

of this there is no doubt that all Xanthellæ (the *Zooxanthella extracapsularis* of SPUMELLARIA and NASSELLARIA, and the *Zooxanthella intracapsularis* of the ACANTHARIA, and possibly also the *Zooxanthella phæodaris* of the PHÆODARIA) do not originally belong to the Radiolarian organism, as was believed up to the time of Cienkowski, but penetrate actively into it from without, or are taken in passively by means of the pseudopodia. In any case their symbiosis, when they are associated with the Radiolarian cell in large numbers, may be of great advantage to both parties, since the metastasis of the Xanthella is vegetable, that of the Radiolarian animal in character. In any case their symbiosis is to a large extent accidental, by no means as necessary as in the case of the Lichens. See on these points in addition to Brandt and Geddes (*loc. cit.*) also Geza Enz, Das Consortial-Verhältniss von Algen und Thieren, Biol. Centralbl., Bd. ii. No. 15, 1883, Oskar Hertwig, Die Symbiose oder das Genossenschaftsleben im Thierreich, Jena, 1883, and Bütschli, Die Radiolarien, in Bronn's Klass. u. Ord. d. Thierreichs, 1882 (L. N. 41, pp. 456-462).

91. *The Exoplasm or Extracapsular Protoplasm.*—The extracapsular protoplasm, which may be shortly termed the “exoplasm” (or ectosarc), is primitively in all Radiolaria (and especially in their earliest development stages) the only important constituent of the extracapsulum, besides the calymma. Although the extracapsular and intracapsular protoplasm of the Radiolaria are everywhere in direct communication, and although the openings in the membrane of the central capsule bring about an interchange between them, still the two portions of sarcode show certain constant and characteristic differences, which are due to the physiological division of labour between the central and peripheral parts of the body and their corresponding morphological differentiation. The extracapsular, like the intracapsular, protoplasm is originally homogeneous, but may afterwards become differentiated in various ways, producing the special constituents of the extracapsulum. Such “external protoplasmic products” are vacuoles, pigment-bodies, &c. More important, however, are the topographically different sections into which the exoplasm may be divided according to its relations to the central capsule and the calymma. In this respect the following parts may be generally distinguished—(1) the *Sarcomatrix*, or fundamental layer of the exoplasm, which surrounds the central capsule as a continuous sheath of sarcode and separates it from the calymma; (2) the *Sarcoplegma*, an irregular network of the exoplasm, which spreads throughout the gelatinous material of the calymma; (3) the *Sarcodictyum* or network of sarcode on the outer surface of the calymma; and (4) the *Pseudopodia*, which project outwards from the latter and radiate into the water.

92. *The Sarcomatrix.*—The sarcomatrix, being “the fundamental layer of the pseudopodia” (or “matrix of the exoplasm”), constitutes the proximal innermost section of the extracapsular sarcode, and in all Radiolaria forms a thin continuous mucous layer, which covers the whole outer surface of the central capsule and separates it from the surrounding calymma (see note A, below). The sarcomatrix communicates internally