

ages with which geologists, since the time of Lyell, have been accustomed to reckon, are not supported by our present knowledge of the periods during which the so-called secular cooling of the earth has been going forward—the period which has elapsed since the “consistior status” of Leibniz set in. He has thus put before natural philosophers a problem—the reconciliation of the geological and the thermophysical record—in which the genetic view of nature must be greatly interested. But even more important than all this is the doctrine of the dissipation of energy, referred to in the second chapter of this volume—a doctrine of which

53.  
Dissipation  
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years has elapsed since the latter part of the secondary period” (‘Origin of Species,’ 1st ed., p. 287). He shows that Hutton and the uniformitarians were misled by a belief in the so-called stability of the solar system, which took no notice of the effect of tidal friction, nor of the phenomena of radiation and cooling in the past, still less of the law of dissipation of energy, and maintains that the modern ideas of evolution are in a sense a return to the older conceptions of Leibniz, Newton, and other more recent geologists (*loc. cit.*, p. 111). Since the subject was thus brought prominently forward, astronomers, physicists, and geologists have not only—as Huxley expected them to do (see ‘American Addresses,’ 1886, p. 93)—adduced arguments in order to arrive at an approximate idea how long the earth may have been able to maintain organic life, but biologists have been induced to revise the postulates of the extreme—almost infinite—slowness, and of the uniform continuity of organic changes, originally contained in the Darwinian theory. The influence of these researches upon biological

and genetic reasoning has been to emphasise the sudden changes, the ruptures in the continuity of development. In England the great work of Mr William Bateson (‘Materials for the Study of Variations,’ 1894) has familiarised us with the idea of “Discontinuity” in the origin of species. On the Continent the rapid or even sudden appearance of variations is not a new idea, though the original suggestion of Maupertuis (1748), which was taken up and elaborated by Geoffroy St Hilaire (see Yves Delage, ‘L’Hérédité,’ p. 291), was forgotten. In quite recent years the reconciliation of the “persistence of species” with their “variability,” and of the “geological” with the “biological” records, has been much furthered by the theory of “Mutation” of the celebrated Dutch botanist de Vries. His view is that “every species has its beginning and its end; it behaves in this way like an individual.” He refers to the experiments on heredity and crossing of butterflies of Standfuss, who has been led to maintain the existence of sudden or “explosive” transformations; and he