

Adolf Ziegler

The scientific field of embryology experienced great growth in scope and direction in Germany from approximately 1850 to 1920. During this time, Adolf Ziegler and his son Friedrich crafted hundreds of wax embryo models, representing a shift in how embryos were viewed and used. Their final products, whether human or trout embryos, showcased the now lost collaboration between wax-modeling artists and embryologists.

The noted embryo modeler, Adolf Ziegler, was born in 1820 in Mannheim, Germany, to Ernestine and Gustav Ziegler. In 1824 the family moved to Freiburg and Ziegler began drawing and modeling with clay while in grammar school. In 1838 he began preparatory studies in philosophy at the University of Freiburg and trained to become an apothecary. He worked as an assistant in several pharmacies before returning to the University of Freiburg in 1845. There he studied pharmacy and eventually received his MD degree in 1850. That same year he was admitted to the obstetrics ward at Vienna's General Hospital to continue his training as a physician.

In 1852 Ziegler returned to the city of Freiburg and worked as a physician's assistant but he quickly moved to Charles University in Prague where he worked with one of the leading microscopists in the field, Jan Purkyně. It was at Charles that Ziegler prepared some of his first wax models: the fine anatomy of skin for Purkyně's anatomy classes.

In 1854 Ziegler again returned to Freiburg and took the position of zootomical assistant (responsible for collections), all the while continuing his medical practice. Embryologists at the time were frustrated over how best to study the developmental stages of embryos. First, it was difficult to obtain embryos, especially those in early development. Second, specimens were so delicate that they either could not be preserved at all or else would remain so for only a short period of time. What was needed was a teaching aid with more permanence than disintegrating embryos. Illustrations and wall charts were useful to a point, but they were limited in dimensional scope. Ziegler and Alexander Ecker, a professor of physiology at Freiburg, combined efforts to turn the two-dimensionality of embryo illustrations into three-dimensional models. This collaboration resulted in a swift change in how embryologists did their research and, to a certain degree, how they taught embryology.

Both Ziegler and Ecker dissected, drew, and hand-shaped models of embryos. Between Ecker's embryo collection and Ziegler's artistic rendering, the University of Freiburg soon housed a large embryological collection, including Ziegler's first model series, "The Development of the Frog." Further series followed, but not all models stayed in-house; selling extra models to other universities and museums helped spread Ziegler models throughout Germany.

By the late 1850s Ziegler's name was synonymous with model-making perfection. However, a low salary coupled with his marriage to Frieda Rieggerdt in 1857 forced him to work outside of the university. He was appointed an Apothekenvisitor (apothecary shop inspector) in 1858 and spent vacations inspecting apothecary shops in Freiburg and surrounding areas. During this time he modeled human brain convolutions and echinoderm larvae for Ecker and midge development for Freiberg's first professor of zoology, August Weismann.

In 1867 Ziegler was commissioned to model a collection of human and animal embryos. Even though the commission would have offered him a significant increase in salary, Ziegler left his position at Freiburg to open his own studio, Atelier für wissenschaftliche Unterrichtsmodelle (Studio for Scientific Teaching Models). At the time, Darwinism was fueling recognition of the embryo's importance and news of Ernst Haeckel's biogenetic law was quickly making embryology a science of which everyone, including the general public, took notice. Model embryos were soon in great

demand and having his own studio allowed Ziegler to profitably sell his models to universities, museums, and private collectors, and to spend the rest of his working life as a self-described “plastic publisher.” But all that Ziegler sold was not plastic. His artisan employees also drew figures and lithographic plates purchased by embryologists to accompany their scientific article and textbook writings.

Ziegler was employed by both Wilhelm His and Ernst Haeckel and managed to remain outside of the two embryologists’ intense quarreling. While the two men differed in their approach to developmental embryology, His and Haeckel both used Ziegler models to support their work. Ziegler and His began collaborating in 1868, leading to their first model series, “Development of the Chicken in the Egg.” In 1876 Ziegler modeled the controversial “gastraea” for Haeckel. At the same time, Ziegler was commissioned to model embryos by His, who rejected Haeckel’s biogenetic law and advocated a mechanical approach to embryo development.

Due to their durability, embryo models traveled well and were well traveled. Ziegler gained international acclaim by sending his embryo models to international exhibits in Paris (1867) and Vienna (1873). The Ziegler models, including trout, sea urchin, beetle, frog, chick, and human embryos were displayed at the 1893 World’s Columbian Exposition in Chicago. There they won Ziegler top prize and provided American exposition-goers with a look into the world of the unborn.

In the early 1880s, with Adolf Ziegler’s health failing (he died in 1889), his second son Friedrich took over the modeling operations. When the elder Ziegler retired in 1883, the new technology of the microtome was already bringing modelers and embryologists together in a spirit of collaboration. Gustav Born’s plate modeling technique was gaining momentum in the world of embryo model preparation. Even Adolf’s son was using Born’s technique, for instance, when he worked with His in the early 1880s to produce a series of human embryo plate models. By the mid 1880s most embryologists were producing their own stacked plate models, not so much for use in teaching but to publish them as part of each embryologist’s research agenda.

Eventually, as embryology became more experimental and less descriptive, the need for accurate model-making declined. After World War I, Friedrich Ziegler found himself with increasingly fewer commissions; he died in 1936 and along with him the famous Ziegler studio and its special relationship with scientists and modelers. According to records kept at the Ziegler studio, Adolf and Friedrich’s work had supplied embryo models to all German universities as well as ninety-five foreign universities. Their work undoubtedly found its way across the Atlantic to the United States. In the early 1900s, following the footsteps of the Zieglers, Osborne O. Heard became America’s most renowned embryo modeler, improving upon the Ziegler techniques and making models for the newly founded Department of Embryology at the Carnegie Institution of Washington.

1. Hopwood, Nick. *Embryos in Wax: Models from the Ziegler Studio*. Cambridge, UK: Whipple Museum of the History of Science, 2002.
2. Hopwood, Nick. “‘Giving Body’ to Embryos. Modeling, Mechanism, and the Microtome in Late Nineteenth-Century Anatomy.” *Isis* 90 (1999): 462-96.
3. Hopwood, Nick. “Pictures of Evolution and Charges of Fraud: Ernst Haeckel’s Embryological Illustrations.” *Isis* 97 (2006): 260-301.