by volcanoes); while the other rests on the operation of small powers, which produce effects almost insensibly by progressive action. Those who love to indulge in geological hypotheses must not, however, forget the horizontality so often remarked amidst gypseous and calcareous mountains, in the position of grottoes communicating with each other by passages. This almost perfect horizontality, this gentle and uniform slope, appears to be the result of a long abode of the waters, which enlarge by erosion clefts already existing, and carry off the softer parts the more easily, as clay or muriate of soda is found mixed with the gypsum and fetid limestone. These effects are the same, whether the caverns form one long and continued range, or several of these ranges lie one over another, as happens almost exclusively in gypseous mountains.

That which in shelly or Neptunean rocks is caused by the action of the waters, appears sometimes to be in the volcanic rocks the effect of gaseous emanations* acting in the direction where they find the least resistance. When melted matter moves on a very gentle slope, the great axis of the cavity formed by the elastic fluids is nearly horizontal, or parallel to the plane on which the movement of transition takes place. A similar disengagement of vapours, joined to the elastic force of the gases, which penetrate strata softened and raised up, appears sometimes to have given great extent to the caverns found in *trachytes* or trappean porphyries. These porphyritic caverns, in the Cordilleras of Quito and Peru, bear the Indian name of *Machays*.† They are in general of little depth. They are lined with sulphur, and differ by the enormous size of their openings from those observed in volcanic tufas‡ in Italy, at Teneriffe, and in

* At Vesuvius, the Duke de la Torre showed me, in 1805, in currents of recent lava, cavities extending in the direction of the current, six or seven feet long and three feet high. These little volcanic caverns were lined with specular iron, which cannot be called oligiste iron, since M. Gay-Lussac's last experiments on the oxides of iron.

† Machay is a word of the Quichua language, commonly called by the Spaniards 'the Incas' language.' *Callancamachay* means "a cavern as large as a house," a cavern that serves as a *tambo* or caravansarai.

‡ Sometimes fire acts like water in carrying off masses, and thus the cavities may be caused by an igneous, though more frequently by an aqueous erosion or solution.