

CONTACT: Wendy Leopold at (847) 491-4890 or at w-leopold@northwestern.edu

FOR RELEASE: Immediate

SIXTEENTH CENTURY SCIENCE TREASURE MEETS TWENTY FIRST CENTURY TECHNOLOGY

EVANSTON, Ill. --- One of the world's great treasures of Renaissance bookmaking and most ambitious and comprehensive surveys of human anatomy is being translated into English from a densely complicated Latin and published online by Northwestern University researchers. For the first time ever, the first and longest book of the 16th century anatomical atlas, "On the Fabric of the Human Body," can be viewed in its entirety on the World Wide Web at <http://vesalius.northwestern.edu>.

Originally published in 1543 -- the year Copernicus published his revolutionary "Revolutions of the Heavenly Bodies," the "Fabrica" is the work of Andreas Vesalius, a Flemish anatomist and physician today known as the father of anatomy. (Vesalius revised his anatomical atlas in 1555).

Just as Copernicus' work forever changed ideas about the place of man in the cosmos, Vesalius' *Fabrica* revolutionized the world's understanding of human anatomy and the importance of direct observation in medicine and science. With its publication, Vesalius put the study of science and medicine on a new course that led to William Harvey's discovery of the circulation of blood in 1628 and other important findings.

Vesalius' work provided a detailed account of the human body and 272 intricate anatomical woodcut drawings and diagrams to help describe that account. Applying 21st century computer technology to sixteenth century images, the online *Fabrica's* illustrations have been edited and enhanced for better viewing.

The Northwestern Web site includes the complete annotated text of the first book of the atlas, representing about one quarter of the *Fabrica*. Eventually all seven books of the original anatomical atlas and substantive revisions in the 1555 edition will be translated and presented on the Web. The site will include edited reproductions of all the diagrams and anatomical woodcuts that appear in both the 1543 and 1555 *Fabrica* editions.

Vesalius of Brussels (1514-1564) produced his first anatomical atlas at age 28, relying more on direct observation and dissection than on the study of ancient books (then the popular method of anatomical study). He challenged the work of anatomists such as Galen (2nd century AD), whose understanding of the human body was based on the study of farm animals and Barbary apes.

Vesalius' work transformed the study of human anatomy and his illustrations - which may have been executed in the studio of the great Renaissance painter Titian -- have had an enduring influence on medical art and illustration. According to "The Oxford Medical Companion," Vesalius' atlas is "probably the most influential of all medical works."

Vesalius, considered in his time a scientific "enfant terrible," revolutionized medicine and science by insisting that truth could be established only by direct observation. The body itself, he insisted, must be the "textbook" from which understanding of the human body arises.

At a time when Christians and Jews alike were still uncomfortable about the use of human cadavers in the study of anatomy, this enfant terrible presented dramatic dissections in large theatres in Pisa, Padua, and Bologna to prove that anatomy could only be learned first-hand at the dissection table.

Rather than bringing in butchers to do the handiwork of his dissections, Vesalius himself worked on the human cadavers and said that students of medicine should do the same. Vesalius vigorously asserted that surgery, which had long been disregarded in science, was one of the central crafts of medicine.

Northwestern's online edition of the atlas includes modern Latin names for all parts of the body mentioned by Vesalius and footnotes on anatomy, contemporaries mentioned by Vesalius, and ancient Greek and Roman sources..

The translation of the first book of the *Fabrica* represents 10 years of work by Daniel Garrison, professor of classics in Northwestern University's Weinberg College of Arts and Sciences, and Malcolm Hast, professor emeritus of otolaryngology in Northwestern's Feinberg School of Medicine.

"The Latin of the *Fabrica* is hideously difficult," says Garrison, who has been reading Latin since he was 13. "It's not so much the terminology that makes it such a killer but the potential for unintentional ambiguity in the language," he explains.

While the completed *Fabrica* is slated for very high-quality print publication, the Web allows Garrison and Hast to make the work widely available as translation progresses. In addition, the Web enhances the environment in which readers can interact with the text and drawings.

"What makes this Web presentation unique is the linkage of text and images," says Garrison. "The images can be enlarged and viewed next to the text for each specific anatomical feature. This is something that doesn't work well in a book, where you have to flip pages." Another useful feature of the online edition is the ability to search text, references to figures, and anatomical terms.

Developing the technology for the online edition of the atlas was the work of staff at Northwestern's Galter Health Sciences Library, the University Library, and Academic Technologies. One of the project's challenges involved digitizing and editing the illustrations so they could be used in the online edition.

"The chief object of the graphical editing was to clean up the tiny Greek and Roman characters and other glyphs in the illustrations to make them more legible," says Garrison.

Garrison has made repairs to two kinds of artifacts resulting from the original production of the woodcuts on the spongy, irregular paper used in 16th century printing: dropouts where

the inked block did not entirely meet the surface of the paper, and blots where too much ink bled onto the paper. "

Since no two woodcut impressions are identical, these repairs require close attention to what Vesalius tells us in the figure legends and to evidence found in original printed specimens and reproductions of these originals," Garrison says.

For this project, Garrison had access to a rare copy of the 1555 *Fabrica* owned by the Galter Library of Northwestern's Feinberg School of Medicine.

The Vesalius project was made possible with support of the National Endowment for the Humanities and National Institutes of Health, National Library of Medicine. For further information, particularly about the technology that has gone into the Web site, see the Fact Sheet that accompanies this release.

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CONTENT

When complete, Northwestern's online edition of the Vesalius atlas will include:

- A literal translation of the 1543 text and a translation of all substantive revisions in the 1555 edition.
- Modern anatomical names for all body parts described in the atlas. Vesalius believed that all anatomical terminology should be based on Latin.
- Footnotes designed to clarify Vesalius' account. These notes relate to anatomy, to Vesalius' ancient Greek and Roman sources, and to his life in general (the people, places, and events that influenced his work).
- Reproductions of every diagram and anatomical woodcut in both editions of the atlas (272 figures), edited for legibility. In addition, there are 17 small and 4 large historiated capitals at the beginnings of the chapter narratives and books.
- Historical introductions to each book. The introduction to book one has been written by Vivian Nutton of the Wellcome Library, author of *John Caius and the Manuscripts of Galen, Medicine at the Courts of Europe 1500-1837* and a forthcoming book on ancient Greek medicine.

TECHNOLOGY

- The translated text was electronically encoded in Extensible Markup Language (XML) according to the Text Encoding Initiative's (TEI) Guidelines for Electronic Text Encoding and Interchange. Using the XML-based markup standard rather than a display-based standard such as HTML or a less open format such as Microsoft Word or WordPerfect assures the longevity and preservability of this important new work.
- Northwestern continues to explore and experiment with different technologies for delivering XML and XML searching to users through standard Web browsers. This online atlas batch-translates the XML into XHTML for browser display, and uses Inktomi's XML Toolkit to handle searches and indexing.
- Images in the atlas are converted to FlashPix and delivered to the browser as JPEGs with TrueSpectra's Image Server. The TrueSpectra server and Flash client allow the user to zoom in and out on these intricate high-resolution images. A vector graphics layer around the image server was developed locally so that highlighted regions can be turned on and off by clicking on the accompanying book text. This functionality is critical for the complex images, which are accompanied by figure legends that explain the various regions in great detail. The image regions, or overlays, were drawn manually with Adobe Illustrator and exported as Scalable Vector Graphics (SVG).