

and centring in van Beneden's discovery,¹ been replaced by definite conceptions capable of typical description. This typical process consists in the fusion of certain parts of the male and female cells, — the nuclei or kernels playing an important if not the essential part. Many biologists of the foremost rank, notably in Germany and France, have contributed to make clearer the various lines in this typical picture of the most mysterious process in the physical organism, whilst every new discovery has brought with it new and unanswered questions or given a novel aspect to older problems.

47.
New
problems.

Of these problems, those of heredity and variation are at present by far the most important. Both the cellular theory of living matter and the theory of natural selection, including the principles of differentiation and of the division of physiological labour, converge upon these two great facts of modern biology. The theory of natural selection pre-

¹ See last note. "Since the researches of O. Hertwig and others in 1875, it had been clear that each parent contributes a single germ-cell to the formation of the offspring; but the masterly researches of E. van Beneden (1883) showed that every nucleus of the offspring may contain nuclear substance derived from each of the parents, a conclusion which is visibly demonstrable for a few of the first steps in cleavage. In fact, van Beneden to some extent *proved* what Huxley had foreseen when he said, in 1878, 'It is conceivable, and indeed probable, that every part of the adult contains molecules, derived both from the male and from the

female parent; and that, regarded as a mass of molecules, the entire organism may be compared to a web, of which the warp is derived from the female, and the woof from the male'" (J. Arth. Thomson, 'The Science of Life,' p. 129). Another theoretical anticipation is, according to Haecker (*loc. cit.*, p. 133), the "Idioplasm" of Nägeli: "The heritable substance, organised, possessing a complex structure, transmitted from one generation to another," which was "about the same time identified by Strassburger, O. Hertwig, von Kölliker, and Weismann, with the chromatin substance of the nucleus."