

Wilhelm August Oscar Hertwig

Wilhelm August Oscar Hertwig contributed to embryology through his studies of cells in development and his discovery that only one spermatozoon is necessary to fertilize an egg. He was born 21 April 1849 to Elise Trapp and Carl Hertwig in Hessen, Germany. After his brother Richard was born the family moved to Muhlhausen in Thuringen where the boys were educated. The two brothers later attended the university in Jena from 1868 to 1888 and studied under Ernst Haeckel, who later convinced Hertwig to leave chemistry and pursue medicine. Hertwig became an assistant professor of anatomy at Jena in 1878 and full professor three years later. He was the first chair of both cytology and embryology in Berlin from 1888 to 1921 and director of the new Anatomical-Biological Institute there. Hertwig also became a member of the Prussian Academy of Sciences in Berlin and the Leopoldina Academy in Jena.

Hertwig initially devoted himself to studying morphological development, a topic on which he wrote a prize essay at Jena in 1871 and a doctoral dissertation at Bonn in 1872. He switched to studying the nature of the fertilization process, however, after reading Leopold Auerbach's *Organologische Studien*. The two main views in this field at the time were that either the spermatozoa made contact with the egg and stimulated development via the transmission of a subtle mechanical vibration (as proposed by Gottlieb-Wilhelm Bischoff), or that the spermatozoa penetrated the egg and mixed their chemical components with the egg yolk. However, when Auerbach found two nuclei in one egg, he concluded that they must have formed from the mixture of chemical components of the sperm and the egg, not from previous nuclei.

Hertwig was dissatisfied with these findings, as he had expected to find a structural continuity between the nucleus of the egg before and after fertilization. Hertwig knew that his brother Richard was about to join Haeckel on a research opportunity in the Mediterranean, so he quit his assistantship at Bonn to go with them. It was there that he discovered the sea urchin was transparent due to its small size, finely divided yolk, and its lack of a membrane. Because of this, he was able to observe the spermatozoa as they entered the egg and fused with its nucleus five to ten minutes later. Most importantly, however, Hertwig found that only one spermatozoon was required to fertilize an egg, and that once one spermatozoon entered the egg, the egg formed a vitelline membrane blocking any other spermatozoa from entering.

Hertwig submitted his findings as his *Habilitationsschrift* and was forced to defend his claims against those who believed that the egg cell did not pass through the monera stage in its development. In fact, Hertwig defended his claim even when the more modern theory of chromosome continuity was proposed. It took the work of Thomas Hunt Morgan for Hertwig to accept that chromosomes exchanged genes by crossing over. Hertwig passed away 25 October 1922 in Berlin. He will always be known for his work with his brother Richard on the embryology and fertilization of sea urchin eggs.

Sources

1. Olby, Robert. "Hertwig, Wilhelm August Oscar." *Dictionary of Scientific Biography* 6: 337-40.