

to the spot, and the modifications, physical and chemical, which these have undergone in the course of time. Each of the constituent elements, whether organic or inorganic, has, again, its own history, and this we have endeavoured to trace by studying their nature, form, dimensions, and their relations to each other at the spot from which they have been collected by the dredge or sounding tube. For this purpose the chemical and microscopical methods recently introduced into the study of geology have been largely made use of. A knowledge of the various particles forming a deposit led to a rational classification of marine deposits and to a definite nomenclature, of which we will have to speak further on.

At the outset, the difficulties which surround this kind of study may be pointed out. In the first instance the quantity of a deposit procured in the sounding tube may be very small, and this, especially whenever of an incoherent nature, has undergone a kind of sorting in the tube itself, owing to some of the finer or coarser particles being washed out while being hauled up through the water. Again, the specimens preserved in spirit or water have undergone sorting by being shaken up during the voyage, so that the contents of the bottles are often arranged in layers, the heavier portions being at the bottom and the lighter on the top. The specimens artificially dried, when not first washed in distilled water, often contained crystals of sulphate of lime and other sea salts. In the case of samples from the dredge or trawl there had been, it was evident, much washing away while the apparatus was being hauled up through the water; indeed often all the deposit was washed away, and only manganese nodules, teeth, bones, and rock fragments remained in the net. It is thus apparent that considerable care was necessary to ensure that, in making analyses or in choosing a sample for determining the percentage of carbonate of lime or other elements present, we were working with an average sample. As a rule we took for this purpose the specimens collected in the sounding tube and dried on board ship. When a difference was noted in the upper and lower layers in the sounding tube, these were preserved and examined separately. The results of an examination of the specimen from the sounding tube, frequently small in quantity, were compared with those obtained from an examination of a very large quantity procured in the trawl or dredge at the same spot, often amounting to several hundredweights.

It is evident, then, that to make the descriptions as clear as possible, it became necessary to follow a systematic plan and not to deviate from it. The method finally adopted was chosen, after many attempts, as the best, and the one most likely to be followed by others in describing deposits that may be hereafter obtained from the ocean's bed. This method will now be referred to in detail, and will be at once rendered intelligible by reference to the Tables in Chapter II., where the particulars regarding each of the Challenger specimens are presented in synoptical form.

In commencing the examination of a deposit, attention was first given to the *macroscopic characters*. By means of the naked eye or a hand lens, the substance was