial spirit. I too thought at one time that it was the observer's field that was effective, but I am now very doubtful; and it would be interesting to have the point settled before a clear experimental verdict is forthcoming.

XCI. Notices respecting New Books.

Transactions of the Bose Research Institute, Calcutta, Vol I. parts 1 & 2, 1918; Vol. II. 1919. Life-movements in Plants, by Sir J. C. BOSE, Kt., M.A., D.Sc., C.S.I., C.I.E., Professor Emeritus, Presidency College; Director, Bose Research Institute. Published by The Bose Research Institute, Calcutta.

IN these two small volumes a set of papers produced by Sir J. C. Bose and his assistants are collected.

The Bose Institute was opened in 1917 and the work done up to 1919 is here recorded. Owing to the fact that the volumes are published by the Bose Research Institute at Calcutta, they are somewhat inaccessible to English readers. But as they contain detailed descriptions of a long series of experiments on which the various pronouncements of Sir J. C. Bose are founded, a critical evaluation of his work can only be obtained through a study of these volumes. Whatever else may be said, it is entirely evident that new applications of physical methods are being introduced; and it is up to the workers who consider the living organism their own domain, to look into the possibilities with respect to this new school; for the old methods have not proved magical in hurrying on the development of knowledge in this domain, and methods which have produced great increases of knowledge in many different branches of physics might well have some help to offer.

IN *An Outline of Physics* (Methuen, 6/6), L. SOUTHERNS, M.A., B.Sc., Lecturer in Physics, University of Sheffield, attempts a radical rearrangement of the subject-matter of a student's first course at a modern university. He gives first a general sketch or outline of the subject, which is intended to act as a frame on which detailed instruction may be placed. Part II. comprises a course suitable for general purposes, and is planned so as to allow the greatest elasticity and scope for modification.