

land by means of rivers. Since the ocean cannot retain in solution more than a trace, all this silica must eventuate as organic deposits, especially Radiolarian and Diatom oozes. Furthermore, a certain quantity of suspended terrigenous clay is being continually converted into the hydrated silica of these deposits. Neglecting the latter source of biological silica and the comparatively inconsiderable radiolarian areas, we can say that the dissolved silica yielded by the continents is tending to accumulate on the frontiers of the temperate and polar zones, especially in the Antarctic Ocean.

The amount of phosphorus in sea-water is comparable in its tenuity to that of silica. Raben's determinations for North Sea and Baltic waters show a seasonal variation ranging from 0.14 to 1.46 parts of P_2O_5 per million. Phosphorus originates as calcium phosphate in the form of apatite, passes through the ionized condition, and is deposited on the bottom of the sea as calcium phosphate. In the deposits this compound is of universal distribution; all samples of whatever character contain from a trace to about 3 per cent of tricalcium orthophosphate. The clays and muds no doubt retain traces of undecomposed mineral phosphate. On the other hand, calcium phosphate is secreted to a greater or less extent by the living denizens of the sea, whence its presence in calcareous and siliceous deposits; here we have the phosphorus withdrawn from aqueous solution and partly going through a cycle between the sea and the bottom, like lime and silica.

If there were no organic life in the ocean, the deposit everywhere would consist of a mud or clay, composed of mineral detritus. As it is, this detritus is nowhere wholly absent, and large areas consist of little else. Whether the mud be brought into the sea by rivers or through the agency of tidal erosion, or whether it be formed *in situ* at the bottom, it is always of a dual nature. The one ingredient is more or less finely powdered original mineral matter produced by mechanical comminution; the other is a mixture of substances resulting from the chemical decomposition of rocks. It has not been found possible to disentangle these components quite satisfactorily by chemical analysis, but it is safe to state that the proportion of one to the other ranges from one quarter to three quarters.

In chemically-produced mud we have the result of the action of water on crystalline silicates without the intervention of any solute except dissolved gases. Qualitatively, therefore, it is of

Phosphorus.

Decomposition of minerals.