mations were accumulated in waters resembling those of the present ocean, except at certain intervals, when, from causes wholly unexplained, a partial recurrence of the "chaotic fluid" took place, during which various trap rocks, some highly crystalline, were formed. This arbitrary hypothesis rejected all intervention of igneous agency, volcanoes being regarded as modern, partial, and superficial accidents, of trifling account among the great causes which have modified the external structure of the globe.

Meanwhile Hutton, a contemporary of Werner, began to teach, in Scotland, that granite as well as trap was of igneous origin, and had at various periods intruded itself in a fluid state into different parts of the earth's crust. He recognized and faithfully described many of the phenomena of granitic veins, and the alterations produced by them on the invaded strata, which will be treated of in the thirty-third chapter. He, moreover, advanced the opinion, that the crystalline strata called primitive had not been precipitated from a primæval ocean, but were sedimentary strata altered by heat. In his writings, therefore, and in those of his illustrator, Playfair, we find the germ of that metamorphic theory which has been already hinted at in the first chapter, and which will be more fully expounded in the thirty-fourth and thirty-fifth chapters.

At length, after much controversy, the doctrine of the igneous origin of trap and granite made its way into general favor; but although it was, in consequence, admitted that both granite and trap had been produced at many successive periods, the term primitive or primary still continued to be applied to the crystalline formations in general, whether stratified, like gneiss, or unstratified, like granite. The pupil was told that granite was a primary rock, but that some granites were newer than certain secondary formations; and in conformity with the spirit of the ancient language, to which the teacher was still determined to adhere, a desire was naturally engendered of extenuating the importance of those more modern granites, the true dates of which new observations were continually bringing to light.

A no less decided inclination was shown to persist in the use of the term "transition," after it had been proved to be almost as faulty in its original application as that of flötz. The name of transition, as already stated, was first given by Werner, to designate a mineral character, intermediate between the highly crystalline or metamorphic state and that of an ordinary fossiliferous rock. But the term acquired also from the first a chronological import, because it had been appropriated to sedimentary formations, which, in the Hartz and other parts of Germany, were more ancient than the oldest of the secondary series, and were characterized by peculiar fossil zoophytes and shells. When, therefore, geologists found in other districts stratified rocks occupying the same position, and inclosing similar fossils, they gave to them also the name of *transition*, according to rules which will be explained in the next chapter; yet, in many cases, such rocks were found not to exhibit the same mineral texture which Werner had called transition. On the contrary, many of them were not more crystalline than different members of the secondary class; while, on the other hand, these last were sometimes found to assume a semi-