

of a softer bed, placed between two hard rocks, and thus form small longitudinal valleys. I have observed several instances of such valleys in the Alps, which may probably have been furrowed by mountain torrents in the course of ages. Some vallies, as Les Echelles, near Chambery, are closed at one end by a perpendicular wall of rock; through this rock a tunnel has been cut for the road: but it is impossible to conceive, that any action of water courses could have formed such a valley. There is only a feeble stream that flows from it.\* Malham Cove, at the head of the valley of the Aire, in Yorkshire, is a perpendicular wall of limestone 200 feet high: at its feet the river rises; but no conceivable action of the river could have originally formed this valley. Whatever extension we may reasonably grant to the action of rivers, it will not be found sufficient for the excavation of valleys, except in particular situations.

The third theory, which attributes the formation of valleys to the elevation of mountain ranges, appears to assign a cause, that will explain, in a simple manner, the formation of many valleys; but on examination, it will be found inadequate to explain the phenomena of other valleys, without the concurrence of inundations or the action of water.

If the crust of the globe were broken, and raised in parallel ridges, they might form mountain ranges, with valleys between them, like what are observed bordering the central range of the Alps; the arched stratification of many of the calcareous mountains, and the vertical position of the beds, favour this hypothesis.

In some instances, where the beds of a mountain are raised from an horizontal, to a nearly vertical position, they would leave a chasm proportionate to the part that had been raised; and this might form the bed of a lake. The steep escarpments, which the calcareous mountains in Switzerland and Savoy present to the lakes which they border, indicate that the beds of the lakes were formed in the hollows that had been left by the elevation of the mountains. The beds of the mountains on the side opposite to the escarpments, generally slope down to the lakes; hence M. De Luc inferred, that these mountains had sunk down, and left the chasm which forms the bed of the lake. Indeed it is highly probable, that when the beds of rock were broken and elevated in one part, the beds adjoining would sink down, leaving vast chasms, which were soon filled with water, and formed lakes. It seems quite certain, that the lakes in the valleys of mountainous countries, could never have been excavated by the rivers that flow into them. The great lakes of North America are situated upon a vast extent of table land, about 800 feet above the sea; but the country is so level, that the rivers which flow into the

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\* For a particular account of the structure of this valley, see *Travels in the Tarantaise*, vol. i. p. 169. I there ascribe its original formation to subsidence.