



TURN-OF-THE-CENTURY SCIENCE

The first findings on meiosis—the divvying up of the genetic material in a cell—fascinated cell biologists and offered new evidence on one of the most pressing scientific questions of the previous century: how individual variation is passed between generations. Evolution had been described by both Charles Darwin and Jean-Baptiste Lamarck, though the details of their theories diverged, and neither could offer an explanation for exactly how inheritance worked at a physical level. But late in the 19th century, thanks to observations of sea urchin eggs undergoing meiosis, biologist August Weissmann was able to declare that Darwin's theory was closer to reality than Lamarck's. Here, biologist Cyril Dean Darlington describes the impact of this early meiosis research.

The story begins with Oscar Hertwig's discovery in 1875 that fertilization, the basis of sexual reproduction, concerns the nucleus and therefore also the chromosomes. The ideas which have arisen from this discovery in the century which has passed have some of them made a great stir. Others have gone on their way to return like comets after many years. And others have disappeared like the paper of Farmer & Moore in 1905 which left us the word meiosis and a few forgotten fallacies.

The idea from which all our work springs was, of course, Weismann's prediction that meiosis in both sexes must be the universal complement of fertilization. But even this had a chequered career. His statement to the British Association in 1887 was at once understood. But it carried with it a rider whose meaning has only gradually unfolded itself. The rider was to the effect that the sexual process had succeeded because it was 'a source of individual variability.' Recombination of the materials of heredity, which we may call ids or genes, germ plasm or chromosomes, allowed individuals in later generations to expose their variation to natural selection.

Weismann's sustained purpose behind this formula was to make a clean separation between Darwin and Lamarck. The idea was novel on the face of it. But behind the face of it were concealed more implications than behind any evolutionary idea other than natural selection itself. And these implications could be grasped only piecemeal as the study of meiosis slowly revealed the mechanism of recombination and the long sequence of its causes and consequences.

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