an area of variable extent. When the pressure exercised by the subjacent lavas is sufficiently powerful to break *through* the terrestrial crust, and by the fracture so produced to effect a direct communication between the interior of the globe and its surface, the lavas—that is, the billows of the central ocean—will one day leap into the light, and form *a volcano*. If this opening, this communication accidentally established at one point between the interior and exterior of the earth, remain permanent, and if the eruption of lavas be continuous, as at Stromboli, or recurring at longer or shorter intervals, as at Vesuvius and Etna, the volcano will be *active*.

If the communication should after awhile be closed up again, we call it an *extinct volcano*; and of extinct volcanoes great numbers exist in various parts of the world, as in the Andes of South America, or in Central France. The occurrence of eruptive masses, such as trachytes and basalts, and of ancient craters, whose form resembles that of existing craters, enable the geologist to affirm without hesitation the past existence of violent igneous action.*

A German physicist, Herr Emile Kluge, has sought to prove that the frequency of volcanic eruptions follows the same cycle of eleven years which has been established in reference to the solar spots, the Aurora Borealis, and the variations of the magnetic needle. He adds that the secular period of the eruptions of Vesuvius, Etna, and other volcanoes—a period whose existence has already been ascertained—comprehends nine of these periods of eleven years. This is not the place, however, to discuss the bearings of such a law, even if we admit that its existence can be proved.

Let us first examine the characteristic phenomena of earthquakes; after which we will pass to a consideration of those of volcanoes.

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^{* [}Volcanic action, says Sir C. Lyell, may be defined to be "the influence exerted by the heated interior of the earth on its external covering." If we adopt this definition, without connecting it, as Humboldt has done, with the theory of secular refrigeration, or the cooling down of an original heated and fluid nucleus, we may then class under a general head all the subterranean phenomena, whether of volcanoes or earthquakes, and those insensible movements of the land by which large districts may be depressed or elevated without convulsions.—" Principles of Geology," i. 577.]