editors, most papers of ordinary character could be taken care of.

If the emphasis upon publication chiefly of brief papers were changed in favor of putting out more considered papers by each author at longer intervals, the total length of all the published papers would probably considerably decrease, for comparisons of an author's earlier data with those gathered later could be published once for all in the comprehensive paper rather than made item by item in the publication of a series of papers each making a minor contribution. There would be some saving also by eliminating a good bit of modification or withdrawal of earlier statements.

But there would still remain some papers whose greater length or abundant illustration or unusually expensive illustration would require publication apart from the regular journals. It is extremely difficult now to find publication for such papers, although they include a goodly proportion of our most valuable studies.

The whole subject of biological publication is now being considered. In this study there should be held in mind the influence which the character of the facilities for publication has upon the development of the science. American biology has suffered appreciably from a wrong influence in this matter, and is due to suffer still further unless the present trend is changed.

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SEPTEMBER 14, 1928

EVOLUTION

THE essential features of the new concept of evolution recently proposed may be stated in a few words. It is rather a harmonizing of previous theories than a new idea; but parts of it are wholly new.

While the idea of linear evolution involving a time element is in general quite valid within restricted groups, as for instance in the vertebrates where it is well illustrated by the horses, yet it must undergo a certain modification, for gaps are found in all these evolutionary lines, and many of these gaps appear to be real—that is, they were never, so far as we have been able to learn, bridged by so-called missing links. To take a concrete example, it is quite obvious that the gap between cats and dogs is broad, and it remains broad throughout the fossil record. Cats never became dogs, nor dogs cats; but both are carnivorous mammals.

Between the backboned animals and the invertebrates the gaps are very wide, and those peculiar types which are intermediate between them are widely different from either.

Between the various invertebrate groups, as the arthropods, echinoderms, nemerteans, and so forth, the gaps are still wider. Indeed, so broad are the gaps between these various types of lower animals that they can not be arranged in any sort of evolutionary line. But they do seem to fit perfectly well into a somewhat complicated figure,[1] showing each to have affinities with several others, not merely with a single one.

The gaps between the various invertebrate phyla go back quite unchanged to the very earliest fossils that are adequately known, those of Cambrian time.

It is undoubtedly true that the Cambrian is much nearer to the present time than it is to the far distant past when life on earth began, so that conditions in the Cambrian are not necessarily those at the time of the origin of life.

But the complexity of the intricate interrelationships between the various phyla at the present day suggests an evolutionary picture of quite a different sort from that indicated by the interrelationships of the forms included within each phylum.

While the developmental lines included within the phyla as we know them (as, for instance, the line tracing the horses from the generalized pygmy type of the Eocene to the large highly specialized types of the present day) involve a time element, the evolutionary scheme by which the phyla themselves are interconnected (see reference cited above) does not. So it is assumed that in so far as the phyla or major groups of animals are concerned life from the very first presented the same essential features that it does to-day.

With this hypothesis both the conditions in the Cambrian and the subsequent changes from horizon to horizon in the time between the Cambrian and the present are in agreement.

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AMIA FROM THE CRETACEOUS

A YEAR ago I received from Edward M. Kindle, paleontologist of Canada, a number of small fragments of the skull of a little fish, found in evaporated Cretaceous ponds in Alberta, Canada. Among these fragments were no traces of skeleton or fins. These I described in the *Canadian Field Naturalist,* under the name of *Kindleia fragosa.* I was mistaken in regarding these as a Cichlid fish. It appears to belong to the group of Amiids.

I have the following valuable note from Dr. Errol I. White, now in charge of the recent fossils in the

[1] *Journ.* Washington Acad. Sci., Vol. 13, No. 7, April 4, 1923, pp. 129–138.