

of the ocean. At the present day these Algæ are the primary source of food for the majority of pelagic and deep-sea animals. Rhabdospheres are only found in the warmer waters of the ocean, but the Coccospheres abound in the northern and southern temperate zones; in the Arctic and Antarctic zones these calcareous unicellular Algæ are replaced by species of Protococci which are identical in the two polar regions. Many pelagic Diatoms of the Arctic and Antarctic are likewise identical.

PELAGIC
FORAMINIFERA.

The pelagic Foraminifera are represented in the surface-waters of the tropics by about twenty species. These are replaced in the waters of the northern temperate and southern temperate regions by a lesser number of species possessing less massive shells; only two dwarfed but identical species, *Globigerina dutertrei* and *Globigerina inflata*, extend to the waters about the Arctic and Antarctic circles.

PELAGIC
MOLLUSCS.

Again there are numerous species of Pteropods in the tropical regions provided with calcareous shells of large size. These species gradually disappear from the surface as we approach the Arctic and Antarctic regions till the group is represented either by naked species or by nearly identical species of the minute thin-shelled *Limacina* in both the polar areas. Numerous other examples might be cited from other groups showing the close resemblance between the surface organisms of high northern and high southern latitudes.

SECRETION OF
CARBONATE OF
LIME.

The above instances of the very slight development of carbonate of lime shells and other carbonate of lime structures in the cold waters of the polar regions are instructive when recalled in connection with the massive coral reefs constructed in the polar regions in Palæozoic and even later geological times. The waters of these ancient oceans must have had a temperature of 65° or 70° F. at the poles, for it has been shown that the deposition of carbonate of lime is due to the secretion of carbonate of ammonia, one of the effete or waste products of marine animals, which, decomposing the soluble sulphate of lime in sea-water, produces insoluble carbonate of lime to form shells, its precipitation taking place with great difficulty and very slowly in cold water, but easily and very rapidly within the organism in water of a high temperature,¹ hence in the cold polar and deep-sea waters of our day no massive carbonate of lime shells or other structures are secreted by organisms.

The vegetation of the coal period implies over the whole globe an almost complete equality in the distribution of light and heat at that epoch. Marine species indicate the same uniformity. The Arctic Ocean was a coral sea in carboniferous times. A massive coral—*Lithostrotion*—is common to Europe, the United States, and the Arctic regions. *Productus semireticulatus* and *Productus longispinus* are found in the Andes of Bolivia

¹ See Murray and Irvine, On Coral Reefs and other Carbonate of Lime formations in Modern Seas, *Proc. Roy. Soc. Edin.*, vol. xvii. p. 90, 1889; see also *Proc. Roy. Soc. Edin.*, 1895, for paper on the Influence of Temperature on the Deposition of Carbonate of Lime.