

## CHAPTER X.—GEOLOGICAL DISTRIBUTION.

(§§ 241-250.)

241. *Historical Distribution.*—Radiolaria are found fossil in all the more important groups of the sedimentary rocks of the earth's crust. Whilst a few years ago their well-preserved siliceous skeletons were only known in considerable quantity from Cainozoic marls (§ 242), very many SPUMELLARIA and NASSELLARIA have recently been found in Mesozoic and a few in Palæozoic strata. By the aid of improved modern methods of investigation (especially by the preparation of thin sections of very hard rocks) it has been shown that many hard siliceous minerals, especially cryptocrystalline quartz, contain numerous well-preserved Radiolaria, and sometimes are mainly composed of closely compacted masses of such siliceous shells; of this kind are many quartzites of the Jura (§ 243). These Jurassic quartzes (Switzerland), as well as the Tertiary marls (Barbados) and clays (Nicobar Islands), are to be regarded as "fossil Radiolarian ooze" (§ 237). Dense masses of compressed SPUMELLARIA and NASSELLARIA form the principal part of these rocks. Isolated or in smaller quantities, fossil Polycystina, belonging to different families of SPUMELLARIA and NASSELLARIA, also occur in other rocks, and even in some of Palæozoic origin. Since specimens have also been recently found both in Silurian and Cambrian strata, it may be stated that as regards their historical distribution, Radiolaria occur in all fossiliferous sedimentary deposits, from the oldest to those of the present time.

242. *Cainozoic Radiolaria.*—The great majority of fossil Radiolaria which have hitherto been described, belong to the Cainozoic or Tertiary period, and in fact, to its middle portion, the Miocene period. At this period the richest and most important of all the Radiolarian formations were deposited, such as the pure "Polycystine marl" of Barbados (see note A), also that of Grotte in Sicily (see note B), and the clay of the Nicobar Islands (see note C). Besides the above-mentioned deposits, which may be designated "pure" fossil Radiolarian ooze, many deposits containing these organisms have recently been discovered in widely separated parts of the earth, partly of the nature of tripoli or marl, partly resembling clay. Among these may be mentioned in the first place many coasts and islands of the Mediterranean, both on the south coast of Europe (Sicily, Calabria, Greece), and the north coast of Africa (from Oran to Tripoli). The extensive layers of tripoli which are found in these Mediterranean Tertiary mountains belong to the upper Miocene (Torton stage), and consist partly of marl rich in calcareous matter, and resembling chalk, partly passing over into plastic clay or "Kieselguhr" (§ 246). The quantity of Radiolaria contained varies, and is more conspicuous the fewer the calcareous shells of Foraminifera present. Similar Tertiary Polycystine formations occur in some parts of America (see note D); probably they have a very wide distribution. In their general morphological characters, the Tertiary SPUMELLARIA and NASSELLARIA