

CHAPTER XXX.

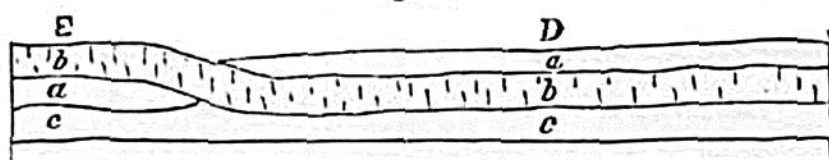
ON THE DIFFERENT AGES OF THE VOLCANIC ROCKS.

Tests of relative ages of volcanic rocks—Tests by superposition and intrusion—Dike of Quarrington Hill, Durham—Test by alteration of rocks in contact—Test by organic remains—Test of age by mineral character—Test by included fragments—Volcanic rocks of the Post-Pliocene period—Basalt of Bay of Trezza in Sicily—Post-Pliocene volcanic rocks near Naples—Dikes of Somma—Igneous formations of the Newer Pliocene period—Val di Noto in Sicily.

HAVING referred the sedimentary strata to a long succession of geological periods, we have now to consider how far the volcanic formations can be classed in a similar chronological order. The tests of relative age in this class of rocks are four:—1st, superposition and intrusion, with or without alteration of the rocks in contact; 2d, organic remains; 3d, mineral characters; 4th, included fragments of older rocks.

Tests by superposition, &c.—If a volcanic rock rests upon an aqueous deposit, the former must be the newest of the two; but the like rule does not hold good where the aqueous formation rests upon the volcanic, for melted matter, rising from below, may penetrate a sedimentary mass without reaching the surface, or may be forced in conformably between two strata, as *b* at *D* in the annexed figure (fig. 656), after which it may cool down and consolidate. Superposition, therefore, is not of the same

Fig. 657.



value as a test of age in the unstratified volcanic rocks as in fossiliferous formations. We can only rely implicitly on this test where the volcanic rocks are contemporaneous, not where they are intrusive. Now they are said to be contemporaneous if produced by volcanic action, which was going on simultaneously with the deposition of the strata with which they are associated. Thus in the section at *D* (fig. 656), we may perhaps ascertain that the trap *b* flowed over the fossiliferous bed *c*, and that, after its consolidation, *a* was deposited upon it, *a* and *c* both belonging to the same geological period. But if the stratum *a* be altered by *b* at the point of contact, we must then conclude the trap to have been intrusive, or if, in pursuing *b* for some distance, we find at length that it cuts through the stratum *a*, and then overlies it as at *E*.

We may, however, be easily deceived in supposing a volcanic rock to be intrusive, when in reality it is contemporaneous; for a sheet of lava, as it spreads over the bottom of the sea, cannot rest every where upon the same stratum, either because these have been denuded, or because,