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Karl Wilhelm Theodor Richard von Hertwig (1850-1937) [1]

By: Brind'Amour, Katherine Garcia, Benjamin Keywords: Biography [2] Hybridization [3] Sea urchins [4] Zoology [5]

Karl Wilhelm Theodor Richard von Hertwig [6] is an important figure in the history of embryology [7] for his contributions of artificial hybridization [8] of sea urchin [9] eggs and the formulation of his coelom theory. He was born 23 September 1850 in Friedelberg, Germany, to Elise Trapp and Carl Hertwig. Richard and his older brother Oscar began their studies at Jena under the direction of Ernst Haeckel [10] from 1868 to 1871. In 1872 Hertwig became a lecturer in zoology at Jena while Oscar lectured in anatomy and embryology [7]. As both brothers advanced in their respective fields, Hertwig left Jena to become a professor at Königsberg. In 1883 he was professor at Bonn and in 1885 in Munich, where he stayed until his retirement in 1925. Hertwig married Julia Braun in 1887 and had two sons and one daughter. He remained very active his entire life, outliving his brother Oscar by fifteen years.

Hertwig?s earliest studies, under the direction of Haeckel, were in the field of comparative morphology [11]. During the 1870s, Hertwig and his brother Oscar published works on areas such as the nervous system, sense organs, and the musculature of coelenterates. Research in these areas led the brothers to theoretical considerations of the phylogenetic relationships of two-layered coelenterates to three-layered coelenterates. The Hertwig brothers later formulated their ?coelum theory,? which accounted for the classification and phylogeny [12] of metazoan animals and is still used today as an important taxonomic criterion.

In the 1880s the Hertwig brothers made even more important contributions to experimental embryology [7]. Their research centered on the chemical environment of eggs in their relationship to artificial hybridization [8], which produced multipolar mitoses with the use of chemical agents. Their results proved that sea urchin [9] eggs can be shaken into fragments and that the nucleate and the non-nucleate can be fertilized and developed. These findings became very important for future studies on the roles of the nucleus [13] and cytoplasm.

In the 1890s Hertwig proved that after being treated with weak solutions of strychnine, sea urchin [9] eggs form mitotic figures and will begin to divide, a process that became known as artificial parthenogenesis [14] following the research of Jacques Loeb [15]. During this time, Hertwig also studied protozoa [16], specifically ciliates and heliozoans, and their cytology [17] and life cycles. His studies on unicellular organisms coupled with his advanced knowledge of the zoology of higher animals allowed Hertwig to pose and research questions of broad interest.

Throughout the early 1900s Hertwig concentrated on the importance of keeping the relative volumes of cytoplasm and nucleus [13] constant within the cell. His theory explains that when there is an excess of cytoplasmic volume, the cell will divide. His studies of the life cycles of protozoa [16] led him to the concept of senescence [18] and his studies on syngamy peaked his interest in sex determination [19]. Hertwig demonstrated that when frog [20] eggs became overripe, they produced males in larger quantities. This was an early indication that

environmental factors could affect genetic expression. He observed that in heliozoans, basophilic granules, which he named chromidia, were given off by the nucleus [13]. Hertwig believed that during each mitotic division, these granules were discharged into the cytoplasm from the nucleus [13] to play an important developmental role.

Richard von Hertwig was one of the most influential and productive teachers of zoology and its history. He produced the *Lehrbuch der Zoologie*, and when he retired in 1925, 117 of his former students were professors in zoology, many of whom were very well known. Hertwig was crucial to the scientific community?s understanding of artificial hybridization [8] and the development of eggs. He died on 3 October 1937.

Sources

1. Oppenheimer, Jane. ?Hertwig, Karl Wilhelm Theodor Richard von.? *Dictionary of Scientific Biography* 6: 336?37.

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[13] http://embryo.asu.edu/search?text=nucleus
[14] http://embryo.asu.edu/search?text=artificial%20parthenogenesis
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