

# Pop it Up

Mechanical models and pop-up pages live on in today's children's books, in non-specialist anatomical and technical contexts but this peculiar publishing and graphic genre had a very different role at the end of the industrial revolution. **Professor Michael Stoll**, from Augsburg University of Applied Sciences, tells their story, and shows rare examples of pop-up books from his huge collection.



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■ With today's information providers sticking largely to standardised production methods or screen-based forms of presentation, it's worth casting our minds back to the end of the industrial revolution, to an era in which there was almost unlimited enthusiasm for technological advances and a wide audience wanting to be kept abreast of developments. With medicine also taking huge strides forward, it was an age that gave rise to many new specialist journals and saw the birth of many a popular-science textbook.

For those whose schools had such a place, being sent on an errand to the map room remains one of the strongest memories of their school days. Not just because the walk there and the retrieving of the required map both ate up classroom time, but also because of the weird and wonderful things lined up on its shelves and windowsills, be

they fishes or frogs or mice or martens, either preserved whole or in partially dissected form. These real-world specimens communicated knowledge far more vividly and memorably than any textbook ever could.

What's more, such rooms were filled to the ceiling with mechanical models – items such as a carious tooth that looked reasonably healthy from the outside, but that, upon removal of the front half, revealed internal decay extending right down to the nerve, or a human eye, five times larger than in real life and assembled like a set of Russian dolls, with layers that could be opened up one after the other to show the organ's various components and their interdependence.

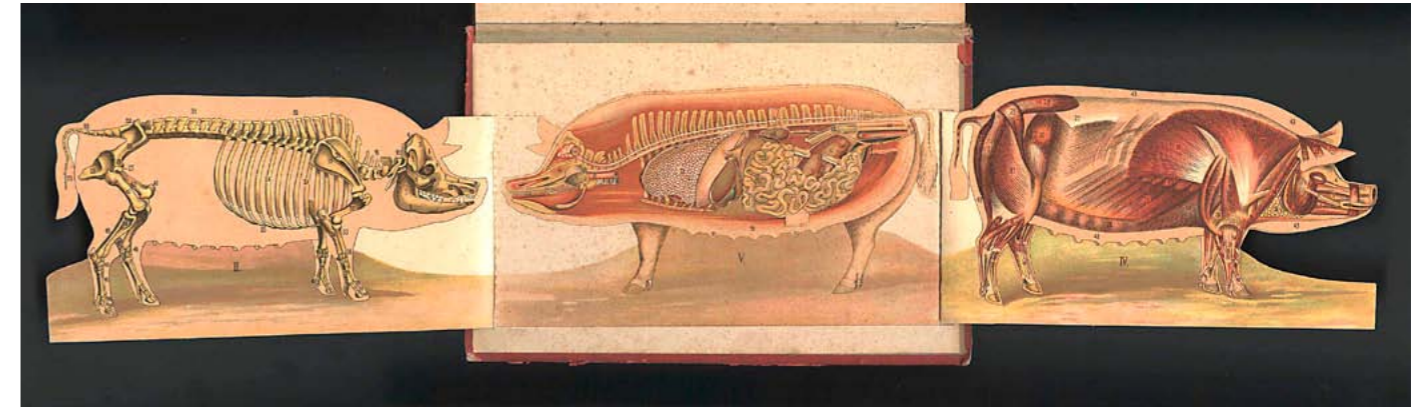
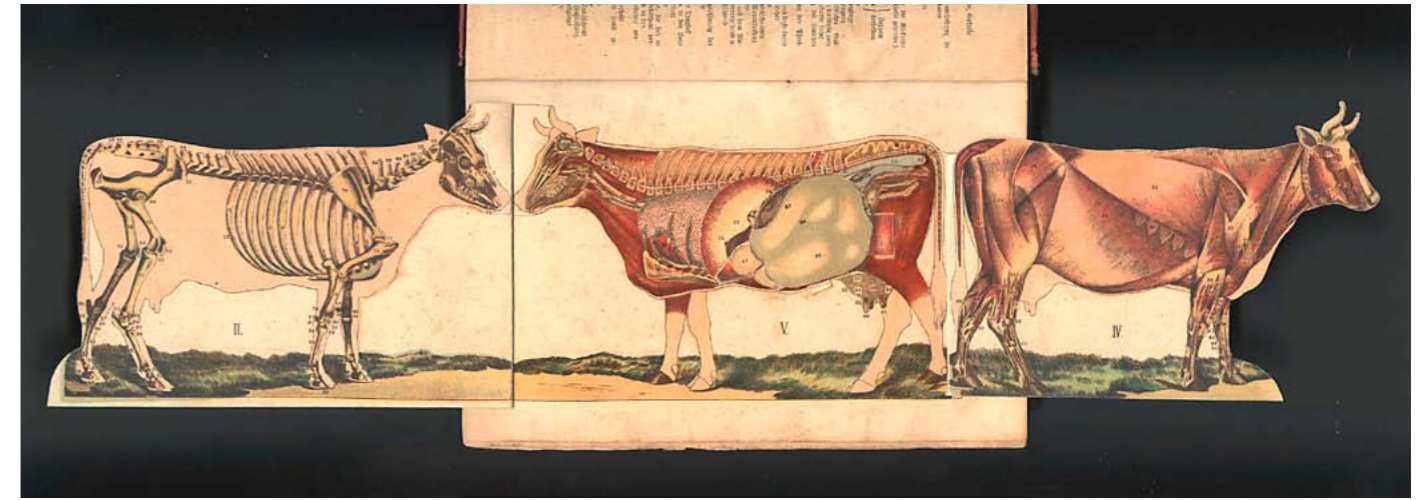
## Mechanical books

In an era of technological and medical advances, publishers of magazines, textbooks and educational maps strove to keep the general public abreast of developments with mass-market publications – and the industry boomed.

What's more, in their attempts to convey the latest developments, publishers didn't simply limit themselves to superficial illustrations that would struggle to do justice to the complex and often abstract nature of the subject matter. After all, the most interesting aspects would not in any case be visible to the reader, being hidden behind the myriad rods and pistons of a 70-horsepower diesel engine, within the hull of a twin-propeller steamliner or behind the lacquered fascia of a four-tube radio receiver.

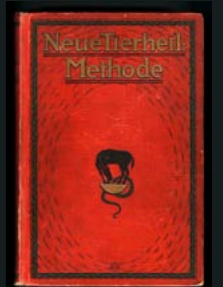
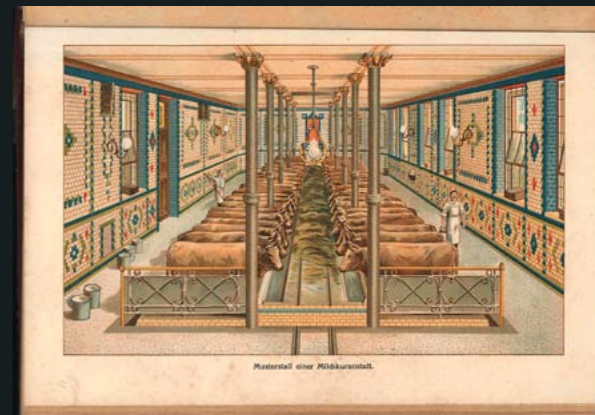
As a result, though many of the era's textbooks (which often ran to multiple volumes) were chiefly printed in black and white, readers would occasionally find, hand-glued into the book, colour lithographic prints providing explanatory illustrations or infographics. Even they, though, often failed to adequately represent or explain such subject matter.

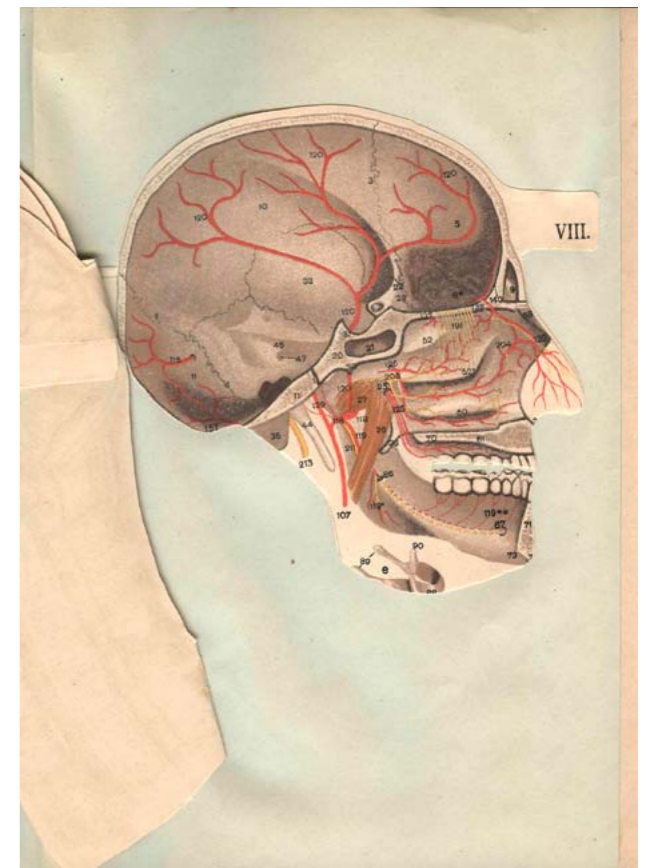
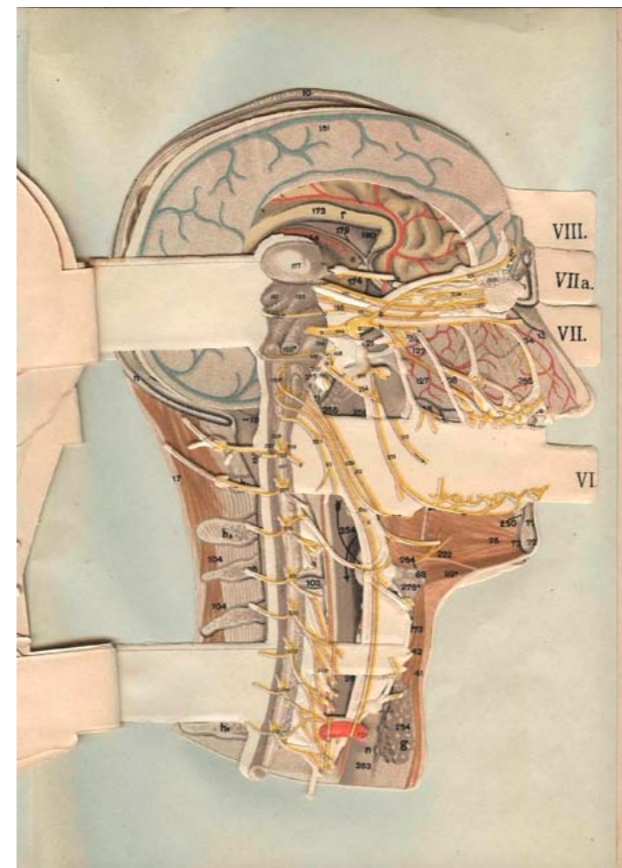
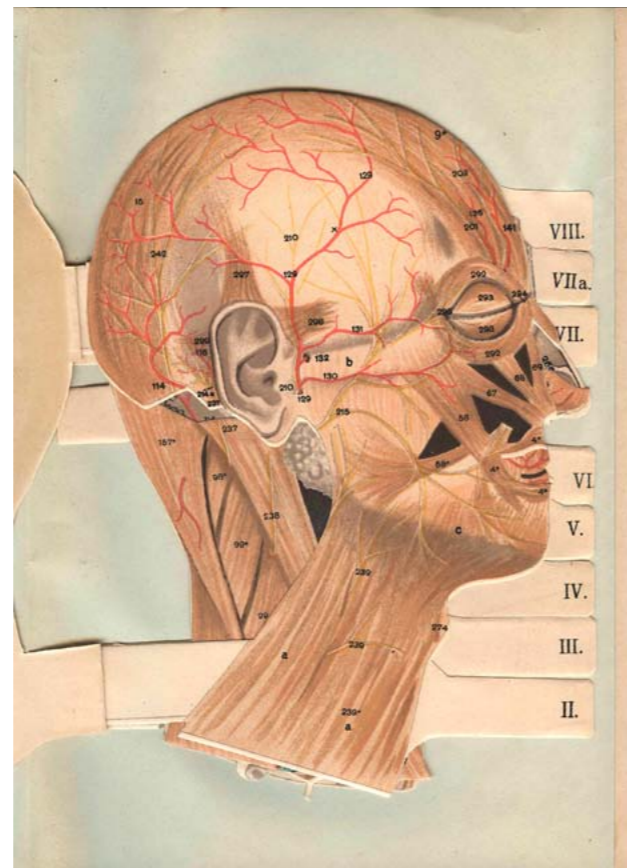
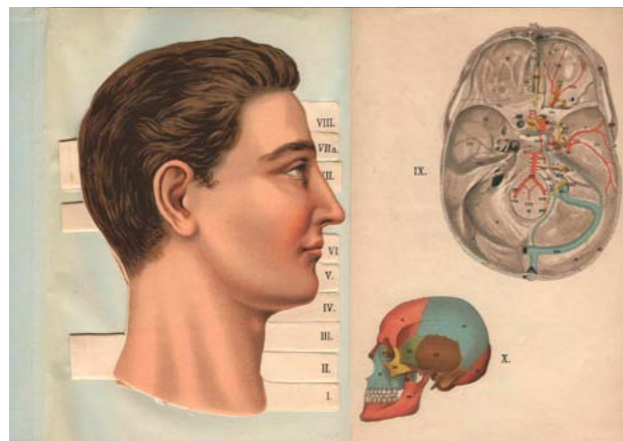
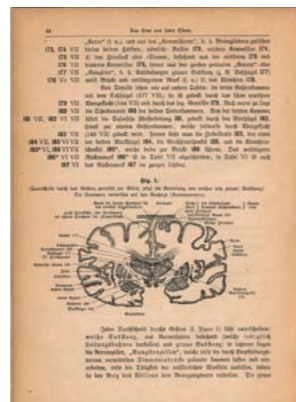
As a result, textbook publishers came up with a pseudo-three-dimensional form of graphics that saw layers of lithographic prints placed one on



**DISSECTING ANIMALS** Dr. Knoll's "Neue Tierheilmethode" ["New Veterinary Methods"] from 1923, with 600 images, 62 chromo- and art print plates and 10 fold-out pictures, is a prime example of how pop-up pages not only can give an overview, but also a closer look into the details of each "layer" of information.

In the two photos (left) we take a look under the skin of a horse. The illustration (right) shows the inside of a milking station should look like – complete with ornate steel columns and elaborate wall decorations to ensure good milk. Above: the bones, viscera, and muscles of the cow, pig, and horse. Photos: Michael Stoll





**IT'S ALL IN THE HEAD** "Der Kopf des Menschen – in zerlegbaren Abbildungen" ["The human head – in detachable images"]. A short, easily comprehensible representation of the individual parts of the human head with explanatory text, edited by Dr Ergo, published by J. F. Schreiber, Esslingen & Munich, ca. 1913. Photos: Michael Stoll.

► top of the other and stuck to the edges of the page with adhesive tabs. These movable illustrations, printed in colour on both sides and sometimes die-cut into shape, were often mounted on thicker card before being inserted into the textbook or, more commonly, collected in special atlases.

The roots of this unusual form of infographic can be traced back to the 16th century, when they were primarily used to publicise the latest anatomical discoveries (as in Andreas Vesalius's "De humani corporis fabrica", 1543). Then as later, these fold-out graphics were based on and designed in the established graphic style of the day. A picture or illustration, acting as a kind of eye-catcher, would conceal layer upon layer providing insights into things not normally visible to the naked

eye. The individual layers varied in size from large, complete pictures to small depictions of components or body parts often measuring just a few square centimetres – all made out of paper and hand-assembled.

**Visual interpretations of reality**

In the mid-19th century, these earlier examples provided the inspiration for a boom in movable models that lasted until the 1920s. In the 1930s, publishers then began using photographs instead of drawings but, soon after, the printing of individual layers onto transparent sheets of acetate became the chief means of creating such models – at least in the scientific field.

What the various types of model had in common was that they were all graphical visual interpretations of real-

ity. Intended to provide well thought-out and carefully arranged depictions of a subject that, when looked at closely, could otherwise be somewhat confusing, these models offered generalised, schematic representations of reality rather attempting to precisely replicate the minutiae of the original.

Often the subjects are thus shown not in their true colours, but in colour schemes chosen for aesthetic reasons or to adhere to representational conventions, such as red for oxygen-rich and blue for oxygen-poor blood.

Anyone who has ever flicked through a modern-day medical textbook – say a dental prosthetics manual featuring high-resolution photographs of drilled-out cavities, cut-away gum tissue and exposed nerves – knows how sensitively lay readers need to be introduced to such subjects in order to avoid a reflexive negative reaction. That was even truer then than it is now. Movable models allowed curious readers to access knowledge in a way that was appropriate to their socialisation, that enabled them to acquire this knowledge

in manageable doses, digesting the information bit by bit and flicking back and forth at their leisure.

From the publishers' point of view, mechanical text books were of interest for a variety of reasons: often their models were the only way readers could gain such information because the subject itself, a steam locomotive engine, for example, existed only in small quantities and could not simply be taken apart for study purposes, while social taboos around sex education helped to ensure there was ample interest in non-

specialist anatomical illustrations.

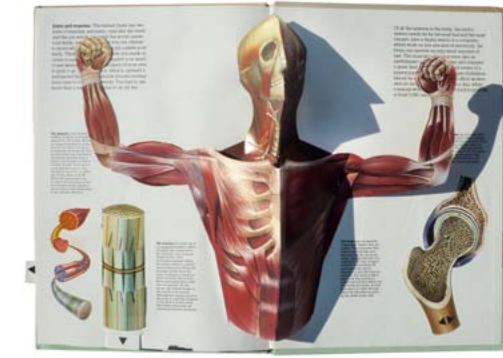
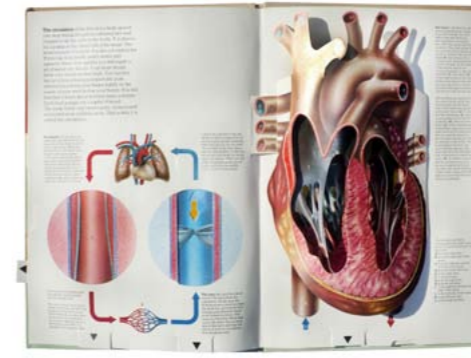
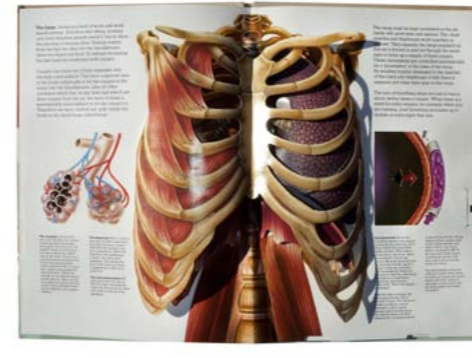
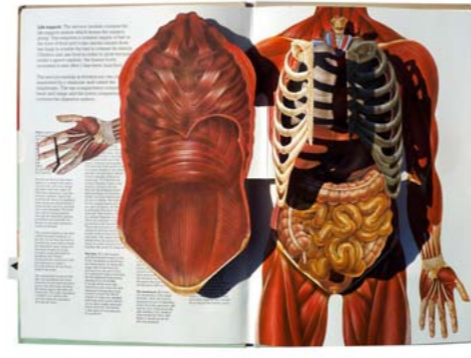
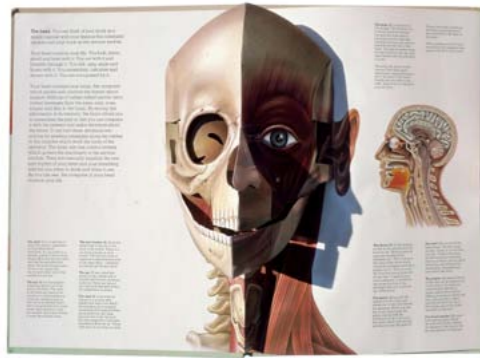
**Overcoming the book's limitations**

Sadly, very little is now known about the planning, manufacture and assembly of these mechanical models. Who decided on the form and content of each model, how, when and by whom were they put together, and how were they then integrated into the body of the book?

What we do know is that they were a welcome opportunity for publishers both to extend their didactic range and

**SO YOU THINK PRINT HAS NO IMPACT?** A Hamburg based designer recently sent me a 1939 copy of the first Volkswagen – back then called KdF-Wagen – the original with the Swastika in a logo (not shown here). This booklet is considered one of the most famous in transart design. Differently from similar booklets, in this one axonometric perspective is used – so we are switching from bird's eye perspective on the front side of a page (pages on the right) to frog's eye perspective (pages on the left). A funny detail is that the figures in the illustrations look really really hyperrelaxed. Photos: Michael Stoll





► to overcome the limitations of the book as a format. Folded up because of their size, some models had to be unfolded before or during use: if, for instance, a human torso was mounted on the cover board, the reader would be able to fold out the head at one end and the limbs at the other.

There may be entirely pragmatic reasons for such constructions, but if we watch how users approach the models, we can sense the great care and respect with which they apply themselves. Having recognised the fragility of the model, they concentrate so intensely on feeling for the uppermost layer of folding parts (and the direction in which they unfold) that the process automatically gains an almost immersive quality.

Using the key in conjunction with the corresponding numbering of the model's parts turns out to be rather more complicated, it proving somewhat tricky to flick back and forth between

key and model, the latter unfolded and held carefully in the reader's hands, with instructions mostly being conspicuously their absence. In its 1913 booklet *Der Kopf des Menschen in zerlegbaren Abbildungen* [*The Human Head in Fold-Out Illustrations*], the firm J. F. Schreiber did at least solve the problem of identifying the correct order in which the various parts should be unfolded, the publisher giving each fold-out layer its own numbered tab.

#### Topographical anatomy

Unlike today's imaging processes, which are by and large technical procedures (such as x-ray technology and the shadow-like images it creates on photographic material), these anatomical and technical movable models were not just ahead of their time, they were also the result of a deliberate analytical and design process on the part of their creators. This is something we can see particularly clearly if we take a closer

look at the images on the individual layers. These differ from the kind of histological samples used by biologists or from the technical cross-sections an engineer might recognise. While models whose layers could be peeled back like those of an onion to reveal the next level down did exist, these were less common than the kind of model in which the subject matter was divided between the various flaps: skin, skeleton, muscle groups and internal organs, for instance, were presented as distinct three-dimensional worlds, despite in reality being interconnected with each other. Experts refer to such renderings as "topographical anatomy" – interestingly, a term they also use for atlases of technical models.

Very occasionally, publishers used the principles of mechanical models to visualise chronological processes. An example of this can be found in the book *Neue Tierheilmethoden* [*New Veterinary Methods*] (Dr. Knoll, Friedrich

Maack Verlagsbuchhandlung, Leipzig, 1923), in which the author uses fold-out drawings to illustrate how the features of a horse's head change over the years.

The didactic benefit of mechanical models lies chiefly in the fact that they gradually add to the reader's picture of the subject as they are unfolded, and that they do so in such a way as to maintain the balance between detail and overview, primarily because the moving parts are overlaid over a basic drawing that remains visible as the layers are unfolded. Knowledge is thus imparted in distinct but not isolated "chapters": the relationship of the fold-out parts to the whole can still be easily determined or the model easily returned to its starting position by simply folding the movable parts back in. The individual layers were mostly cut into a particular shape, the outline of a lung for instance, and often featured cut-away internal sections. This helped to fix the form of the object in the mind of the viewer. As for the reverse of such layers, this was rarely left blank, instead showing, at the very least, the other side of the featured object or, more often, presenting additional information.

#### Pop-up revival

While mechanical models live on in today's children's books, in non-specialist anatomical and technical contexts their role was, from the 1940s, generally fulfilled by less complex forms of presentation, such as photographic reproduction, infographics and imaging processes. The standardisation of offset colour printing brought together production processes that had previously only been possible in parallel, such as hot-metal typesetting and lithographic colour printing.

Around 1920, searching for alternatives to mechanical models, publishers began to turn to a material that had

previously played a key role in the development of photography, using flexo-printed layers of acetate to create illustrations that would not otherwise have been economically viable. Early examples can be seen in *Baillière's Synthetic Anatomy*, a book in which the individual sheets are bound together via file hole punching. Important works with directly integrated acetate-sheet graphics included the anatomical atlases designed by Gladys McHugh – *The Human Eye in Anatomical Transparencies* (Bausch & Lomb Press, 1943) for example – and technical titles such as *Practical Car Owner* from 1956 (Frank Preston, Douglas Cleave; Grosvenor Press (England) Ltd.). Since the mid-1980s, led by volumes such as *The Facts of Life, A Three-Dimensional Study* by Jonathan Miller and David Pelham, pop-up books on anatomical subjects have been experiencing something of a revival. The current high water mark in the anatomical field, however has to be the Google Body (now Zygote Body) web app first unveiled by Google in 2010, via which users can explore rotatable 3D models of the male and female bodies by making different layers transparent.

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See also: *Looking back: Page through Michael Stoll's treasure island of infographic textbooks* by John Grimwade on [snd.org](http://snd.org)

► [www.kortlink.dk/eftx](http://www.kortlink.dk/eftx)

► [www.flickr.com/photos/mstoll/sets/](http://www.flickr.com/photos/mstoll/sets/)

**REVIVAL** "The Human Body", designed by David Pelham, illustrated by Harry Willock and published 1983 by Jonathan Cape Ltd. is a recent example of the revival of the pop-up book for popular science. Photos: Michael Stoll.



**Michael Stoll** studied communication design at the Konstanz University of Applied Sciences, writing his thesis on the subject of infographics and their classification.

► Since 2005, he has taught at the design faculty of the Augsburg University of Applied Sciences, lecturing in media theory, infographics and information design on both its bachelor's and master's programmes.

► As Educational Director (intl. Affairs) of the Society for News Design in the US, he coordinates the academic dialogue between member colleges.

► He is also a member of the International Institute for Information Design in Vienna and of the Editorial Board of the *Information Design Journal* (John Benjamins Publishing Company).

► Michael Stoll collects historic infographics and has amassed one of the largest collections of such material, the highlights of which can be seen in his travelling exhibition "History of Infographics".



#### UNDER THE HOOD

G. Ripke's "Der Praktische Maschinenbauer" ["The Practical Machine Builder"], ca. 1910, shows what's under the hood of a modern steam locomotive (bottom), or how an automobile with gas engine (top right) is constructed. Photos: Michael Stoll.

