

CHAPTER XXXII.

CAUSES OF EARTHQUAKES AND VOLCANOS.

Intimate connexion between the causes of volcanos and earthquakes — Supposed original state of fusion of the planet — Universal fluidity not proved by spheroidal figure of the earth — Attempt to calculate the thickness of the solid crust of the earth by precessional motion — Heat in mines increasing with the depth — Objections to the supposed intense heat of a central fluid — Whether chemical changes may produce volcanic heat — Currents of electricity circulating in the earth's crust — Theory of an unoxidated metallic nucleus — The metallic oxides when heated may be deoxidated by hydrogen.

It will hardly be questioned, after the description before given of the phenomena of earthquakes and volcanos, that both of these agents have, to a certain extent, a common origin; and I may now, therefore, proceed to inquire into their probable causes. But first, it may be well to recapitulate some of those points of relation and analogy which lead naturally to the conclusion that they spring from a common source.

The regions convulsed by violent earthquakes include within them the site of all the active volcanos. Earthquakes, sometimes local, sometimes extending over vast areas, often precede volcanic eruptions. The subterranean movement and the eruption return again and again, at irregular intervals of time, and with unequal degrees of force, to the same spots. The action of either may continue for a few hours, or for several consecutive years. Paroxysmal convulsions are usually followed, in both cases, by long periods of tranquillity. Thermal and mineral springs are abundant in countries of earthquakes and active volcanos. Lastly, hot springs situated in districts considerably distant from volcanic vents have been observed to have their temperature suddenly raised, and the volume of their water augmented, by subterranean movements.

All these appearances are evidently more or less connected with the passage of heat from the interior of the earth to the surface; and where there are active volcanos, there must exist, at some unknown depth below, enormous masses of matter intensely heated, and, in many instances, in a constant state of fusion. We have first, then, to inquire, whence is this heat derived?

It has long been a favourite conjecture, that the whole of our planet was originally in a state of igneous fusion, and that the central parts still retain a great portion of their primitive heat. Some have imagined, with the late Sir W. Herschel, that the elementary matter of the earth may have been first in a gaseous state, resembling those nebulae which we behold in the heavens, and which are of dimensions so vast, that some of them would fill the orbits of the remotest planets of our system. The increased power of the telescope has of late years resolved the greater number of these nebulous appearances into clusters of stars, but so long as they were confidently supposed to consist of aëriiform matter it was a