

into the crevices of the most solid rocks, it rends them open on freezing with mechanical force.* For this reason, although, in cold climates the comparative quantity of rain which falls is very inferior, and although it descends more gradually than in tropical regions, yet the severity of frost, and the greater inequalities of temperature, compensate in some degree for this diminished source of degradation. The solvent power of water also is very great, and acts particularly on the calcareous and alkaline elements of stone, especially when it holds carbonic acid in solution, which is abundantly supplied to almost every large river by springs, and is collected by rain from the atmosphere. The oxygen of the atmosphere is also gradually absorbed by all animal and vegetable productions, and by almost all mineral masses exposed to the open air. It gradually destroys the equilibrium of the elements of rocks, and tends to reduce into powder, and to render fit for soils, even the hardest aggregates belonging to our globe.†

When earthy matter has once been intermixed with running water, a new mechanical power is obtained by the attrition of sand and pebbles, borne along with violence by a stream. Running water charged with foreign ingredients being thrown against a rock, excavates it by mechanical force, sapping and undermining till the superincumbent portion is at length precipitated into the stream. The materials cause a temporary obstruction, ponding back the water until by its accumulated weight it sweeps down the barrier.

Sinuosities of rivers.—By a repetition of these land-slips the ravine is widened into a small, narrow valley, in which sinuosities are caused by the deflexion of the stream first to one side and then to the other. The unequal hardness of the materials through which the channel is eroded tends partly to give new directions to the lateral force of excavation. When by these, or by accidental shiftings of the alluvial matter in the channel, and numerous other causes, the current is made to cross its general line of descent, it eats out a curve in the opposite bank, or in the side of the hills bounding the valley, from which curve it is turned back again at an equal angle, so that it recrosses the line of descent, and gradually hollows out another curve lower down in the opposite bank, till the whole sides of the valley, or river-bed, present a succession of salient and retiring angles. Among the causes of deviation from a straight course by which torrents and rivers tend in mountainous regions to widen the valleys through which they flow, may be mentioned the confluence of lateral torrents, swollen irregularly at different seasons by partial storms, and discharging at different times unequal quantities of sand, mud, and pebbles, into the main channel.

When the tortuous flexures of a river are extremely great, the aberration from the direct line of descent is often restored by the river cutting through the isthmus which separates two neighbouring

* *Quart. Journ. of Sci., &c., New Series, No. xiii. p. 194.*

† *Sir H. Davy, Consolations in Travel, p. 271.*