of their first appearance upon earth; and though some still maintain that Vertebrata originated somewhat later, it is universally conceded that they were already in existence toward the end of the first great epoch in the history of our globe. I think it would not be difficult to show upon physiological grounds that their presence upon earth dates from as early a period as any of the three other great types of the animal kingdom, since fishes exist wherever Radiata, Mollusks, and Articulata are found together, and the plan of structure of these four great types constitutes a system intimately connected in its very essence. Moreover, for the last twenty years, every extensive investigation among the oldest fossiliferous rocks has carried the origin of Vertebrata step by step further back, so that whatever may be the final solution of this vexed question, so much is already established by innumerable facts, that the idea of a gradual succession of Radiata, Mollusks, Articulata, and Vertebrata, is for ever out of the question. It is proved beyond doubt, that Radiata, Mollusca, and Articulata are everywhere found together in the oldest geological formations, and that very early Vertebrata are associated with them, to continue together through all geological ages to the present time. This shows that even in those early days of the existence of our globe, when its surface did not yet present those diversified features which it has exhibited in later periods, and which it exhibits in still greater variety now, animals belonging to all the great types now represented upon earth, were simultaneously called into existence. It shows, further, that unless the physical elements then at work could have devised such plans, and impressed them upon the material world as the pattern upon which Nature was to build for ever afterwards, no such general relations as exist among all animals, of all geological periods, as well as among those now living, could ever have existed.

This is not all: every class among Radiata, Mollusks, and Articulata, is known to have been represented in those earliest days, with the exception of the Acalephs¹ and Insects only. It is, therefore, not only the plan of the four great types which must have been adopted then, the manner in which these plans were to be executed, the systems of form under which these structures were to be clothed, even the ultimate details of structure which in different genera bear definite relations to those of other genera; the mode of differentiation of species, and the nature of their relations to the surrounding media, must likewise have been determined, as the character of the classes is as well defined as that of the four great branches of the animal kingdom, or that of the families, the genera, and the species. Again, the first represontatives of each class stand in definite relations to their successors in later

¹ Acalephs have been found in the Jurassie Limestone of Solenhofen; their absence in other formations may be owing simply to the extraordinary softness of their body. Insects are known as early as the Carboniferous Formation, and may have existed before.