

the ground-form of the skeleton either polyaxon or isopolar monaxon, two fundamental and variously combined directions of growth are recognisable; firstly, the *concentric* growth (equal increase of volume in all directions), and secondly, multipolar or *diametral* growth (hypertrophy of certain parts in the direction of definite pairs of radii). A different state of things obtains, however, for the most part, in the two legions of the Osculosa (NASSELLARIA and PHÆODARIA), in which the central capsule possesses a vertical main axis with different poles, and the structure of the skeleton is determined by this allopolaxonal ground-form. The two fundamental directions of growth here combined in the most various ways are, firstly, *unipolar* growth (starting from the basal pole of the vertical main axis), and secondly, radial or *pyramidal* growth (characterised by the different development of separate parts in the direction of definite radii). Whilst the growth of the *malacoma* is dependent on intussusception (as in most organic structures capable of imbibing), the growth of the *skeleton* in all Radiolaria takes place by apposition (see note B).

A. The earliest investigations into the modes of growth in the Radiolaria are due to J. Müller (L. N. 12, pp. 21–33). More detailed communications I gave myself in my Monograph (L. N. 16, pp. 150–159). The relations there sketched have now, in consequence of the examination of the Challenger collection, undergone many important additions, and in some divisions, important modifications; these are for the most part treated of in the general account of the separate families.

B. The view here maintained, that the skeleton of all Radiolaria grows only by apposition, appeared formerly to have certain exceptions. I thought I had shown that in *Cœlodendrum* the thin-walled tubes grew not only in length but also in thickness, with continuous increase in the lumen (L. N. 16, pp. 152, 360). Further K. Brandt concluded, from the varying size of the median bars in the twin-spicules of *Sphærozoum*, that these siliceous structures grow by intussusception (L. N. 38, p. 401). Both suppositions have been proved erroneous, and I have come to the opinion that in all Radiolaria the skeleton grows by apposition.

151. *Regeneration*.—Whilst the general course of individual development (perhaps without any exception in the Radiolaria), begins with the formation of zoospores in the central capsule, there yet occurs in some groups a different form of ontogeny, introduced by simple division of the unicellular organism, and coming under the term “regeneration” in its wider sense. This spontaneous division occurs quite commonly in the Polycyttaria (or social SPUMELLARIA), and produces their colonies (compare the chapter on Reproduction, § 273). On the contrary, it has not been observed in the solitary SPUMELLARIA, nor in the ACANTHARIA and NASSELLARIA; possibly, however, the peculiar ACANTHARIAN family, Litholophida, has arisen by the division of Acanthonida (compare p. 734). Among the PHÆODARIA division is commonly observed in the order Phæocystina (which have an incomplete Beloid skeleton or none), and also in the Phæoconchia. In all these cases the increase by division is nothing else than an ordinary case of cell-division, in which bisection of the nucleus precedes that of the central capsule. The regeneration by