



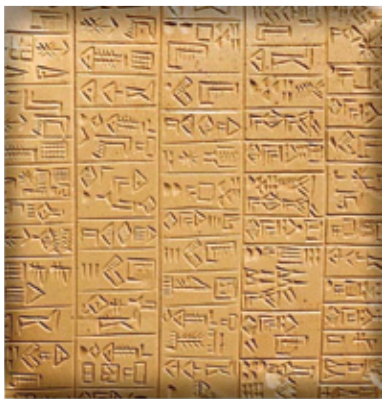
MEDICAL HISTORY: *From Cuneiform to Virtual*

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I. The History of the Written Word

Cuneiform and Clay Tablets

Written symbols have existed since at least 3500 B.C.E. The earliest, named Cuneiform, originated in the Sumer region of southeastern Mesopotamia, in what is now southern Iraq. This script was a collection of approximately 1,000 pictographs representing objects; eventually, abstract concepts were added to the language. The pictographs were written in a vertical column on a clay tablet with a reed serving as a stylus. The reed left a wedge-shaped impression. Around 2500 B.C.E. the symbols were written in horizontal rows from left to right. Once a cuneiform tablet was fired in a kiln, a permanent document was created; these tablets were used to record lists of agricultural and manufactured goods, as letters announcing important events and as tributes to deities. Cuneiform existed and evolved for 35 centuries; throughout antiquity, the Sumerian language was



Sumerian Cuneiform (public domain Sumerian cuneiform. http://en.wikibooks.org/wiki/File:Sumerian_26th_c_Adab.jpg)

the most widespread and significant writing. It was supplanted eventually by the alphabetic writing of the Greeks and Romans around 100 A.D. Cuneiform was a “language isolate” meaning that it did not belong to a family of languages. In 1700 Thomas Hyde, a British classical scholar, linguist and “Orientalist” named this script “Cuneiform,” using the Latin root *cuneus*, meaning “wedge.” It was not until 1857 that a substantial portion of cuneiform was deciphered through the scholarly works of four men: Henry Rawlinson, Edward Hincks, Julius Oppert and William Henry Fox Talbot. Many of these tablets were preserved intact in special alcoves. Other tablets may have survived when invading armies burned the buildings where they were stored.

Papyrus, Parchment and Paper

The Egyptians looked to materials other than stone for the written word. Around 3000 B.C.E., papyrus was created in the lower Nile. *Cyperus Papyrus* is a reed-like plant in the sedge family; its triangular stem distinguishes it from the grass family. Papyrus grows in freshwater wetlands along the Nile River. After harvesting the 10-foot long stems, the outer rind was removed and the inner core or pith of the reed was cut lengthwise and pounded to remove the sugar. These strips were placed closely together on a drying table for at least six days. Sheets of papyrus were usually a consistent length and width. Papyrus was created only in Egypt and was a state monopoly. It was exported to Greece and Rome in the late 4th century B.C.E. and was used until the 11th century A.D. Papal decrees were written on papyrus until 1052. Papyrus was best suited to the dry climates of Egypt, Greece and Italy.

Parchment was created around 280 B.C.E. as an alternative writing surface when papyrus exportation was limited. This thin sheet of animal skin was made from calves, goats and sheep. It was less expensive and more durable than papyrus. The finer grades of parchment were termed vellum.

Paper as we know it was created in China, probably in the 2nd century B.C.E. Can Lai perfected the pulp papermaking process in the 2nd century A.D., during the Han Dynasty (206 B.C.E. – 220 A.D.). Lai used mulberry bush pulp, but in more



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modern times, tree wood was transformed into pulp. Paper's consistency, versatility and durability were revolutionary.

Scrolls and Codices

Joining many papyrus sheets end to end and then wrapping this document around a stick created scrolls. Usually only one side of a scroll was used for writing. The best-quality papyrus was used for scroll ends as these portions were handled most often. The Romans introduced the codex (from Latin, meaning trunk of tree or block of wood) in the first century A.D. This was a significant milestone in the history of books. Multiple sheets of parchment, vellum or paper were gathered into units known as quires and then bound together and given a hard cover. The codex had a few advantages over papyrus scrolls: A scroll must be read sequentially usually from left to right, whereas a codex is a random-access item. You can open the codex to any page. A scroll usually had writing on one side of the papyrus, but a codex contained writing on both sides of a sheet: the recto (front) and verso (back) sides. By the 3rd century A.D., codices (plural) were as common as scrolls. The modern book evolved from the codex, but in the nomenclature of antiquities, the term now refers to handwritten manuscripts. The Codex Leicester was written between 1506 and 1510 and is one of the best-known books ever created: This 72-page document is one of 30 scientific journals written by Leonardo da Vinci, the Renaissance artist, scientist and thinker. The script is Italian and in da Vinci's iconic mirror writing, and there are 300 drawings. Da Vinci



Codex Leicester public domain http://en.wikipedia.org/wiki/File:Vinci_-_Hammer_2A.jpg

related his observations on astronomy, engineering, fossils and the movement of water. In 1994, Bill Gates bought the Codex for \$30.8 million. It is the most expensive book ever sold and the only da Vinci work held privately, and the only one held in the United States. In 1995, the Codex Leicester was scanned in one of the earliest efforts to digitize a truly magnificent work of writing. I had the special fortune to view the exhibition "Codex Leicester: A Masterpiece of Science" at the American Museum of Natural History in December 1996, and it is just as magical and bewitching as you might imagine.

II. The History of Medical Libraries

Assyria

The Mesopotamian Valley nurtured two advanced and enlightened civilizations: the Assyrians and the Babylonians. Some of the earliest collections of medical documents have been found in Nineveh, in Assyria. Sargon II (772-705 B.C.E.) created a library housing clay tablets dating to 2000 B.C.E. Somewhere near 30,000 tablet fragments from the ancient library are preserved in the British Museum. Many of these writings were the work of Ashipu, or Assyrian doctors who treated people for ailments such as headaches, infections and wounds. Ashipus used the cuneiform script to record a patient's medical history, to outline the diagnosis of a disease, to describe a surgical procedure, and to create a medical journal of past practices. Sargon II's grandson, King Assurbanipal (668-626 B.C.E.), greatly expanded the library. He sent ambassadors throughout the known world with a mission to acquire materials related to medicine, politics and religion. Library staff catalogued the tablets and then stored them in earthen jars on shelves mounted on walls. Each tablet had a catalog tag denoting the jar, the shelf and the room where it was stored.

Alexandria

In 332 B.C.E., Alexander the Great of Macedonia conquered Egypt and built Alexandria as his capital city. The Royal Library of Alexandria, or Bibliotheca Alexandrina, was established in the 3rd century B.C.E. by Ptolemy I Soter (323-283 BC), one of Alexander's generals, and then expanded by his son, Ptolemy II (283-246 BC). The Ptolemies were the Greek rulers who inherited the Egyptian lands claimed by Alexander. This ancient library served as a repository for the world's most

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critical documents covering medicine, philosophy, religion and astronomy. Callimachus (310–240 B.C.E.), a poet and student of medicine, advanced the Greek classification system known as the Pinakes (Greek “table”). In this organizational scheme, the names of authors were arranged chronologically, written on tablets that were stored in subject divisions — medicine, religion, philosophy, etc. This 120-volume index is the first known library catalog. Eventually, 700,000 scrolls and papyrus were cataloged and placed on wall-mounted shelves. We know the Alexandria Library was the site where the Old Testament was translated into Greek and where handmade copies of scrolls from Greece, Persia, Africa, India and Mediterranean societies were preserved. Adjacent to the Alexandria Library was the Alexandrian School of Medicine, one of the premier medical schools in antiquity. The Greek physician Herophilus (335-280 BC) was one of the school’s founders. Herophilus performed dissections of human cadavers and for this reason he is considered to be the first anatomist. He made several significant contributions to medicine: the distinction between arteries and veins, the concept that the brain and not the heart was the seat of the intellect, and that motion and sensation were related to the nervous system. Herophilus introduced a rudimentary

version of the scientific method. The Alexandria Library held copies of two of Herophilus’ novel books, including *On pulses* and *Midwifery*.

III. The Wood Library-Museum Rare Book Collection

The Wood Library-Museum of Anesthesiology (WLM) Rare Book Collection is housed in the K. Garth Huston, Sr. Rare Book Room at the ASA headquarters in Park Ridge. This

comprehensive collection includes rare and unusual literature describing the discovery of anesthesia and its introduction to surgery. The collection includes priceless books such as Valerius Cordus’ *In hoc volumine continentur Valerii Cordi simesusii annotationes in pedacii dioscoridis anazarbei de medica materia libros v* published in 1561. There are 2,242 items listed in this collection – the largest



Valerius Cordus



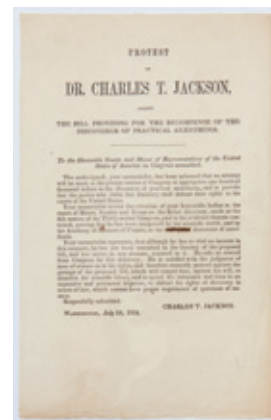
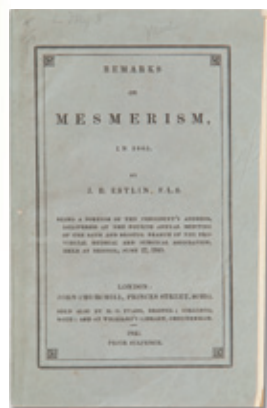
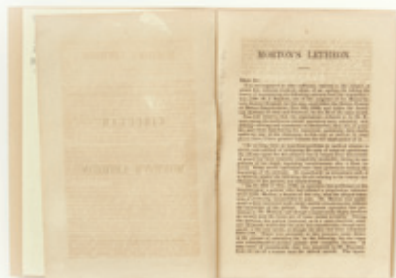
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Micrographics in LaCrosse, Wisconsin. Their digitization process uses multiple scanners and book cradles to allow scanning without unbinding the book spine. The digitized product is a searchable portable document file (PDF) and a digital versatile disc (DVD). In November 2008, Karen Bieterman, M.L.S. visited Northern Micrographics to verify firsthand that the WLM's rare books would be cared for with respect. In December 2008, the WLM posted the first online digitized rare book, *Anaesthesia*. Who made and developed this great discovery? A statement "delivered upon the mellowing of occasion," a pamphlet written by Gardner Quincy Colton in 1886.

Technique of Scanning

Northern Micrographics uses three bit-depths for the WLM rare book collection scanning project: All black and white pages without images are scanned as bitonal at 600 dots per inch (dpi) and saved as G4 compressed TIFF files. Black and white pages with images are scanned as grayscale at 300 dpi and saved as JPEG files. All color images are scanned at 300 dpi and saved as JPEG files. The text is captured utilizing Optical Character Recognition (OCR) software. The final product created from each rare book or pamphlet is a volume of archived digital images, a searchable PDF image and text files. The ASA receives archived and derivative files in a DVD format as well.

The WLM's philosophy and approach towards its digitization effort has evolved over the past three years. Initially, we focused on unique books that might be overlooked by larger electronic databases such as Google Books. We soon realized that sometimes we could offer superior access and search features for certain items even if they were digitized by Google. The digitization effort continues on a regular schedule. As of May 2011, there are 225 books and pamphlets preserved electronically. The collections and some representative items are catalogued as follows:



Clockwise from top left: Confusio Transfusionis Sive by Santinelli, 1668; Protest of Dr. Charles T. Jackson, 1854; Mesmerism and Animalism, J.B. Estlin, 1845; and Morton's Letheon by W.T.G. Morton, 1854.

Ether Controversy

Morton's Letheon, W.T.G. Morton, 1847.

Protest of Dr. Charles T. Jackson, the bill providing for the recompense of the discoverer of practical anaesthesia. Charles T. Jackson, 1854.

Some account of the Letheon: or, who is the discoverer? Edward Warren, 1847.

Obstetrical Anesthesia

Anaesthetic midwifery: report on its early history and progress. James Young Simpson, 1848.

On the administration of chloroform during parturition. John Snow, 1853.

Blood Transfusion

Observations on transfusion of blood, with a description of the Gravitator. James Blundell, 1828-9. (This article is from *The Lancet*. Vol. II, #302, pp. 321-324, 1828-9.)

Asphyxia and Resuscitation

A dissertation on suspended respiration, from drowning, hanging, and suffocation: in which is recommended a different mode of treatment to any hitherto pointed out. Edward Coleman, 1791.

Mesmerism and Animalism

Remarks on Mesmerism in 1845. J.B. Estlin, 1845.

Local Anesthesia

Local anaesthetics and cocaine analgesia; their uses and limitations.
Thomas Manley, 1894.

The Future:

The Wood Library-Museum's goal is to digitize the entire Rare Book Collection. This detailed and methodical project is a work in progress. We expect this task will require several years, but the results will be well worth the effort. As of 2011, one-tenth of our special treasures are preserved electronically. The WLM website displays some of these titles: <http://www.woodlibrarymuseum.org/library/rarebooks>. Anyone can access these collections: ASA members, scholars, students of history and, finally, the general public. If you love rare and beautiful written books, I urge you to visit the WLM website and see for yourself some of anesthesia's special written words. If you plan to attend the ASA Annual Meeting in Chicago, consider a real visit to the WLM. Digitization has allowed us to share our anesthesia heritage, but holding a first edition book published a century and a half ago is at once both humbling and inspiring.

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