

of the interior on the exterior. The frequency and general prevalence of a phenomenon which is probably dependent on the raised temperature of the deepest molten strata explain its independence of the nature of the mineral masses in which it manifests itself. Earthquakes have even been felt in the loose alluvial strata of Holland, as in the neighborhood of Middleburg and Vliessingen on the 23d of February, 1828. Granite and mica slate are shaken as well as limestone and sandstone, or as trachyte and amygdaloid. It is not, therefore, the chemical nature of the constituents, but rather the mechanical structure of the rocks, which modifies the propagation of the motion, the wave of commotion. Where this wave proceeds along a coast, or at the foot and in the direction of a mountain chain, interruptions at certain points have sometimes been remarked, which manifested themselves during the course of many centuries. The undulation advances in the depths below, but is never felt at the same points on the surface. The Peruvians\* say of these unmoved upper strata that "they form a bridge." As the mountain chains appear to be raised on fissures, the walls of the cavities may perhaps favor the direction of undulations parallel to them; occasionally, however, the waves of commotion intersect several chains almost perpendicularly. Thus we see them simultaneously breaking through the littoral chain of Venezuela and the Sierra Parime. In Asia, shocks of earthquakes have been propagated from Lahore and from the foot of the Himalaya (22d of January, 1832) transversely across the chain of the Hindoo Chou to Badakschan, the upper Oxus, and even to Bokhara.† The circles of commotion unfortunately expand occasionally in consequence of a single and unusually violent earthquake. It is only since the destruction of Cumana, on the 14th of December, 1797, that shocks on the southern coast have been felt in the mica slate rocks of the peninsula of Maniquarez, situated opposite to the chalk hills of the main land. The advance

\* In Spanish they say, *rocas que hacen puente*. With this phenomenon of non-propagation through superior strata is connected the remarkable fact that in the beginning of this century shocks were felt in the deep silver mines at Marienberg, in the Saxony mining district, while not the slightest trace was perceptible at the surface. The miners ascended in a state of alarm. Conversely, the workmen in the mines of Falun and Persberg felt nothing of the shocks which in November, 1823, spread dismay among the inhabitants above ground.

† Sir Alex. Burnes, *Travels in Bokhara*, vol. i., p. 18; and Wathen, *Mem. on the Usbek State*, in the *Journal of the Asiatic Society of Bengal*, vol. iii., p. 337.