

may be explained as protective coverings, the radial spines as defensive weapons, and the anchor-hooks and spathillæ as organs of prehension, which are of advantage to their possessors in the struggle for existence; the regular arrangement of the radial spines in the Radiolaria may also be explained on hydrostatic grounds, it being advantageous that the body should be maintained in a definite position of equilibrium, &c. The well-known laws of *direct* or *actual adaptation*, which we designate cumulative, correlative, divergent adaptation, &c., here explain a multitude of morphological phenomena. The connection is less distinct in the case of the laws of *indirect* or *potential adaptation*, although this must play as important a part in the formation of the Radiolaria as in that of other organisms (compare on this head my *Generelle Morphologie*, Bd. ii. pp. 202–222).

212. *Reproduction*.—The most common form of reproduction in the Radiolaria is the formation of spores in the central capsule, which in this respect is to be regarded as a sporangium (§ 215). In many Radiolaria (Polycyttaria and PHÆODARIA), however, there occurs in addition an increase of the unicellular organism by simple division (§ 213); upon this the formation of colonies in the social Radiolaria is dependent (§ 14). Reproduction by gemmation is much less common, and has hitherto been observed only in the Polycyttaria (§ 214). In this group alone there also occur at certain times two different forms of swarm-spores which copulate, and thus indicate the commencement of sexual reproduction (Alternation of Generations, § 216). The general organ of reproduction is in all cases the central capsule, whilst the extracapsulum never takes an active part in the process.

213. *Cell-Division*.—Increase by cell-division among the Radiolaria in the early stage, before the formation of the skeleton, is widely distributed (perhaps even general?); in the adults of this class it is rather rare and limited to certain groups. It is most readily observed in the Polycyttaria; the growth of the colonies in this social group depends mainly (and in many species exclusively) upon repeated spontaneous division of the central capsule; all the individuals of each colony (in so far as this has not arisen by the accidental fusion of two or more colonies) are descendants of a single central capsule, which has arisen from an asexual swarm-spore (§ 215) or from the copulation of two sexual swarm-spores (§ 216). Whilst the central capsules of the colonies continually increase by division, their calymma remains a common gelatinous sheath. Among the SPUMELLARIA reproduction by simple cell-division probably occurs also in many monozootic Collodaria. Among the ACANTHARIA the peculiar group Litholophida has perhaps arisen by the spontaneous division of Acanthonida (see p. 734). Among the PHÆODARIA increase by cell-division seems to occur commonly in many groups, as in the Phæocystina, which have no skeleton (Phæodinida, Pl. 101,