

On the other hand, and of more biological importance, there is the action of the environment upon organisms. This formed the main subject of Prof. Karl Semper's masterly Lowell Lectures in 1881, and his book should certainly be ranked first in the literature of the subject. If we add to that the records of a representative series of experiments, such as those of Professor Weismann on the seasonal dimorphism of butterflies, of Professor Poulton on the coloration of caterpillars, of Dr. De Varigny on the dwarfing of water-snails (*Limnæus*), of Profs. Born and Yung on the determination of sex in tadpoles, and similar experiments by M. Maupas and Prof. Nussbaum on the rotifer *Hydatina senta*; and finally read Prof. Weismann's Romanes Lecture, we gain a fair idea of the present state of knowledge and opinion on the subject.

As the result of much detailed work, biologists have become clearer as to the complex relations between organisms and their environment. A summary may be attempted here.

(1) There is the relation of normal functional dependence, in virtue of which life continues from moment to moment, as may be illustrated by the respiratory interchange of gases. Of the same sort, obviously, is the relation between the developing embryo and its environment, including not only the essential food-supply, but various external stimuli, such as gravity, pressure, the chemical medium, heat, light, and electricity.

(2) There is the relation of direct modification, wherein an environmental change produces a change in the metabolism of the organism which is followed by a lasting change of structure. There must always be *some* change of structure, but if this passes what may be called *the limit of vital elasticity* the result is a "modification" which persists. The Lamarckians believe that these modifications of the body may affect the germ-cells in such a way that the offspring may show a change in the same direction as the original modification, and apart from the recurrence of a similar environmental influence. This remains a hypothesis, and there are few facts at present known which can be said to favour it.