

Bohemia,¹ has come to the conclusion that their species do not extend from one formation to the other; D'Orbigny² and Pictet³ have come to the same conclusion for the fossil remains of all classes. It may well be said that, as fossil remains are studied more carefully, in a zoölogical point of view, the supposed identity of species, in different geological formations, vanishes gradually more and more; so that the limitation of species in time, already ascertained in a general way, by the earlier investigations of their remains in successive geological formations, is circumscribed, step by step, within narrower, more definite, and also more equable periods. Species are truly limited in time, as they are limited in space, upon the surface of the globe. The facts do not exhibit a gradual disappearance of a limited number of species, and an equally gradual introduction of an equally limited number of new ones; but, on the contrary, the simultaneous creation and the simultaneous destruction of entire faunæ, and a coincidence between these changes in the organic world and the great physical changes our earth has undergone. Yet it would be premature to attempt to determine the extent of the geographical range of these changes, and still more questionable to assert their synchronism upon the whole surface of the globe, in the ocean and upon dry land.

To form adequate ideas of the great physical changes the surface of our globe has undergone, and the frequency of these modifications of the character of the earth's surface, and of their coincidence with the changes observed among the organized beings, it is necessary to study attentively the works of Elie de Beaumont.⁴ He, for the first time, attempted to determine the relative age of the different systems of mountains, and showed first, also, that the physical disturbances occasioned by their upheaval coincided with the successive disappearance of entire faunæ, and the reappearance of new ones. In his earlier papers he recognized seven, then twelve, afterwards fifteen such great convulsions of the globe, and now he has traced more or less fully and conclusively the evidence that the number of these disturbances has been at least sixty, perhaps one hundred. But while the genesis and genealogy of our mountain systems were thus illustrated, palæontologists, extending their comparisons between the fossils of different formations more carefully to all the successive beds of each great era, have observed more and more marked differences between them, and satisfied themselves that faunæ also have been more frequently renovated, than was formerly supposed; so that the general results of

¹ BARRANDE, *Système silurien*, etc., q. n.; see, also, my *Monographies d'Echinodermes*, q. n., p. 54.

² D'ORBIGNY, *Paléontologie Française*, q. n., p. 95.

³ PICTET, *Traité de Paléontologie*, etc., q. n., p. 96, note 1.

⁴ ELIE DE BEAUMONT, *Notice sur les systèmes de Montagnes*, Paris, 1852, 3 vols. 12mo.; see, also, BUCH. (LEOP. v.) *Ueber die geognostischen Systeme von Deutschland*, Leonhard's Taschenb., 1824, II., p. 501.