

perature when they are unmixed with the waters rising from great depths, or descending from considerable mountain elevations, and when they have passed through a long course at a depth from the surface of the earth which is equal in our latitudes to 40 or 60 feet, and, according to Boussingault, to about one foot in the equinoctial regions;\* these being the depths at which the invariability of the temperature begins in the temperate and torrid zones, that is to say, the depths at which horary, diurnal, and monthly changes of heat in the atmosphere cease to be perceived.

Hot springs issue from the most various kinds of rocks. The hottest permanent springs that have hitherto been observed are, as my own researches confirm, at a distance from all volcanoes. I will here advert to a notice in my journal of the *Aguas Calientes de las Trincheras*, in South America, between Porto Cabello and Nueva Valencia, and the *Aguas de Coman-gillas*, in the Mexican territory, near Guanaxuato; the former of these, which issued from granite, had a temperature of  $194^{\circ}\cdot5$ ; the latter, issuing from basalt,  $205^{\circ}\cdot5$ . The depth of the source from whence the water flowed with this temperature, judging from what we know of the law of the increase of heat in the interior of the earth, was probably 7140 feet, or above two miles. If the universally-diffused terrestrial heat be the cause of thermal springs, as of active volcanoes, the rocks can only exert an influence by their different capaci-

\* The profound investigations of Boussingault fully convince me, that in the tropics, the temperature of the ground, at a very slight depth, exactly corresponds with the mean temperature of the air. The following instances are sufficient to illustrate this fact:

Stations within Tropical Zones.	Temperature at 1 French foot [1·006 of the English foot] below the earth's surface.	Mean Temperature of the air.	Height, in English feet, above the level of the sea.
Guayaquil.....	78·8	78·1	0
Anserma Nuevo.....	74·6	74·8	3444
Zupia.....	70·7	70·7	4018
Popayan.....	64·7	65·6	5929
Quito.....	59·9	59·9	9559

The doubts about the temperature of the earth within the tropics, of which I am probably, in some degree, the cause, by my observations on the Cave of Caripe (Cueva del Guacharo), *Rel. Hist.*, t. iii., p. 191-196), are resolved by the consideration that I compared the presumed mean temperature of the air of the convent of Caripe,  $65^{\circ}\cdot3$ , not with the temperature of the air of the cave,  $65^{\circ}\cdot6$ , but with the temperature of the subterranean stream,  $62^{\circ}\cdot3$ , although I observed (*Rel. Hist.*, t. iii., p. 146 and 194) that mountain water from a great height might probably be mixed with the water of the cave.