

stone in New York and Pennsylvania is of cotemporaneous origin with a limestone in the Ohio and Mississippi valleys. Some rocks in eastern New York are not found in the western part of that state, and some in the central and western part not in the eastern.

2. In all periods, sand-beds, mud-beds, clay-beds, pebble-beds, and limestone-beds have been *simultaneously* in progress over different parts of the globe; and, if a period is known in geology as solely a period of limestone, it is because science has not yet discovered where the beds of sand, mud, or pebbles were being deposited while the limestone was making over its regions. The idea of a period of sandstone-making, or of limestone-making, is therefore an absurdity; for sand deposits are local; a short distance off, there may have been, in all times, as now, mud deposits. Still, it is true that, over continental seas, the *prevailing* depositions have sometimes been of limestone material, and sometimes of mud or sand; yet this has been true for certain great regions in the seas of a continent, rather than for all its seas at once.

3. Again, a stratum of one era may rest upon any stratum in the whole of the series below it, — the Coal-measures on either the Archæan, Silurian, or Devonian strata; and the Jurassic, Cretaceous, or Tertiary on any one of the earlier rocks, the intermediate being wanting. The Quaternary in America in some places rests on Archæan rocks, in others on Silurian or Devonian, in others on Cretaceous or Tertiary.

4. In addition, denudation and uplifts have thrown confusion among the beds, by disjoining, disarranging, and making complex what once was simple.

Amidst all these sources of difficulty, how is the true order ascertained?

Means of correlation. — The following are the means employed: —

1. *Order of superposition.* — When strata are little disturbed, vertical sections give the true order in those sections; and so also may outcrops of inclined strata over the surface of a country. In using this method by superposition, several precautions are necessary.

Precaution 1. — Proof should be obtained that the strata have not been folded upon one another, so as to make an upper layer a lower one (see page 104), — a condition to be suspected in regions where the rocks are much tilted.

Precaution 2. — It should be seen that the strata under examination are continuous. A fault in the rocks may deceive; for it makes layers seemingly continuous which are not so. Faults are common in regions of upturned rocks and may occur when the dip is slight. In some cases, beds forming the upper part of a bluff (as *ab*, Fig. 350) have settled down bodily (*c*) to the bottom, so as to seem to be continuous with the older ones of the bottom (as *c* with *d*). In other cases, caverns in rocks have been filled through openings from above, and the same kind of mistake made.

