

Thinking 3D

FROM LEONARDO TO THE PRESENT

ANATOMY TRAIL

Answers

Leonardo da Vinci was a key figure of the Renaissance, the revival of art and literature in 14th-16th century Europe. There are three pages from his notebooks on the right hand wall.



Look



Think



Write



In these pages, which anatomical subjects has he drawn?

Pages on display will change during the course of the exhibition, but will include:

- The arm
- Blood vessels / valves / circulatory system
- The body / organs

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Look around the exhibition to find different examples of how anatomy has been represented: All the types are present in the exhibition.



If you could use only one of these types of illustration to help you before you performed an operation, which one would be most useful?

Answers will be subjective and varied, but themes to draw out could be:

- Observational drawings improve realism and accuracy
- Paper models indicate three dimensions and reveal layers of complexity
- Colour can be used to make images more realistic
- Colour can be used to differentiate between organ systems or functions
- Different materials can be used to mimic tissues
- 3D models and printing indicate actual proportions and relationships

Over the centuries, both artists and doctors have tried to find ways to illustrate the messy complexity of anatomy to improve teaching and understanding.



Medieval anatomy texts were some of the first books to include diagrams. Organ systems were separated into five pictures on different pages.



Which organ system is shown in this hand-written and illustrated 13th century manuscript?

The illustration represents the circulatory system, although some other organs are shown.

During the Renaissance artists and physicians began to dissect and closely observe the body, rather than relying on descriptions from ancient Greek and Roman texts. Printing technology allowed both text and images to be mass-produced.



Find an example of an anatomical image that looks like it has been drawn from looking at a dissected body.

Answers will depend on the image chosen, but all these examples are observational drawings based on dissection. Organs and tissues are in correct proportions and arrangement. There is much more attention to the detail of anatomical structures and the focus is on depicting these structures realistically. The Hunter illustration of a dissected pregnant woman (23) could potentially be distressing for some students.

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The body is three-dimensional, so there is a limit to what can be shown on a two-dimensional page. One way to overcome this problem was to build paper models. Lift-up flaps reveal layers of complexity beneath the surface.



Examples here include (unassembled) paper dolls of the body by Vesalius, a text on anatomy by Johann Remmelin and two different 3D models of the eye, by George Bartisch and Gustave Joseph Witkowski.



When were these models published?

Vesalius (female and male bodies): **1543**

Bartisch (human eye): **1583**

Remmelin (anatomy in colour): **1695**

Witkowski (human eye): **1844-1923**



Which of these models do you find most effective? Why is this?

Answers will be subjective but possible themes are the realism of the illustration, the different materials used, the use of colour, and/or the degree of elaboration in the paper layering/modelling.



In the early 20th century anatomists use stereoscopic photography to trick the eye into seeing 3D images of anatomy.



What are the advantages and disadvantages of using Arthur Thompson's stereoscopic slides to study anatomy?

Advantages: having a 3D perspective; a greater sense of realism than a 2D illustration; being able to study anatomy with a 'surgeon's eye view' without a dissected body.

Disadvantages: Cumbersome equipment needed to view slides; only one person at a time can use it, cost of the equipment, level of realism makes it harder to understand the structures shown without prior knowledge.

In the 21st century, we can use 3D printers to create anatomical models. Find a 3D print of the brain or heart on the display near the entrance.



What can these 3D printed models add to our understanding of anatomy?

Tactile, information on size, mass, volume. Can be viewed from different angles, rotated. More advanced models can be made with multiple parts that can be disassembled to help students understand interlocking structures.



Having followed this Thinking 3D anatomy trail, how has your thinking changed about the best way to represent anatomy?

This question is intended to promote reflection, rather than produce a particular answer. Answers may indicate that students have gained a greater appreciation of the variety of ways anatomy can be represented. Students may reflect on themes such as:

- Compromise between the complex detail of anatomical structure and the necessity for clarity when teaching & learning about separate structures and functions. This also relates to the choice of whether to use colour realistically or artificially, to differentiate structures or organ systems.

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- Different medical models require different types of illustration: a medieval European understanding of illness caused by imbalances of humours, or the Ayurvedic model, would not rely on dissection to represent the body's structures or emphasise surgery as a key medical intervention.
- Printing technology allowed a far wider audience to learn about the body; Leonardo's sketchbooks contained hugely detailed hand-drawn images and original anatomical observations, but initially had little influence on scientific understandings of the body as they were not published or disseminated.
- Active manipulation of lift-the-flap models mimics dissection in an accessible and repeatable way. DIY building of paper models which are provided ready to cut out in some books may provide an insight into how different structures relate to each other and help an anatomy student actively learn about the body.
- 3D printing produces models which go beyond the constraints of paper construction or stereoscopic slides, but which may not show the level of detail possible in some 2D representations.