LETTERS TO THE EDITOR

Radiating Masses in Einstein's New Relativity

It is well known that the field equations of general relativity have not yet provided a satisfactory mechanics of radiating masses. Following the ideas of classical relativity it has been shown by the author[1] that even radiating small masses trace geodesics. However, according to the recent developments of general relativity, largely due to Einstein[2] and his collaborators at Princeton, the geodesic postulate is extraneous and the field equations themselves ought to give both matter and motion. The question now arises as to whether the new theory explains the problems of radiating masses such as (i) the external field of a radiating mass or (ii) the motion of a radiating mass in the field of another. The latter problem is of great astronomical interest in connection with the evolution of binary stars.

It is found that the new exposition of general relativity fails to explain the mechanics of radiating masses. This comes out, moreover, in a way, not anticipated by Einstein and his collaborators. It is not possible to give here all the details but the crux of it is that, in the problem of p bodies, the following equation (1938 2*b*, §9) is obtained:

$$\gamma_{00,n} - \gamma_{0n,0} = \sum_{k=1}^{p}\left(4\overset{k}{m}\Big/\overset{k}{r}\right)_{,n} \qquad (1)$$

Einstein and his collaborators now remark: "This equation can be solved without introducing new singularities only if $\dot{\overset{k}{m}} = 0$. In other words, the quantities $\overset{k}{m}$, which actually measure the masses of the point singularities, are necessarily constant".

What needs to be pointed out here is that if we use the true equation of motion for the k^{th} particle (1938 2*b*, [illegible]) we get from (1) itself

$$0 = \overset{k}{C}_n = \frac{1}{4\pi}\int [illegible]$$

Hence $\overset{k}{m}$ must necessarily be constant, that is, the masses must be necessarily constant, a result which we get without attempting a solution of (1).

The failure to incorporate non-static masses in the treatment of the new as well as classical relativity must be attributed either to the field equations or to the condition at infinity, i.e., that the field is Galilean there. A Galilean field at infinity is necessary for the conservation of energy of any isolated material system, and so, if the joint system consisting of radiating masses and outgoing radiation is to obey the principle of conservation, space [illegible] ed to be flat or Galilean at infinity.

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1 Narlikar, V. V., *Nature*, [illegible] 1938, **142**, [illegible]
2 (*a*) Einstein and Rosen, *Phys. Rev.*, 1935, **48**, [illegible]
(*b*) Einstein and others, *Ann. of Math.*, [illegible] 1938, **39**, 65–100.
(*c*) Infeld, L., *Phys. Rev.*, 1938, **53**, [illegible]
3 Tolman, *R. C. Thermodynamics* [illegible] 1934, [illegible]