

surface assumes the glazed appearance and characteristic shining streak peculiar to all the varieties of clay.

In the great majority of cases the Red Clay presents a homogeneous appearance to the naked eye and is smooth and soapy to the touch, but not unfrequently there are numerous pellets of peroxide of manganese, zeolitic crystals, fragments of pumice and minerals, which if they be not visible to the naked eye can be readily detected by the gritty feeling when the deposit is passed between the fingers. Although as a rule homogeneous when examined in small quantity, still if examined in masses the layers of Red Clay would undoubtedly present a very heterogeneous character, although the paste or matrix might appear homogeneous, for in some regions of the South Pacific thousands of sharks' teeth, bones of Cetaceans, large and small fragments of pumice, and other volcanic materials, are imbedded in the deposit, together with manganese nodules formed around these remains, or having other substances as nuclei. In all the red clay regions the dredge gave evidence that occasionally one or other of these foreign matters was present in considerable abundance, and at Station 281 there was evidence of a thin layer of true volcanic ashes.¹

The basis or permanent substratum of the deposit is the hydrated silicate of alumina ($2\text{SiO}_2, \text{Al}_2\text{O}_3 + 2\text{H}_2\text{O}$), composed of colourless amorphous particles without crystallographic outlines or trace of mechanical action, behaving as isotropic between crossed nicols. Like all ordinary clays, however, it is impure from the admixture of foreign substances, the hydrated silicate of alumina never making up even in the purest samples more than one-half of the deposit, and generally much less, as shown by the analyses. It is well known that a pure clay is only found in those cases where it has been transported: clay formed *in situ* is never pure; it always contains an admixture of the different minerals, or of decomposition products, of the altered rocks, from which the clay has had its origin, and the greater part of the materials of a Red Clay from the deep sea appears to have originated in this way.

When a specimen of Red Clay from the greatest depths of the ocean is treated with dilute hydrochloric acid, either no points of effervescence are observed, or at the most only a few isolated spots, and chemical analysis does not show more than 1 or 2 per cent. of carbonate of lime to be present. A microscopical examination in such cases will sometimes show a few broken fragments of pelagic Foraminifera. An examination of specimens from lesser depths in the same region will, however, reveal a considerable number of these calcareous organisms, and they may be sufficiently abundant to make up 20 per cent. of the whole deposit. The carbonate of lime present in the Red Clay consists principally of the remains of calcareous organisms which live in the surface waters of the region from which the specimen has been collected, and among these pelagic Foraminifera are the most abundant, such as species of *Globigerina*, *Pulvinulina*, *Sphæroidina*, and *Pullenia*, together with a few Coccoliths or Rhabdoliths. To these

¹ See Pl. XXI. fig. 2.