

PLATE XXI.

Fig. 1. Section of nucleus of an elongated manganese nodule from Station 276 ; 2350 fathoms, South Pacific.

This preparation offers an excellent example of the abundance and variety of volcanic products at the sea-bottom. The fragments of minerals and rocks have been enveloped by depositions of the peroxide of manganese, and form a veritable tufa composed of many species of rocks and minerals. Commencing at the top of the figure, there is a colourless crystal of plagioclase surrounded by altered vitreous matter, irregular colourless particles of volcanic glass, more or less vesicular, black and opaque fragments of volcanic rocks surrounded by a whitish zone of zeolites. Near the centre of the figure to the left is a particle of sideromelan, infiltrations of manganese, small volcanic fragments, basaltic lapilli with pores filled with zeolites and an external zeolitic zone. To the right, embedded in the manganese, is a rather large black and opaque basaltic lapilli, in part surrounded by zeolites. Beneath this there is a rather large greenish fragment of pumice, and alongside of it a fragment of sideromelan. Towards the lower part of the figure there are again lapilli and fragments of zeolites surrounding or detached from the fragments of rocks. The yellowish mass in which all the fragments are embedded is composed of muddy matters more or less coloured with iron and manganese, and the whole surrounded by concretionary layers of the peroxide of manganese (magnified 37 diameters).

Fig. 2. Section of volcanic tufa from Station 281 ; 2385 fathoms, South Pacific, the macroscopic appearance of which is represented on Pl. IV. fig. 3. The figure shows two parts sharply marked off from each other : that to the right a more or less homogeneous Red Clay, that to the left formed of an agglomeration of volcanic mineral particles representing a shower of volcanic ashes that had fallen upon the deposit. The whole has been surrounded by depositions of manganese, which have preserved the layers in their primitive position (see Pl. IV. fig. 3). In the Red Clay, near the lower part of the figure, a small manganese nodule is represented with a reddish centre ; the brown colour of the Red Clay passes in the layer of volcanic minerals to a greenish colour, due to the presence of numerous individuals of augite and hornblende. All these minerals are clastic, have a sharp fracture, and give the impression that they belong to a volcanic ash. The largest and most numerous are fragments of hornblende with a brown or greenish colour, and about 0.5 mm. in diameter ; augite is much less abundant, and the crystals are less deeply coloured. Felspars, especially fragments of plagioclase, can be observed, but they are generally altered and decomposed into a zeolitic substance. Finally, there are some little fragments of volcanic rocks, in which the principal elements are microliths of augite, as well as fragments of magnetite, vitreous basaltic lapilli, and peroxide of manganese (magnified 37 diameters).