species to any clear and determinate principles, since they have usually speculated on the phenomena, upon the assumption that the physical geography of the globe had undergone no material alteration since the introduction of the species now living. So long as this assumption was made, the facts relating to the geography of plants and animals appeared capricious in the extreme, and by many the subject was pronounced to be so full of mystery and anomalies, that the establishment of a satisfactory theory was hopeless.*

Centres from which plants have been diffused. — Some botanists conceived, in accordance with the hypothesis of Willdenow, that mountains were the centres of creation from which the plants now inhabiting large continents have radiated; to which De Candolle and others, with much reason, objected, that mountains, on the contrary, are often the barriers between two provinces of distinct vegetation. The geologist who is acquainted with the extensive modifications which the surface of the earth has undergone in very recent geological epochs, may be able, perhaps, to reconcile both these theories in their application to different regions.

A lofty range of mountains, which is so ancient as to date from a period when the species of animals and plants differed from those now living, will naturally form a barrier between contiguous provinces; but a chain which has been raised, in great part, within the epoch of existing species, and around which new lands have arisen from the sea within that period, will be a centre of peculiar vegetation.

"In France," observes De Candolle, "the Alps and Cevennes prevent a great number of the plants of the south from spreading themselves to the northward; but it has been remarked that some species have made their way through the gorges of these chains, and are found on their northern sides, principally in those places where they are lower and more interrupted."† Now the chains here alluded to have probably been of considerable height ever since the era when the existing vegetation began to appear, and were it not for the deep fissures which divide them, they might have caused much more abrupt terminations to the extension of distinct assemblages of species.

* This and the preceding chapter, on the causes of extinction of species and their present geographical distribution, are reprinted almost verbatim from the original edition of the second volume of "The Principles," published in January, 1832. It was I believe the first attempt to point out how former changes in the geography and local climate of many parts of the globe must be taken into account when we endeavour to explain the actual provinces of plants and animals, the changes alluded to having been proved by geological evidence to be subsequent to the creation of a great proportion of the species now living, and these having been, according to the view which I advocated, introduced in succession, and not all at one geological epoch. In my third volume, published in May, 1833, I announced my conviction that the greater part of the existing Fauna and Flora of Sicily were older than the mountains, plains, and rivers, which the same species of animals and plants now inhabit. (Prin. of Geol. vol. iii. ch. ix.; repeated in Elements of Geol., 2d edit., vol. i. p. 297.) This line of reasoning has since been ably followed up and elucidated by Professor E. Forbes in an excellent paper (published in 1846) already alluded to. (See page 88.)

† Essai Elémentaire, &c. p. 46.