

deposited from water, as we suppose, the layers must have been originally nearly horizontal. Rocks are not usually inclined more than ten degrees by original deposition, but there may be cases where the angle would be as large as 25° or 30° over limited areas. Hence if we get the perpendicular thickness of a series of strata we ascertain the character of the crust of the globe to that depth.

If we measure the breadth of a series of upturned strata, on a line at right angles to their strike, and ascertain their dip, we have given the hypotenuse and angles of a right-angled triangle to find the perpendicular, which is the thickness of the strata. If the strata are perpendicular, a horizontal line across their edges gives their thickness.

In calculating the thickness of rocks in any given district, we must be careful not to measure the same strata more than once. For when strata are folded over, the upper beds will be folded beneath the lower and dip at the same angle. Especially if the crest of the fold has been denuded is there danger of mistake. Without regard to this principle, most enormous thicknesses might be calculated.

By measurements and calculations of this sort, it has been ascertained that the total thickness of the fossiliferous strata in Europe is not less than 15 miles. In this country, as has been already shown, the total thickness of the fossiliferous strata is nearly ten miles.

We see from these statements how groundless is the opinion, that geologists are able to ascertain the structure of the earth only to the depth that excavations have been made, which is less than a mile; especially when we recollect that the unstratified rocks are uniformly found beneath the stratified; and since their igneous or aqueo-igneous origin is now generally admitted, it can hardly be doubted that they came from very great depths; so that probably the essential composition of the globe is known almost to its center.

UNSTRATIFIED OR IGNEOUS ROCKS.

The differences among the unstratified rocks result from two causes. 1. A difference in chemical composition. 2. The diversity of circumstances under which they were produced.

All the varieties of these rocks pass into one another by insensible gradations, even in the same mountain mass; giving rise to endless varieties, which can not be described minutely in a treatise like the present.