The art of medicine
Model politics

In museums and high-profile exhibitions old anatomical models have been thriving on the buzz around "art and science". University departments are taking ancient artefacts in wax, plaster, or papier mâché out of cupboards and putting them on show. But although models may affect us more directly than books, next to light, bright, digital images they can look heavy, sombre, and static. We may appreciate their makers' skill and be prompted to reflect on life, death, and the anatomical tradition; they readily feed nostalgia for a time before "3-D" referred to a picture on a flat screen. Yet it can be difficult to interpret them further. Research has to cope with secretive modellers and lost labels, but the biggest obstacle is the assumption that the models will somehow explain themselves. Paradoxically perhaps, they will better address current concerns the more we know about the politics of their production and use.

The stakes are particularly clear in a contrast between two mid-19th-century makers of models in the German lands, then on the rise as the world centre of medical science. Although born in the same year and starting out with closely related projects, their careers exemplify the extremes of confrontation and cooperation with medical authority. Models by Paul Zeiller (1820–93) are now few and far between, whereas wax embryos by Adolf Ziegler (1820–89) are widely represented in collections today. Their work resonates with recent debates over alternatives to dissection. It matters more generally because in the era of Gunther von Hagens' *Body Worlds* exhibitions and the US National Library of Medicine's *Visible Human Project*, the relations between producers, patrons, clients, users, and corpses still frame the politics of anatomical visual aids.

Anatomische Anstalt München/Photo by Prof Dr Rainer Breul

Detail from full-size female statue in plaster, half-anatomical, by Paul Zeiller

Medical waxworks achieved a first peak of perfection in late 18th-century Italian collections. Artificial anatomies aimed to create a three-dimensional encyclopaedia of the body that would supplement and perhaps even replace the dissection of scarce cadavers. But after the French Revolution regular medical authority increasingly rested on direct engagement with human bodies, dead and alive. By the early 19th century most anatomists agreed that models of normal adults, although fine for laypeople, should never substitute for dissection in medical education. The professors accepted, however, that models produced under close supervision might have an auxiliary role, especially where specimens were too rare, small, transient, or difficult to preserve, or preparations too laborious to make.

Taking advantage of a general embrace of visual aids, enterprising modellers sold their work as easier to grasp than natural specimens or drawings, but had to negotiate medical authority carefully. Most either concentrated on laypeople and schools or worked to physicians' professional agendas, but it was still just possible to challenge them head-on. Anatomy was vulnerable because dissection had become controversial as public dissections of executed criminals gave way to private dissections of the poor. The German poet and sometime anatomist Johann Wolfgang von Goethe, shocked by news from Britain of grave-robbing and even murder, Romantically promoted models as more humane and more effective, for "building up teaches more than tearing apart, joining together more than separating, animating what is dead more than killing over again what has already been killed".

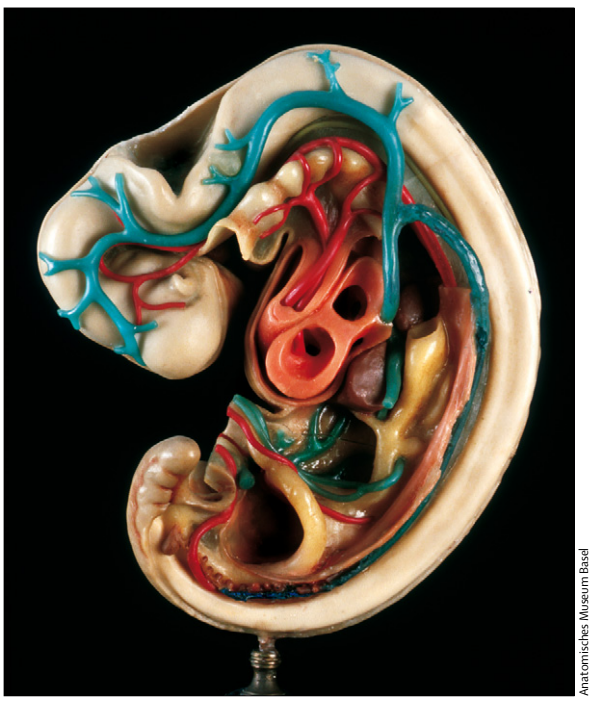
Goethe's plea was picked up and radicalised in Bavaria at the University of Munich during and after the revolution of 1848. The artist Paul Zeiller had been appointed "wax preparator" on the strength of academically acclaimed models to accompany an atlas of embryology. But when King Ludwig I abdicated, Zeiller joined other artisans in asserting his rights, and a dispute with the professor of anatomy soon escalated into a public slanging match over the status of model makers and models' value. Although he did not have a medical degree, Zeiller reckoned he could work more accurately on his own than under supervision. The resulting models would provide the visual synthesis that decay and dismemberment destroyed, and save proletarian corpses from a fate many resented and feared. In response, the professor articulated a widespread snobbery in extreme form; like wax effigies, models belonged on fairgrounds but had no role in science. He charged Zeiller with insubordination and accused him of stirring up the mob.

Remarkably, even as the revolution failed, Zeiller had enough medical support to hang onto his job for another 10 years until he left to realise his own vision, and that of his modeller wife Franziska, in a private anatomy and anthropology museum. Laypeople and students at Germany's leading art school were frequent visitors, and some medical students came too. Anatomists continued to sponsor modellers who produced supplementary visual aids, but rejected the suggestion that these could ever substitute for dissection and disparaged models not made under their control. Few of Zeiller's models survive—one, ironically, is prominently displayed in the Munich Anatomical Institute—and for a long time it may have seemed obvious that he failed. Today, when virtual models are among the tools that have replaced cadaver dissection in some medical schools, his long-forgotten battles appear relevant again.

While Zeiller struggled to introduce his models into medical teaching, his contemporary Adolf Ziegler made specialised wax models an important part of academic research. Ziegler's first big project was also a collaboration with an anatomy professor around an embryological atlas. During the 1850s in Freiburg, southwest Germany, they worked closely together, the anatomist learning from the experience and encouraging colleagues at other universities to buy Ziegler's work. The professors soon found the highly magnified models of tiny, complicated, rapidly changing objects indispensable in helping students grasp a notoriously difficult subject. Human embryology relied on material from abortions and miscarriages in women, which these developmental series reinterpreted and represented in vivid form.

Ziegler set up an independent atelier in 1868. Apart from focusing on embryos, the key to his success was careful cultivation of relations with scientists and willingness not to claim authorship in his own right. A medical degree raised his status, but a novel strategy mattered more. Borrowing from the world of print, Ziegler styled himself a "plastic" or sculptural "publisher". He had professorial "authors" provide drawings and specimens and sent the first set of models as "proofs". "Correcting" and approving these allowed Ziegler to advertise his work as "after Prof X", and thus to link it to books and journal articles. The waxes became so standard that textbooks often reproduced pictures not of specimens but of the models.

Ziegler's studio gained even greater importance with the introduction of routine serial sectioning into embryology in the late 1860s. He helped vertebrate embryologists "give body" to embryos that existed only as thin slices. By the 1880s they were transferring highly magnified outlines of the sectioned structures to wax plates of appropriate thickness, removing the excess wax and stacking them up—an ancestor of digital reconstruction techniques. An anatomist would now make a set of models from sectioned specimens and write an article describing and depicting them. He, or rarely she, would send the manuscript to a print publisher or editor for publication in a journal, and the original models to Ziegler's son Friedrich, who ran the studio from the mid-1880s to the mid-1930s. He not only reproduced the models, but first also finished them, by smoothing and adding colours and labels. They played a crucial role in refining the embryological view of the course of a pregnancy, and, through the evolutionist doctrine of recapitulation, of the history of life on earth.



Anatomisches Museum Basel

Wax model of 1-month-old human embryo by Friedrich Ziegler after Wilhelm His, "dissected" by selective reconstruction from serial sections

The late 19th century was a great age of print, when many medical textbooks, handbooks, and journals were founded, but leading anatomists argued that models should be treated as publications in their own right or at least as essential parts of complex publications. It was hardly open access, but wherever embryology was taught articles were read with the models on the bench. They were as important as today's data sets linked to an online publication, but the mix of media and the sheer physicality of the encounter is a far cry from accessing everything on one's own computer.

For all the continuity in methods and issues, visual aids have changed a great deal, and their politics too. Yet even as embryo images populate cyberspace and millions queue to see plastinated cadavers, success and failure remain bound up with relations of production and use. Historical interpretation can recover the politics of 19th-century models and so help them provide food for thought.

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Further reading

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