the other hand, in some areas the unaltered splinters of pumice, the fragments of volcanic ashes, and minerals from floating ice, may augment considerably in size and abundance and make up 20 per cent. of the deposit. One of the great characteristics of the Red Clay, however, is that the mineral particles over 0·05 mm. in diameter are few in number, and these have generally undergone alteration. The extreme fineness of the mineral particles, indeed, permits the relatively small quantity of pure clay to give a much more plastic character to the deposits than if these particles were of large size.

The mineral particles[1] in the Challenger samples of Red Clay make up on an average 5·56 per cent. of the whole deposit; they are generally angular, being recorded as rounded and angular in eight cases and rounded only in one case, and have a mean diameter of 0·08 mm. They are mentioned as occurring in the following order of abundance:—magnetite (in 62 cases), manganese grains and fragments (55), felspar (53), glassy volcanic particles (45), augite (43), pumice (34), manganese nodules (32), pellets, pieces, and nodules of pumice (31[2]), hornblende (31), palagonite (22), quartz (21), plagioclase (20), mica (19), phillipsite or zeolitic matter (10), cosmic spherules (8), sanidine (7), scoriæ (6), glauconite (6), olivine (5), lapilli (5), rock fragments (5), zircon (3), tourmaline (3), epidote (2), garnet (1).

The Challenger trawlings and dredgings obtained sharks' teeth in 11 cases, and ear-bones and other bones of Cetaceans in 6 cases.

It has been stated that in marine deposits the species of unaltered particles of minerals with a diameter of not more than 0·02 mm. can in many cases be determined (see p. 25), and the fragments of pumice even less than that can also be recognised, but the particles of this size are usually very intimately associated with the clay of the deposit, and generally pass away in decantation with the impalpable matter, which we have denominated "fine washings." These fine washings consist essentially of the hydrated silicate of alumina, mixed with an immense number of recognisable and unrecognisable particles of minute dimensions, derived from all the other materials which combine to form the deposit, such as minerals, Diatoms, and Radiolarians. It is quite natural to conclude that the mineral particles, mixed with the clayey matter in the fine washings, are of the same nature as those of larger size which can be identified, and that quartz, felspar, &c., may be present in a very fine state of division as ultramicroscopic bodies, but this cannot be made out with the microscope, chemical analysis only gives an indication.[3]

[1] See Pl. XXVI. figs. 2–4; Pl. XXVII. figs. 2, 3. [2] In five cases distinctly stated to be covered by manganese.

[3] It is known that clay has the power not only of absorbing and of retaining certain liquids, but that it even possesses a similar property in the case of certain solids of very small dimensions. If, for example, clay be agitated in water, microscopic grains of carbonate of calcium and particles of an organic nature will remain in suspension as long as the water is agitated, but as soon as the water is at rest these are deposited. These particles are thoroughly penetrated by the water, and form a colloid gelatinous mass; the particles are found to be in contact, and so attached the one to the other that it is not possible by the agitation of the water to detach them. This mutual attraction or interpenetration takes place not only with particles of the same nature, with clay for example, but in the case of clay with hydrated peroxide of iron, clay with chalk, clay with organic particles, so that it is difficult, if not impossible, to