

in the two portions of the malacoma. It is sometimes possible, however, to recognise the direct connection between them and to observe how the granules pass through the openings in the capsule-membrane.

208. *Currents in the Endoplasm.*—Intracapsular circulation or a certain slow flowing of the plasma within the central capsule is probably just as common in the Radiolaria as without it, but it is not so easy to observe in the former case as in the latter. A more satisfactory proof of these endoplasmatic currents is furnished by the arrangement of the protoplasm within the central capsule, since this is (at all events in part) an effect produced by them. In this respect the two main divisions of the class show characteristic differences. In the Porulosa (the SPUMELLARIA, § 77, and the ACANTHARIA, § 78) the endoplasm is in general distinguished by a more or less distinct radial structure, which is to be regarded as the effect of alternating centripetal and centrifugal radial streams. In the Osculosa, on the other hand, this radial structure is absent and the intracapsular plasmatic streams converge or diverge towards the osculum or main-opening in the central capsule which lies at the basal pole of its main axis, and through which the mass of the endoplasm issues into the calymma. The two legions of the Osculosa, however, present differences in this respect. In the NASSELLARIA (§ 79) the endoplasmatic currents appear to unite in an axial main stream at the apex of the monaxon central capsule, and this apical stream seems to split into a conical bundle, the individual threads of which pass diverging between the myophane fibrillæ of the podoconus towards the basis of the central capsule, and issue through the pores of the porochora. In the PHÆODARIA (§ 80), on the other hand, meridional currents of endoplasm are probably present on the inner surface of the capsule, which flow from the aboral pole of the vertical main axis to its basal pole, and return in the reverse direction.

209. *Currents in the Exoplasm.*—Extracapsular circulation, or a distinct flowing of the plasma outside the central capsule, may be readily observed in all Radiolaria which are examined alive; this is most readily seen in the astropodia, or those free pseudopodia which radiate from the sarcodictyum on the surface of the calymma into the surrounding water. The granular movement is often quite as clear in the sarcodictyum itself, and may be recognised in the collopodia, which compose the irregular plasmatic network within the calymma. More rarely it is possible to follow the granular stream thence through the sarcomatrix, and further into the interior of the central capsule. In general the direction of the extracapsular protoplasmic streams is radial, and it is frequently possible, even in a single free astropodium, to observe two streams opposite in direction, the granules on one side of the radial sarcode thread moving centripetally, those on the other side centrifugally. If the threads branch, and neighbouring ones