

were made by Hochstetter, Suess, and Reyer on molten sulphur and other substances which absorb gases in large quantities, and during the process of cooling from the molten condition, the escape of the gases was accompanied by explosive phenomena. Under certain circumstances, at the places of explosion conical-shaped masses formed resembling those of volcanic mountains.

F. *Earthquakes*.—Earthquakes may arise in the solid crust or in still deeper horizons of the earth. They accompany all the more violent eruptions, but they may take place quite independently of volcanic phenomena. Records of earthquakes have been handed down from the earliest times, but the classical and mediæval writers confined themselves to the descriptions of the leading natural phenomena, and the catastrophes and terrifying effects produced by earthquakes on people and animals.<sup>1</sup>

Scientific research of earth-tremors may be said to have commenced in the beginning of the eighteenth century, and had already progressed so far that Hoff was able to compile an excellent monograph of earthquakes for the second volume of his work. Another good account of the phenomena and effects of earthquakes was published in Friedrich Hoffmann's posthumous works (1828). An essay by Dr. Kries upon the origin of earthquakes was awarded a prize at Leipzig in 1827. Naumann's *Text-book of Geognosy* contained a complete *resumé* of all the scientific facts about earthquakes known before 1850. So exhaustive was Naumann's account that Landgrebe could bring forward little additional knowledge in his *Naturgeschichte der Vulkane und Erdbeben* (vol. ii., 1854).

All the earlier writings of the nineteenth century follow Alexander von Humboldt in representing earthquakes and volcanoes as different manifestations of the same set of causes. Humboldt defined earthquakes as "Reactions of the earth's nucleus against the solid crust," and volcanoes as "Safety-valves" for the immediate neighbourhood of such disturbances. Emil Kluge, who made a special study of the earth-tremors and shocks in the years 1850-57, supported Humboldt's

<sup>1</sup> A short historical account of the prevailing views regarding earthquakes which were held by the authorities of antiquity and the Middle Ages, will be found in R. Hoernes' *Erdbebenkunde*, Leipzig, 1893.