

In the primitive mountains open to our researches, real grottoes, those which have some extent, belong only to calcareous formations, such as the carbonate or sulphate of lime. The solubility of these substances appears to have favoured the action of the subterranean waters for ages. The primitive limestone presents spacious caverns as well as transition limestone,* and that which is exclusively called secondary. If these caverns be less frequent in the first, it is because this stone forms in general only layers subordinate to the mica-slate,† and not a particular system of mountains, into which the waters may filter, and circulate to great distances. The erosions occasioned by this element depend not only on its quantity, but also on the length of time during which it remains, the velocity it acquires by its fall, and the degree of solubility of the rock. I have observed in general, that the waters act more easily on the carbonates and the sulphates of lime of secondary mountains than on the transition limestones, which have a considerable mixture of silex and carbon. On examining the internal structure of the stalactites which line the walls of caverns, we find in them all the characters of a chemical precipitate.

As we approach those periods in which organic life develops itself in a greater number of forms, the phenomenon of grottoes becomes more frequent. There exist several under the name of *baumen*,‡ not in the ancient sandstone to which the great coal formation belongs, but in the Alpine limestone, and in the Jura limestone, which is often only the superior part of the Alpine formation. The Jura limestone§ so abounds with

* In the primitive limestone are found the Kuetzel-loch, near Kaufungen in Silesia, and probably several caverns in the islands of the Archipelago. In the transition limestone we remark the caverns of Elbingerode, of Rubeland, and of Scharzfeld, in the Hartz; those of the Salzfluhe in the Grisons; and, according to Mr. Greenough, that of Torbay in Devonshire.

† Sometimes to gneiss, as at the Simplon, between Dovredo and Crevola.

‡ In the dialect of the German Swiss, *Balmen*. The Baumen of the Sentis, of the Mole, and of the Beatenberg, on the borders of the lake of Thun, belong to the Alpine limestone.

§ I may mention only the grottoes of Boudry, Motiers-Travers, and Valorbe, in the Jura; the grotto of Balme near Geneva; the caverns between Muggendorf and Gaylenreuth in Franconia; Sowia Jama, Ogrodzimiec, and Wlodowice, in Poland.