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Review Of "Embryos In Wax: Models From The Ziegler Studio" By N. Hopwood

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Embryos in Wax: Models from the Ziegler Studio (review)

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in the United States than in other endemic areas, and while she develops a credible thesis for its eradication, she does not imply that the same techniques can be applied elsewhere. But she has certainly helped us to be better informed and thus forewarned.

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Embryos in Wax: Models from the Ziegler Studio.


Nick Hopwood’s Embryos in Wax is a beautiful extended footnote to his larger work on the embryologist Wilhelm His. While it not a major study, it has its own pleasures for those who enjoy the interactions of art and science. Most of us who have studied or taught embryology have used plaster or plastic models. Some of us have even made our students sculpt embryos out of colored modeling clay. (Indeed, such modeling is perhaps the surest way to understand amphibian gastrulation.) This modeling has its history, and Hopwood has put together a thoughtful and illustrated volume about the paragons of embryonic modeling: Friedrich Ziegler and his father Adolf. Working at the end of the 19th century in Freiburg, Germany, these artist-scientists handcrafted wax models of embryos that were not only scientifically accurate and aesthetically designed, but also durable—some are still used today for university teaching.

The Zieglers thought of themselves as publishers rather than toolmakers, and they worked closely with their respective scientific investigators. The letters between scientist-researcher and scientist-modeler would refer to “proofs” and “authors,” evidence of the Zieglers’ role in “publishing” the investigators’ studies. Their models proudly announced that they were the products of collaboration: the series of amphioxus embryos were advertised as being “nach Hatschek,” while the beautiful and best-selling series of human embryos were “nach His.” At a time when embryology was descriptive, and print publication was the major means of illustrating one’s findings, the wax representations had a full- dimension advantage over the journals. The product of all this effort was a series of wax representations of the various embryos and embryonic organs,
which scientists could use both for their research and for their teaching. These works were enormous magnifications of the embryo in both senses of that word.

The resulting wax models were indeed large, but they also exalted the embryo as an important entity. These models were the first depictions of animal and human embryos made available for public display, and their arrangements for the public gaze resembles the triptychs of medieval altars. And they certainly were public. In addition to their use at universities and medical schools, the Ziegler embryo models—trout, sea urchin, beetle, frog, amphioxus, electric ray, chick, and even human—were prominently displayed at the 1893 World’s Columbian Exposition in Chicago. There, they won for their maker, Friedrich Ziegler, the Fair’s highest prize, and it is easy to see why they attracted so much attention. These wax models provided the public a view of themselves unborn, the history of the species, and a spectacular panorama of progress (evolutionarily and developmentally), that was, after all, the theme of the Exposition. Moreover, the individual models were works of art. One of the figures (enlarged in this beautifully designed book) is of a 15-somite stage chick embryo (*nach His*) seen from the ventral side, focusing on the veins and blood islands. It is obviously the scientific work of Wilhelm His, but its form and intricate casting from Ziegler also presages the filigrees and lost-wax glass art of René Lalique.

The book is, however, more than a catalog, and Hopwood is well tuned to the embryological controversies of the late 19th century (such as that between His and Haeckel), and how the Zieglers managed to work with and sell to both groups. Like today’s world of scientific publishing, wax modeling was at the intersection between science, pedagogy, and entertainment. There were competitors and a discerning clientele who bought the models.

While the desire for wax models waned in the early part of the 20th century, as embryology became less descriptive and more experimental, the need for accurate models has never been more acute than now. This is partly because relatively little “old-fashioned” developmental anatomy is currently taught to students, and partly because the immediate task of modern developmental biology has focused on eliciting the regulatory networks responsible for generating new tissues, rather than on the anatomy of embryos. And there are a lot of these tissues, some of which (e.g., rhombomeres) were not even in the textbooks of the artists who made those wonderful wax models. Indeed, given the sheer numbers of developmental biologists at work today, making enough wax models to satisfy demand would require real mass-production techniques.

It is therefore not surprising that today’s modelers are using silicon rather than wax, and that the first such digital embryos are starting to be made available over the web (see <http://genex.hgu.mrc.ac.uk> for some early mouse embryos). Although their production is rather less romantic than those of wax,
they are no easier to make: these reconstructions not only require large amounts of skilled work and embryological knowledge to integrate the digitized sections into coherent 3D models and delineate all their tissues, but they also require some very smart programming to make them available to anyone with a terminal and an internet connection. What these digital models lack in tactility they make up for in their versatility, and here, they have two key advantages over their wax predecessors. First, these digital embryos can be used as the front end of a database so that, for example, gene-expression data can be linked to embryonic space and made accessible via a spatial search. Second, any tissues irrelevant to the immediate purpose can be stripped away so that the user can reduce the image to just what he or she wants.

And what the viewer can see can be staggering beautiful. It is possible to visualize structures in 3D (there are glasses and software that create such images) to the extent that one can almost walk inside, for example, the cardiovascular system. Such pictures have almost magical qualities, and are an up-to-date version of those 3D images of photos that were so popular at the turn of the last century. But the old and the new are part of the same tradition, and what the generation who modeled in wax and their contemporaries who work in silico have in common is that they love embryos and their exquisite structures—and, no matter that the technology changes, their wonderful geometry spans the generations.

With embryos, it is always the visuals that matter, and one pleasure of Hopwood’s book is that it is full of pictures. The second half of the book contains photographs of individual models and the entire catalogue from the mid-1920s. There are also tables of all the organisms modeled and the scientists who collaborated with the Zieglers in these endeavors. Developmental biology remains an intensely visual discipline. This book reminds us of the artistic history of embryology and its importance in both understanding the embryo and transmitting that understanding to our students.

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