

developed as secondary minerals in the hollow cavities, the vesicles, the fissures, of some older or recent eruptive masses and in their tufas; they are sometimes also seen pseudomorphosed on anhydrous silicates. An intimate bond unites the zeolites with the matters upon which they are implanted or with which they are associated. It might be said that these hydrated silicates are nothing else than the volcanic minerals transformed under the action of water and in a manner regenerated; as soon as these crystalline rocks or their tufas are exposed to the action of water that penetrates them their pores are seen to be lined with zeolitic minerals. This filling up is in direct relation with the degree of alteration of the rocks; in short, these veins and geodes have been lined by zeolitic minerals by an exudation, so to speak, of the rock containing them. It is especially in the geodes of basalts, of phonoliths, of diabases, or in the respective tufas, that they are met with. The submarine volcanic matters of the regions already indicated are precisely those that might be considered as the tufas of basaltic rocks.

The study of the crystals and zeolitic coatings lining the cavities of products of subaerial eruption indicates clearly that these secondary minerals have been formed by waters, which have taken from the very rocks through which they have passed the constituent elements of the zeolites. We may even follow in the various zones of the geodes the gradual series of alterations that the rocks have undergone under the influence of the infiltrating water; it has deposited in the hollow cavities matters with which it has been gradually charged during its passage through the capillary canals traversing these eruptive masses. Amygdaloid rocks of the basic series of all geological formations exhibit the conditions here recalled; it has even been shown that, in lavas so recent as those of the Puy-de-Dôme and of Gravenoire, these zeolites are present. In a word, wherever basic volcanic rocks are exposed we are sure to observe minerals belonging to the group of zeolites, always formed by the solvent action of waters upon the volcanic masses containing them. This is the case in Auvergne, in Bohemia, in the Siebengebirge, in the rocks in the neighbourhood of Idar, in Iceland, in the Deccan, in the eruptive masses in the Trias of Scotland, &c.

It is only in exceptional circumstances that the zeolites are observed in sedimentary layers. The solutions depositing them may then have taken the elements from the neighbouring eruptive rocks, or these sedimentary layers may have originated from tufaceous matters more or less closely resembling those found at the present time on the bed of the Pacific. It is very probably in these conditions that zeolites occur in the argillaceous schists at Andreasberg and Eule, in the limestones at Chappel, Fife, where apophyllite with opal is observed filling *Strophonemas*, and in the sandstones of the Upper Tertiary at Crevacuore. But whatever their position, or the nature of the rock in which they are formed, these silicates always present characters indicating hydrochemical origin. It may also be stated, as the result of a considerable number of observations,