

living beings. During this state of things some of the residuary mineral ingredients of the primæval ocean were precipitated, and formed deposits (the transition strata of Werner), half chemical and half mechanical, and containing a few fossils.

By this new theory, which was in part a revival of the doctrine of Leibnitz, published in 1680, on the igneous origin of the planet, the old ideas respecting the priority of all crystalline rocks to the creation of organic beings, were still preserved; and the mistaken notion that all the semi-crystalline and partially fossiliferous rocks belonged to one period, while all the earthy and uncrystalline formations originated at a subsequent epoch, was also perpetuated.

It may or may not be true, as the great Leibnitz imagined, that the whole planet was once in a state of liquefaction by heat; but there are certainly no geological proofs that the granite which constitutes the foundation of so much of the earth's crust was ever at once in a state of universal fusion. On the contrary, all our evidence tends to show that the formation of granite, like the deposition of the stratified rocks, has been successive, and that different portions of granite have been in a melted state at distinct and often distant periods. One mass was solid, and had been fractured, before another body of granitic matter was injected into it, or through it, in the form of veins. Some granites are more ancient than any known fossiliferous rocks; others are of secondary; and some, such as that of Mont Blanc and part of the central axis of the Alps, of tertiary origin. In short, the universal fluidity of the crystalline foundations of the earth's crust, can only be understood in the same sense as the universality of the ancient ocean. All the land has been under water, but not all at one time; so all the subterranean unstratified rocks to which man can obtain access have been melted, but not simultaneously.

In the present work the four great classes of rocks, the aqueous, plutonic, volcanic, and metamorphic, will form four parallel, or nearly parallel, columns in one chronological table. They will be considered as four sets of monuments relating to four contemporaneous, or nearly contemporaneous, series of events. I shall endeavor, in a subsequent chapter on the plutonic rocks, to explain the manner in which certain masses belonging to each of the four classes of rocks may have originated simultaneously at every geological period, and how the earth's crust may have been continually modelled, above and below, by aqueous and igneous causes, from times indefinitely remote. In the same manner as aqueous and fossiliferous strata are now formed in certain seas or lakes, while in other places volcanic rocks break out at the surface, and are connected with reservoirs of melted matter at vast depths in the bowels of the earth,—so, at every era of the past, fossiliferous deposits and superficial igneous rocks were in progress contemporaneously with others of subterranean and plutonic origin, and some sedimentary strata were exposed to heat and made to assume a crystalline or metamorphic structure.

It can by no means be taken for granted, that during all these changes the solid crust of the earth has been increasing in thickness. It has been