days, at a suitable temperature. The line of demarcation between two daughter amœbæ travels down from north to south of the fission sphere (= the form assumed by the dividing amœba), which remains firmly in contact with the substratum during the whole process of division. In this it resembles *A. proteus* γ and *A. discoides*, and differs from *A. lescheræ*. Division of the nucleus is mitotic and takes place within the nuclear membrane; the chromosomes are small and numerous. The telophasic stages are semi-elliptical in outline, in contradistinction to those of *A. lescheræ*, which are more or less triangular. The ectoplasm, which has no longitudinal folds, is tougher than that of the other amœbæ we have investigated. This is an especially useful characteristic for the study of the developing young, permanent preparations of which are, in consequence, more readily made.

The resting nuclei of both adult and developing amœbæ are of the typical form. In the former, a central karyosome suspended in an achromatic network is separated by a clear area from the region of the regularly disposed chromatin blocks lying just under the nuclear membrane. A variety of form consequent upon the fact that the nucleus is rolled about into all sorts of positions by the surrounding cytoplasm may be seen when large numbers of *A. kerrii* are fixed and stained.

The reproductive cycle commences with the emission of chromidia from the nucleus of an adult amœba into the surrounding cytoplasm. Each chromidial mass becomes the rudiment of the nucleus of the new amœba, which is differentiated in the agamont and becomes an encysted agamete. Hundreds of these are shed into the surrounding medium, where they remain for a varying period of time. Hatching out of the young amœba, which is only just visible under a $\frac{1}{8}$-in. objective, is more easily observed in winter. A limax form is that most often assumed by the growing young amœba, the nucleus of which is easily visible. In about eight months the whole life-cycle of *A. kerrii* is completed.

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Boundaries of Space and Time

It is with some diffidence that I venture to comment on the very abstruse issues raised by Prof. Dingle in his Halley Lecture (*Nature*, **153**, 731, 758; 1944) but there is an aspect of the matter to which it seems worth while to direct attention.

The theory of relativity tells us that observable space has a boundary, the extent of which can be approximately estimated, and that any events which may take place, or which may have taken place, at or beyond this boundary are unknown and unknowable. It would also appear that the interpretation of events which may appear to occur near the boundary must be indeterminate, because it is impossible to say to what extent they may be influenced by events or conditions beyond the boundary, of which, it is agreed, we can have no knowledge. Moreover, it may be suggested that this doctrine of a boundary to the observable universe is reasonable whether we accept the other implications of the theory or not.

The boundaries of comprehensible time, past and future, are not known with the same precision as the boundaries of observable space, but it is reasonable to postulate that such boundaries must exist, and that any discussion of events which lie beyond these boundaries is meaningless.

The purpose of the present letter is to point out an important consequence which follows from these postulates: when we are discussing events lying within these boundaries of space and time, we are not entitled to introduce into our argument any assumptions as to conditions at the boundaries or beyond them. Thus we are not entitled to favour theories which enable us to extend the boundaries of time to infinity any more than we are entitled to favour theories which postulate an infinite extension of space. Provided that the boundaries of time permitted by a theory are sufficiently extensive to be consistent with observed facts, no more can be demanded of it.

There is also a further point. We live in a world of change, but there are certain properties of the universe as we know it which appear to be constant in time. It must be remembered, however, that our observations extend over an interval of time which is infinitesimal compared with the periods of time which we are wont to discuss, and we do not therefore appear to have any reliable means of determining whether these apparently constant quantities are in fact constant, or whether they are slowly variable over long periods, and if so in what sense. Where two or more theories are consistent with the observed facts and differ only in respect of the conditions which they involve at the boundaries of space and time, the selection of one theory or another would appear to be entirely a matter of convenience.

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THE theory of relativity tells us that observable space may not be infinite in extent, but it does not postulate a boundary; "finite but unbounded" is the usual phrase. The theory gives no support to the idea that observable events can be influenced by conditions outside the region of possible observation, nor does it set any limits to time. In this respect time differs from space. The last paragraph of Colonel Edgeworth's letter is perfectly correct in principle, but the range of our present knowledge can scarcely be called infinitesimal. A quantity may change so slowly as to appear constant, but the progress of science consists partly in extending the range of observation so as to detect such changes; the slowing down of the earth's rotation, and the reddening of nebular light, however it be interpreted, are examples. It is always possible, of course (unless constancy is postulated by definition), to say that an apparently constant phenomenon is changing too slowly for detection; but any theory which included this assumption would probably give some indication of the rate of change, and further knowledge would enable us to determine whether the assumption was valid. The question of retaining the theory would then be decided on grounds other than convenience.

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