

produce those constituting the crust of the globe. If, for instance, we can determine how fast ponds, lakes, and oceans are filling up with mud, sand, and gravel, conveyed to their bottoms, we can judge of the period necessary to produce those rocks which appear to have been formed in a similar manner; and if there is any evidence that the process was more rapid in early times, we can make due allowance.

In the third place, all the stratified rocks appear to have been formed out of the fragments of other rocks, worn down by the action of water and atmospheric agencies. This is particularly true of that large proportion of these rocks which contain the remains of animals and plants. The mud, sand, and gravel of which these are mostly composed, must have been worn from rocks previously existing, and have been transported into lakes, and the ocean, as the same process is now going on. There the animals and plants, which died in the waters, and were transported thither by rivers, must have been buried; next, the rocks must have been hardened into stone, by admixture with lime, or iron, or by internal heat; and, finally, have been raised above the waters, so as to become dry land. Beds of limestone are interstratified with those of shale, sandstone, and conglomerate; but these form only a small proportion of the whole, and, besides, were mostly formed in an analogous manner, though by agencies more decidedly chemical.

Now, for the most part, this process of forming rocks by the accumulation of mud, sand, and gravel is very slow. In general, such accumulations, at the bottom of lakes and the ocean, do not increase more than a few inches in a century. During violent floods, indeed, and in a few limited spots, the accumulation is much more rapid; as in the Lake of Geneva, through which the Rhone, loaded with detritus from the Alps, passes, where a delta has been formed two miles long and nine hundred feet thick, within eight hundred years.¹ And

¹ This had always seemed to me a very strong case, as I had seen it described. But a recent visit to the spot (September, 1850) did not make so strong an impression upon me as I expected. In the first place, I found the head of Lake Lehman, where the Rhone enters, to be so narrow, that the detritus brought down by the river cannot spread itself out very far laterally. Secondly, I found, on ascending the Rhone, that it is every where a very rapid stream; and, on account of the origination of its branches from glaciers, it is always loaded with