

46.
Fusion
of two
elements.

biologists a formula which, like his physiological units, has helped to give precision and direction to reasoning on these subjects. But as growth has a natural limit and leads to division, so reproduction through division appears to have a limit also. "Only the very lowest organisms, such as fission fungi, appear to be able to multiply indefinitely by repeated divisions: for the greater part of the animal and vegetable kingdoms the general law may be laid down that, after a period of increase of mass through cell division, a time arrives when two cells of different origin must fuse together, producing by their coalescence an elementary organism which affords the starting-point for a new series of multiplications by division."¹ Fertilisation is now known to be a cellular problem. As such it has been studied in favourable cases which permitted of direct observation, and what has been ascertained in those cases—exhibiting in general the same common features and phases of development—has by inference under the great generalisations of the cellular theory been extended to all living things in which sexual differentiation exists, be they animals or plants.² The male and the female

¹ Hertwig, 'The Cell,' p. 252. The process may be looked at as an instance of the cyclical order of change. "The multiplication of the elementary organism, and with it life itself, resolves itself into a cyclic process. . . . Such cycles are termed generation cycles. They occur in the whole organic kingdom in the most various forms." Similarly Sir M. Foster ('Text-book of Physiology,' 5th ed., p. 1555), as quoted, *supra*, p. 289. We may add that from a still broader standpoint, which we may call that of

bionomics—in distinction from biology—the cycle never repeats itself, but, owing to overcrowding and selection, something different, more complex—i.e., externally or internally better endowed—is produced. Philosophically we call this progress.

² There exists no more remarkable instance of the extension of natural knowledge by a process of very incomplete induction than the gradual firm establishment of the now universally adopted doctrine of fertilisation, no more brilliant refu-