From the preceding analyses it appears that deep-sea bones, like fossil ones, contain a far larger proportion of fluorine than recent bones. This fluorine cannot be assumed to be the original fluorine of the bones, but must be supposed to owe its origin to a continuous, though slowly progressing, double decomposition between the phosphate of the bone and the trace of dissolved fluoride in the sea water.

To test this view I have made the following experiment:—10 grms. of precipitated tricalcic phosphate (undried) were digested for six weeks in a solution of 30 grms. of common salt and 2 grms. of fluoride of sodium, in 1 litre of water; the precipitate was then collected on a filter, washed free from chlorides (and dissolved fluorides), dried, ignited, and tested quantitatively for fluorine by means of the method used for the bones. 5 grms. of ignited substance gave 0·120 grms. of fluorine = 2·41 per cent., equivalent to 4·95 per cent. of fluoride of calcium. It is quite reasonable to admit that what the 0·2 per cent. of fluoride of sodium in the solution employed effected in six weeks, the trace of fluoride in actual sea water (small as it is) may accomplish in thousands of years.[1]

The "manganese oxide" which was found diffused through, or at least as a deposit on, the surface of all the deep-sea bones examined, no doubt owes its origin to a slow decomposition of extraneous mineral matter in which the bones at some stage of their existence got embedded.[2]

MANGANESE NODULES.

These concentrations of ferric and manganic oxides, mixed with argillaceous materials, whose form and dimensions are extremely variable, belong generally to the earthy variety or wad, but pass sometimes, though rarely, into varieties of hydrated oxide of manganese with distinct indications of radially fibrous crystallisation. The interpretation adopted, in order to explain the formation of these manganese nodules, is the same as that which is admitted in explanation of the formation of coatings of this material on the surface of terrestrial rocks. These salts of manganese and iron, dissolved in water by carbonic acid, then precipitated in the form of carbonate of the protoxides of iron and manganese, become oxidised, and give rise in the calm and deep oceanic regions to more or less pure ferro-manganiferous concretions. The following analyses are of nodules from two Stations, one in the North and the other in the South Pacific.—JOHN MURRAY.

[1] It may be that, owing to the fluoride of calcium being less soluble than the phosphate, a relatively large quantity of the former remains in the bones as the latter is dissolved away. In comparing the analyses of the bones and teeth dredged from the bottom of the sea with those of recent animals, the elimination of gelatinous organic matter from the former is very striking. These facts added to others support the view of the great antiquity of the deep-sea specimens.—J. M.

[2] On the Distribution of Volcanic Débris over the Floor of the Ocean, &c., by John Murray, *Proc. Roy. Soc. Edin.*, vol ix. p. 256, 1877.