as concentric zones of different colours frequently giving the fragment the aspect of certain agates. The hydrochemical change has in some instances proceeded so far that the vitreous matter has totally disappeared, but frequently the glass still occupies the centre of the lapilli. The decomposition and disintegration of these vitreous matters result in an argillaceous residue which forms a large part of deep-sea deposits. Wichmann has pointed out that a similar reddish clayey matter results from the decomposition of the vitreous basic rocks of the island of Futuna, one of the Tongu Islands. The hydrochemical action which results in the formation of zeolites at the bottom of the sea is probably the most interesting of all. A very large number of the volcanic fragments present under the microscope remarkable examples of the development of zeolitic minerals. Between the granules of vitreous and basaltic rocks in most of the nodules are colourless bands composed of small prismatic crystals. These cement the lapilli, are attached at one end and arranged in tufts; they protrude to meet those which advance from the next fragment, and at the point of union the heads of the crystals become interlaced, forming a serrated line often distinctly marked by infiltration of manganese. When these crystals fill the vesicular pores of a rock fragment the terminal faces are always turned towards the inside of the cavities; frequently the crystals are not fixed directly to the wall of the pore or fissure, but are separated from it by one or two zones of reddish brown or yellow-green matter (see Plate O, fig. 12).

In addition to the zeolitic crystals found in the fragments of altered rock, there are microscopic crystals and zeolitic spherules in the clay itself. The spherules are fibro-radiated, appear to the naked eye like whitish vitreous granules covered with manganese and iron oxides; their diameter is about 0·5 mm., under the microscope their surfaces are seen by reflected light to be crowded with the extremities of the crystals, the faces of which are exactly the same as those of philipsite, faces of a rectangular prism terminating in a summit with four lozenge-shaped faces which rest on the edges of the prism. Chemical analysis shows that these spherules have the composition of philipsite. Although the greater number of the crystal spherules are formed by the irregular grouping of prisms diverging from a centre, they are sometimes composed of a smaller number of crystals which cross each other with such regularity that they must be looked upon as twin-crossed crystals, so common in the case of philipsite. Associated with the spherules and cross-twinned crystals are smaller crystals of the same species; some are so small that even with the highest magnifying power they appear as small lines; the crystals are often obscured by particles of manganiferous clay, but when these are removed by hydrochloric acid the form of the crystal becomes more apparent since a siliceous skeleton remains. At a few Stations these crystals and crystal balls make up nearly a third of the deposit.

It may be stated generally, that the manganese-iron nodules, which have been so frequently referred to in the course of this Narrative, occur more frequently and