

or predominantly, that form of skeletal element from which the rest have developed, we must, after determining this fundamental form, strive to understand why in each individual stem the specific form of spicule must be what it is.

In regard to the calcareous sponges, Haeckel expresses, in his epoch-making monograph, the conviction, based both on anatomical and embryological facts, that the fundamental and primitive form of all calcareous sponge spicules is the regular triradiate form, and in association with that, perhaps, though less widely distributed, the simple rod-like form. But by "regular triradiate" Haeckel means a three-rayed spicule, in which the rays, perfectly similar in size and form, meet at equal angles of 120° , and all lie in one plane. Haeckel¹ shows that even yet the triradiate spicules are throughout the firm supports of the body, while the tetracts occur as the protective weapons of the gastral surface, or the rods of the dermal; and he draws the conclusion "that the triradiate forms originally and primarily played the principal role, while the four-rayed spicules first arose only as internal adaptive modifications on the gastral surface, and the rod-like forms as external and therefore secondary differentiations."

As of special importance in regard to the formation of this specific form of spicule (triradiate) in the soft parts of the primitive calcareous sponges, Haeckel notes (p. 377) a peculiar process of "biocrystallisation, *i.e.*, a compromise of the crystallising tendency of carbonate of lime and the organic processes of the protoplasm." The calcareous spicules of the Calcispongiæ are, according to Haeckel, to be regarded as "biocrystals or form-individuals occupying a median position between an inorganic crystal and an organic secretion, and in their origin expressing a compromise between the crystallisation of carbonate of lime and the formative activity of the fused cells of the syncytium." "The original and fundamental form of all three-rayed and four-rayed spicules is the absolutely regular triact, which may be considered as a hemiaxonal form of the hexagonal crystal system, in which the carbonate of lime crystallises as calc-spar."

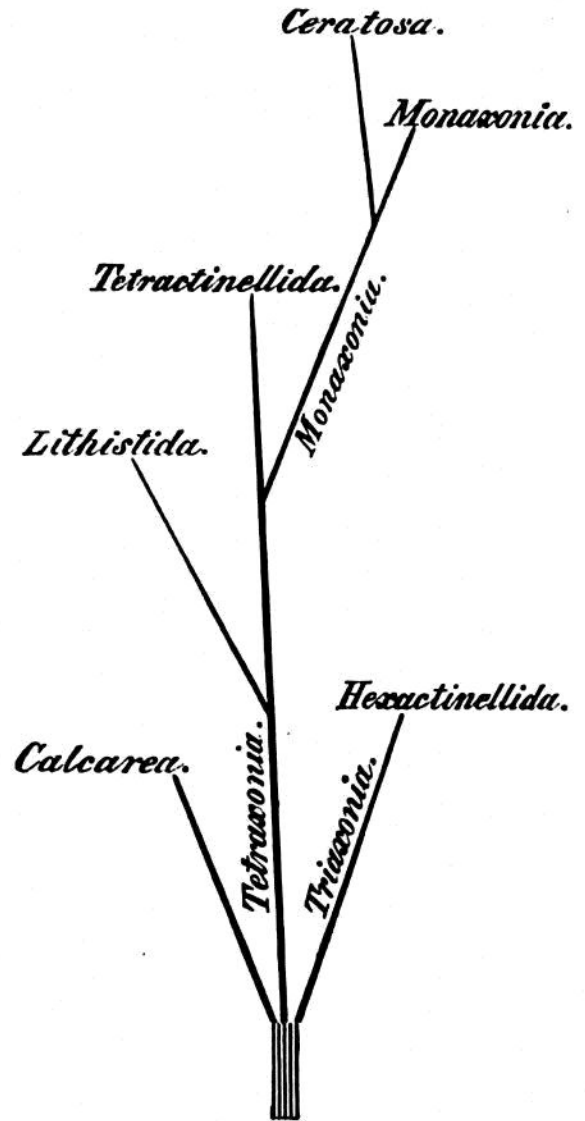


FIG. 9.—Genealogical Tree of the Porifera.

¹ *Loc. cit.*, Bd. i. p. 352.