

To the biologist the value of the question obtains from a different point of view. The sea is the original home of all life on the globe, and it was in the sea that the differentiation between animal and vegetable life, as well as the evolution of the great divisions of the animal kingdom were effected. Indeed the great events in the evolution of animal forms have been rendered possible by changes which have taken place in the composition of ocean water. These changes have modified organisms, and have created conditions which have served as factors in directing the course of development. This may be specially illustrated by reference to the case of the calcium salts in sea water. That the earlier Archæan seas contained comparatively small quantities of calcium compounds seems to be clearly indicated by the fact that in pre-Cambrian strata the limestone deposits are very limited, not more than two per cent. of the thickness of the beds, the Huronian portions of which, now generally recognized as of sedimentary origin, are, according to Lawson,* over 50,000 feet in thickness. The small amount of limestone deposits could not have been due to the absence of living organisms, for the oldest Cambrian beds contain Trilobites and Brachiopods, and such highly specialized forms postulate a long course of pre-Cambrian life. The very fact that the Brachiopods of the early Cambrian were largely those provided with a horny or chitinous shell, indicates that all the animal forms of the preceding period had imperfectly acquired the lime "habit," which, one may reasonably believe, would have earlier made its appearance had calcium salts been present in considerable quantities in ocean water from the first. It is perhaps due to the absence of this lime "habit" that fossils do not obtain in pre-Cambrian strata.

Once, however, the lime "habit" was acquired, through adaptation of the animal cell to its environment, the course of development became accelerated, and the evolution of the higher types of Invertebrate life, as well as all the forms of Vertebrata, became possible. The Vertebrate skeleton, and all that it implies in evolution, is, therefore, a result of the gradual increase in the quantity of calcium in the oceans of the pre-Cambrian period.

To both the geologist and the biologist the history of the chemistry of the ocean has recently acquired an additional interest from the attempt made by Joly† to determine the age of the earth, who uses for that purpose as factors the amount of sodium now in the ocean, and that

* Geol. Survey of Canada, 1887, pp. 101 and 102, F.

† An Estimate of the Geological Age of the Earth. Trans. Roy. Dublin Soc., Vol. 7. (Ser. 2), 1899, p. 23.