

beneath the sea-level, or in still unexplored regions. Under these circumstances it is not yet possible to construct a genealogical tree for the various genera, so we must dismiss to a pre-Silurian time, where the light of experience no longer guides us, all the hypotheses which would derive the Hexactinellida from the Tetractinellida or Monactinellida."

An explanation of the sudden appearance of the fossil Lithistidæ and Hexactinellida may be reasonably sought in the mode of life exhibited by their modern representatives. Both groups are especially inhabitants of the deep-sea, and only in the former deep-sea deposits can one hope to find their fossil remains in any abundance.

If therefore we have to refer the origin of the Hexactinellida to a pre-Silurian period of which no certain representatives are preserved, we cannot obviously expect from palæontology any conclusion as to the manner of their origin or the nature of the primitive forms. It is, however, of importance, that even in the Silurian period both Lyssacine and Dictyonine forms appear to be present. In the later mesozoic formations which are so rich in Dictyonina (especially the Jurassic and Cretaceous), hardly a hint of Lyssacina is to be found, while now they form among living forms a large majority—a fact which appears to find its explanation in the improbability of the preservation of forms with a loose spicular framework which would fall to pieces with the destruction of the soft parts. The following considerations may, however, appear not unworthy of close examination.

From the fact that the modern Hexactinellids all live at a considerable depth, always below 95 fathoms, Zittel has already drawn the conclusion that they were probably from the first deep-sea forms.

From the bathymetrical statistics of the Challenger Hexactinellida, it is seen that the Hexactinellids now living in the greater oceanic depths are almost exclusively Lyssacina, and that the modern Dictyonina are, with the exception of one very simple genus, all confined to the relatively lesser depths, between 100 and 1500 fathoms. The conclusion, therefore, seems warranted, that in ancient times also the Lyssacina predominantly occurred in the greater depths, while the more differentiated Dictyonina inhabited, as they now do, relatively shallower waters, at no very great distance from the coasts. Now if one may assume that the deepest regions of the great oceans have remained permanently covered with water since the Palæozoic period, while only the shallower regions near the continents were here and there raised above water, and thus became now accessible to the hammer of the palæontologist, we can understand why we find in certain Jurassic and Cretaceous deposits so many and highly differentiated Dictyonina, but only slight hints of Lyssacina, even in circumstances which would not exclude their preservation, or at least that of their characteristic spicules.

Hitherto I have restricted myself to the Hexactinellida themselves; I shall now consider their relation to the other groups, beginning with the calcareous sponges.

It may be assumed as a generally acknowledged fact that the calcareous sponges are