PRINTING PRESS – BACKGROUND INFORMATION

PRINTING PRESS TIMELINE

YEAR	EVENT	MISCELLANEOUS
ca. 3450 B.C.E	-Cuneiform writing system develops in Sumer (modern day Iraq). Wedge-shaped marks are made on wet clay tablets by a scalpel-like writing instrument, a stylus cut from a reed. Signs denote objects and sounds from the spoken language.	-The advent of writing made possible record keeping, communication, trade, increasingly abstract thought, and, for the first time, history could be recorded.
ca. 3500 – 3200 B.C.E.	-Administrators and scribes develop hieroglyphic writing in Egypt. Formalized pictures symbolizing objects and syllables are used to represent words. Hieroglyphics are written on monuments and papyrus. -The writing material used in Egypt is papyrus (more expensive, but less cumbersome than clay). It is made from an Egyptian reed, the core of which is cut into strips, laid out crosswise, and pressed into textured sheets. The sheets are assembled into scrolls.	
ca. 2700 B.C.E.	-Papyrus is first documented in Egypt.	
ca. 2200 B.C.E.	-Date of oldest surviving written document on papyrus.	
ca. 100 to 200 C.E.	-Paper is first made in China from hemp, mulberry fibers, and rags.	
ca. 100 C.E.	-Codex book form emerges in the Roman Empire	
By 220 C.E.	-Woodblock printing is used in China	-One of the chief catalysts for printing is the growing popularity of Buddhism in east Asia.
618 – 907 C.E.	-During the Tang Dynasty in China, printing is done using ink on carved wooden blocks to make multiple transfers of an image to paper.	-Video of woodblock print making, Asian Art Museum, San Francisco, CA. http://education.asianart.org/explore-resources/background-information/invention-woodblock-printing-tang-618%E2%80%93906-and-song-960%E2%80%931279 (Accessed: 5 Nov. 2016)
ca. 700 C.E.	-With the expansion of the Islamic Empire into Pakistan people in the Abbasid Caliphate began using paper. By 800, Islamic manufacturers make their own paper	
700s – 1400s C.E.	-Paper and papermaking skills are diffused through the Islamic World. Chinese merchants and missionaries transmitted paper and papermaking knowledge to neighboring lands such as Japan, Korea, and Central Asia. It Asia Muslims first encountered it in the eighth century. In turn, Islamic civilization spread knowledge of paper and papermaking to Iraq, Syria, Egypt, North Africa and, finally, Spain.	-Bloom, Jonathan M. "Revolution by the Ream: A History of Paper," *AramcoWorld* Vol. 50, No. 3 (May/June 1999). http://archive.aramcoworld.com/issue/199903/revolution.by.the.ream-a.history.of.paper.htm (Accessed: 5 Nov. 2016)
ca. 800 C.E.	-*The Book of Kells*, a world famous medieval manuscript, is written on vellum. It is an illuminated Latin manuscript of the four Gospel of the Life of Jesus Christ and other writings.	-Trinity College, University of Dublin, Dublin, Ireland. http://www.tcd.ie/library/manuscripts/book-of-kells.php (Accessed: 5 Nov. 2016)
868 C.E.	-*The Diamond Sutra*, a Chinese translation of a Buddhist text is printed in China. It is the world's earliest complete and	"The Diamond Sutra," British Library, https://www.bl.uk/collection-items/the-diamond-sutra

	dated printed book. This scroll is preserved in the British Library.	(Accessed: 5 Nov. 2106)
932 C.E.	-Chinese printers adapt wood-block printing to the large-scale production of classical books.	
1041-1048 C.E.	-Moveable-type (single ceramic moveable type) printing is invented in China by Bi Sheng. He made one clay type for each linguistic character and fired them hardness.	-Since thousands of ideograms are required for written Chinese, moveable type was not as efficient as it would be four centuries later in Western Europe. Thus, woodblock printing remained popular in China for several more centuries.
1150 – 1151 C.E.	-First paper mill is built in Europe at Xàtiva (Spain).	
1200s – 1400s C.E.	-Production of paper in Europe increases and expands -By 1250 AD, paper-making technology reached Italy, and the Italians made good paper and sold it all over Europe. -In 1338, French monks began to make their own paper. Europeans used water wheels to power paper mills, so they could make paper more cheaply. By the 1350s, Europeans were selling paper to people in North Africa and Mamluk Egypt and West Asia. -By 1411 people in Germany began producing their own rag paper.	-Museo della Carta e della Filigrana (Italian Papermaking Museum): http://www.museodellacarta.com/default.asp (Accessed: 21 Feb. 2016) -In 2106, paper is still made by hand in Fabriano, Italy. -Tumba Papermill Museum, Tumba, Sweden. http://www.tumbabruksmuseum.se/index_eng.htm (Accessed: 3 Nov. 2016)
1282 C.E.	-Watermarks used in Italian-made paper	
1298 C.E.	-Wooden moveable type is used in China.	
1377 C.E.	-World's oldest extent book printed with moveable metal type is published in Chuengju, Korea. *Baekun Hwasang Chorok Buljo Jikji Smiche Yejeol* is now in the Bibliotheque Nationale in France. -Common screw press is used to print texts cut from single blocks of wood	-South Korean student corrects mistake in the American Printing History Association's website. http://www.koreatimes.co.kr/www/news/special/2016/09/178_213737.html (Accessed: 5 Nov. 2106)
1423 C.E.	-A wood block print of St. Christopher carrying the infant Christ is made to instruct common people because the illiterate read by looking at pictures.	
1440 – 1455 C.E.	**Johann Gutenberg** -Adjustable type mold developed by Johann Gutenberg in Germany. In 1440, in Strasbourg, Gutenberg perfected and unveiled the secret of printing -In 1448, he was back in Mainz, where he took a loan from his brother-in-law Arnold Gelthus, presumably for a printing press. Later, he secured a loan of 800 guilders from wealthy moneylender Johann Fust. -By 1450, the press was in operation, and a German poem had been printed. -Peter Schöffer, Fust's adoptive son and later son-in-law joined the enterprise. Schöffer had worked as a scribe in Paris designed some of the first typefaces. -Gutenberg's work commenced on the Bible in 1452. At the same time, the press was also printing other, more lucrative texts such as Latin grammar books. Later, he made money printing indulgences for the Church (1454-1455). -In 1455, the Gutenberg Bible is completed by his creditor Johann Fust and his assistant Peter Schöffer. The 42-line Bible, commonly known as the Gutenberg Bible, was printed on both paper and vellum. About 180 copies of the Bible were printed, most on paper and some on vellum. Early documentation states that a total of 200 copies were scheduled to be printed on rag cotton linen paper, and 30 copies on velum animal skin. It is not known exactly how	-Johann Gutenberg (c. 1398 – c. 1468), German craftsman, printer, and inventor of moveable type -Indulgences: http://www.bl.uk/treasures/gutenberg/indulgences.html -Gutenberg indulgence: Documents that Changed the World, Gutenberg Indulgences, 145, University of Washington, Information School https://ischool.uw.edu/documents-that-changed-world/gutenberg-indulgence (Accessed: 7 Nov. 2016) -Johann Fust (c.1400 – 1466), goldsmith, lawyer, and moneylender. He lent Gutenberg 800 guilders in 1450 to perfect his movable-type printing process. An additional 800 guilders was lent about two years later. Gutenberg's 42-line Bible and his 1457 Psalter were almost finished, but Fust sued in 1455 for 2,026 guilders to recover his money with interest. The court found in Fust's favor, and Gutenberg lost his business, equipment, and most of his assets.

	many copies were actually printed. Today, only 22 copies are known to exist, of which 7 are on velum. -First dated (1454) document printed in Europe: a papal indulgence attributed to Gutenberg. -Johann Fust and Peter Schöffer form a successful printing firm, Fust and Schöffer	-Peter Schöffer (c. 1425 – c. 1503), German printer and innovator; working for Fust he is Gutenberg's principal workman; in 1455, he testified for Fust against Gutenberg. - The paper used in the Gutenberg Bible was produced in a paper mill. Production begins by pounding either wood or linen fibers in a vat to form a pulpy liquid. A craftsman then dipped a mold into the liquid and shakes it, thus fusing the fibers together to form a sheet of paper. The sheet is then placed on a piece of felt and layered with other sheets until dry. -See Missouri State University, Digital Collections, Medieval Manuscripts and Early Printing Collection, http://digitalcollections.missouristate.edu/cdm4/browse.php?CISOROOT=/Medieval&CISOSTART=1,2 (Accessed: 5 Nov. 2016)
1452 C.E.	-In Europe, printers use metal plates to print	
1453 C.E.	-The Fall of Constantinople	
1462 C.E.	-Fust and Schöffer print *Biblia Pulcra*.	-The first explicated dated Bible and the first to have a printer's mark.
1464 C.E.	-Arnold Pannartz and Konrad Sweinheim, first printers in Italy (Subiaco) and first to use a Roman printing type.	
1470s C.E.	-In 1471, in Bruges, English merchant, William Caxton (ca. 1422 – 1492) publishes an English translation of *The Recuyell of the Historyes of Troye*, the first book printed in English. -Late in 1475 or early in 1476, Caxton set up a printing press in London (the first printing press in England). The first book he printed in England, *Dictes and Sayenges of the Phylosophers,* appears in 1477. Among his earliest books are two magnificent editions of the 14th-century classic, Chaucer's Canterbury Tales: the first published in 1476 and the second, illustrated with woodblock prints, in 1483.	"William Caxton and Canterbury Tales," British Library, https://www.bl.uk/collection-items/william-caxton-and-canterbury-tales (Accessed: 4 Nov. 2016) http://www.bl.uk/treasures/caxton/firstbook.html (Accessed: 4 Nov. 2106)
1473 C.E.	-*The Constance Gradual* becomes the earliest printed music (after the single line of music in the 1457 Mainz Psalter). Two copies of the *Constance Gradual* survive; a complete copy is preserved in the British Library, and a fragment at Tübingen.	-King, Alec Hyatt. "The 500th Anniversary of Music Printing: The Gradual of c1473," *The Musical Times*, Vol. 114, No. 1570 (Dec. 1973): 1220-1221 + 1223. http://www.jstor.org/stable/954716?seq=1#page_scan_tab_contents (Accessed: 4 Nov. 2016)
1478 C.E.	-Printing begins at Oxford University	
1493 C.E.	-*Nuremberg Chronicle* is one of the first books to successfully integrate illustrations and text. It is written in Latin and chronicles the history of the Christian world from the beginning of time to the 1490s. It is one of the most important German incunables and the most extensively illustrated book of the fifteenth century.	-See a digital copy of the book at the University of Cambridge's website, http://cudl.lib.cam.ac.uk/view/PR-INC-00000-A-00007-00002-00888/1 (Accessed: 5 Nov. 2106)
1495 C.E.	-Papermill established in England	
1501 C.E.	-*Harmonice Musices Odhecaton* (*One Hundred Songs of Harmonic Music*), a collection of popular songs, is published in Venice by Ottaviano Petrucci. It is the first book of sheet music printed from movable type.	-Jeremy Norman, "The First Book of Sheet Music Printed from Moveable Type, HistoryofInformationa.com

		http://www.historyofinformation.com/expanded.php?id=1727 (Accessed: 5 Nov. 2016)
1517 C.E.	-Martin Luther openly criticizes the Roman Catholic Church by making public his *Ninety-five Theses*, which were written in Latin (the language of the Church and scholars)	-The creation of "brand Luther," as Luther and supporters masterfully used the printing press to spread his religious ideas.
1515 C.E.	-Metalsmith Daniel Hopfer develops etching in Augsburg	
1517 – 1541 C.E.	-Protestant Reformation in Europe	
1537 – 1538 C.E.	-In Venice, Paganino and Alessandro Paganini produce the first printed edition of the Qur'an in Arabic	-Jeremy Norman, "Paganino & Alessandro Paganini Issue the First Printed Edition of the Qur'an in Arabic, of Which one Copy Survived," HistoryofInformation.com http://www.historyofinformation.com/expanded.php?id=405 (Accessed: 4 Nov. 2016)
1539 C.E.	-Juan Pablos (Giovanni Paoli) becomes the first printer in North America (Mexico City)	-Jeremy Norman, "Paganino & Alessandro Paganini Issue the First Printed Edition of the Qur'an in Arabic, of Which one Copy Survived," HistoryofInformation.com http://www.historyofinformation.com/expanded.php?id=405 (Accessed: 4 Nov. 2016)
1543 C.E.	-On his deathbed, priest and astronomer Nicolaus Copernicus published *De revolutionibus orbium coelestium* (*On the Revolutions of the Heavenly Spheres*)**,** the seminal work on heliocentrism. The book, printed in Nuremberg, Holy Roman Empire, offered an alternative model of the universe to Ptolemy's geocentric system, which had been widely accepted since ancient times. -Andreas Vesalius published a medical treatise *De humani corporis fabrica* (*On the fabric of the human body*) and an illustrated accompanying text, *Epitome*.	**KNOWLDEDGE REVOLUTIONS** -Printed books helped diffuse new ideas and information about technology, science, medicine, religion, etc.
1550 – 1649 C.E.	-Religious wars in France, Germany, and Britain	-Intensified civil and international wars
1560 – 1648 C.E.	A Counter-Reformation is launched as the Catholic Church proposes internal reforms and continues its defensive campaign against the Protestants and other critics	The Catholic Church also uses the printing press quite extensively, but perhaps less successfully than Martin Luther.
1563 C.E.	Printing in France is forbidden without royal permission under penalty of death.	
1569 C.E.	Flemish geographer and cartographer, Gerardus Mercator, designs his world map (the Mercator projection world map)	Navigation
1610 C.E.	Galileo publishes *Sidereus nuncius (Starry messenger)*	Astronomy and the telescope.
1611 C.E.	The first edition of the King James Bible is published	Bible
1623 C.E.	Shakespeare's First Folio is published	
1632 C.E.	Galileo publishes *Dialogue on the Two Systems*	Science and religion
1683 C.E.	Joseph Moxon publishes the first manual on printing titled *Mechanick Exercises on The Whole Art of Printing*	Mechanick Exercise, 3rd ed., 1702. https://books.google.com/books?id=t_IRCzjTf08C&source=gbs_similarbooks (Accessed: 4 Nov. 2016)
1687 C.E.	Isaac Newton publishes *Philosophi naturalis principia mathematica* (*Mathematical principles of natural philosophy*)	Laws of motion and universal gravitation
1704 C.E.	Isaac Newton publishes in English his treatise *Opticks: or, a treatise of the reflections, refractions, inflections and colours of light*.	*Opticks*, Third Edition, corrected (1721) https://books.google.com/books?id=41ViAAAAcAAJ&source=gbs_similarbooks (Accessed: 4 Nov. 2016)

1710 C.E.	The Parliament of Great Britain passes the Statute of Anne, the first copyright act in the world	The Copyright Act of 1710, http://www.copyrighthistory.com/anne.html (Accessed: 6 Nov. 2016)
1733 C.E.	Benjamin Franklin publishes *Poor Richard's Almanack* in Philadelphia, Pennsylvania.	James N. Green and Peter Stallybrass, Exhibit: "Inventing Poor Richard," The Library Company of Philadelphia, 2006. http://www.librarycompany.org/BFWriter/poor.htm (Accessed: 6 Nov. 2016)
1746 C.E.	*Myologie Complette (*Comprehensive study of the muscles) by Gautier D'Agoty and Joseph Guichard Duverney is published	http://huntington.org/exhibitions/beautifulscience/dagoty/Shell_Dagoty.html (Accessed: 4 Nov. 2016)
1749 C.E.	*Tabulae Sceleti et Musculorum Corporis Humani (Tables of the Skeleton and Muscles of the Human Body) by Bernhard Siegfried Albunis (in the tradition of Vesalius, Albinus presented the human body in the ideal form, placing his figures against backgrounds that referenced nature and beauty and classical scenes of beauty)*	http://huntington.org/exhibitions/beautifulscience/albinus/Shell_Albinus.html (Accessed: 4 Nov. 2016)
1751 – 1772 C.E.	-Denis Diderot and Jean le Rond d'Alembert (until 1759) publish the multi-volume *Encyclopédie* in France (21 volumes of text and 11 volumes of plates). It was intended to be a systematic and comprehensive dictionary of sciences, arts, and the crafts. It made science and practical knowledge available to all, and in French, so it was considered a "democratic" project?	-University of Michigan's English translation project of *Encyclopedie*. http://quod.lib.umich.edu/d/did/ (Accessed: 5 Nov. 2016)
1755 C.E.	-Samuel Johnson publishes *A Dictionary of the English Language* -John Smith publishes *The Printer's Grammar*	
1768 – 1771 C.E.	-*Encyclopedia Britannica* is published in Edinburgh, Scotland	https://www.britannica.com/topic/Encyclopaedia-Britannica-English-language-reference-work (Accessed: 5 Nov. 2016)
1776 C.E.	-Thomas Paine publishes *Common Sense* -*Declaration of Independence* is printed by John Dunlap. -Adam Smith publishes *On the Wealth of Nations*	-Political and economic treatises

WOODBLOCK PRINTING IN CHINA

Illustration: *A Manuscript containing Chapter 2 of the Dharani Sutra of Great Splendor* (Daweide tuoluoni jing), 1231-1322. Song dynasty (960-1279)-Yuan dynasty (1279-1368). China. Ink on paper. Gift of the Walter H. and Phyllis J. Shorenstein Foundation, 1991.208. Source: Asian Art Museum, San Francisco, CA. http://education.asianart.org/explore-resources/background-information/invention-woodblock-printing-tang-618%E2%80%93906-and-song-960%E2%80%931279

Art historians and curators at the Asian Art Museum in San Francisco, California have assembled a dynamic and informative exhibit titled "The Invention of Woodblock Printing in the Tang (618-906) and Song (960-1279) Dynasties." These scholars have written "among the most globally significant innovations of the Tang (618–906) and Song (960–1279) dynasties were the inventions of woodblock printing and moveable type, enabling widespread publishing of a variety of texts, and the dissemination of knowledge and literacy. Scholars believe that woodblock printing first appeared in China around 600, probably inspired by the much older use of bronze or stone seals to make impressions on clay and silk, and the practice of taking inked rubbings of inscribed texts from bronze and stone reliefs. The process for block printing on paper was perfected by the end of Tang dynasty.

Once printing became widespread, it also stimulated the development of a sophisticated paper industry with many different specialized papers created for different purposes. Wood for printing blocks usually came from date or pear trees. Text to be printed was first written on a sheet of paper. The paper was then glued face-down to the wood block and, using a knife, the characters on the paper were carefully engraved on the wood. The surface of wood block was then inked and covered with a sheet of paper. By gently brushing the paper over the engraved characters, the text was printed.

At first, woodblock printing was mainly used for printing books on agriculture and medicine, as well as for printing calendars, calligraphy, and auspicious charms. In 762, the first commercially printed books were sold in the markets of Chang'an, the Tang capital. In 782, printed papers were available in the marketplace as receipts for business transactions and tax payments.

Although woodblock printing played an important role in the spread of information and commercial transactions in China, it was a time-consuming technology. For example, in 971, at the beginning of Song dynasty, the monk Zhang Tuxin began a project to print the *Tripitaka* (a collection of essential Buddhist scriptures) using wood blocks. It took him twelve years to finish printing the 1076 volumes. The limitations of woodblock printing led to the invention of moveable-type printing during the Song dynasty

Moveable-type printing was invented between 1041 and 1048 by Bi Sheng, a common man who was highly experienced in woodblock printing. Song dynasty scientist Shen Kuo described the invention of moveable type in his book *Dream Stream Essays*. According to Shen Kuo, Bi Sheng made one clay type for each linguistic character, then had them fired for hardness. A layer of resin, wax, and paper ash mixture was placed on the bottom of an open iron box to hold the type with characters facing up. The bottom of the box was heated to melt the wax mixture, and simultaneously all the typeface was pressed down with a wood board to ensure that the types were level.

Finally the tops of the clay types were inked, and the mechanism would then be ready for printing just like a wood block. Afterward the clay types could be disassembled and reused. The moveable-type printing process substantially reduced the time for printing from several days to a matter of hours. Nevertheless, because of the thousands of ideograms required for written Chinese, moveable type was not as efficient as it would be four hundred years later in Western Europe. In fact, woodblock printing still remained popular in China for several centuries. Nevertheless, the diffusion of Tang and Song printing technology throughout East Asia, to the Middle East, and finally to Western Europe had a significant impact on the development of world history."

Source of the above information: "The Invention of Woodblock Printing in the Tang (618–906) and Song (960–1279) Dynasties," Asian Art Museum, San Francisco, CA. http://education.asianart.org/explore-resources/background-information/invention-woodblock-printing-tang-618%E2%80%93906-and-song-960%E2%80%931279 (Accessed: 5 Nov. 2016)

THE BOOK OF KELLS

Ireland's finest national treasure, *The Book of Kells*, is a world famous medieval manuscript, hand-written on calf vellum. It is an illuminated Latin manuscript of the four Gospel of the Life of Jesus Christ and other writings. It was created at the Columban monastery in Ireland c. 800, and since 1953 its 340 folios have been bound in four volumes. It gets its name from the Abbey of Kells, its home for many centuries. It is famous for its artwork, Christian iconography, decorative illustrations and vibrant colors. It is considered a masterpiece of Western calligraphy and insular illumination. Today, *The Book of Kells* is on permanent display at Trinity College Library, Dublin. In addition, it has been digitized and may be viewed for free via the library's website. Link: http://digitalcollections.tcd.ie/home/index.php?DRIS_ID=MS58_003v

Illustration: *The Book of Kells*, ca. 800, TCD MS 58, f. 14r © The Board of Trinity College Dublin, The University of Dublin, 2015. Source: Early Irish Manuscripts, *The Book of Kells*, Trinity College, Dublin, The University of Dublin, Ireland. http://www.tcd.ie/library/manuscripts/book-of-kells.php (Accessed: 5 Nov. 2016)

THE DIAMOND SUTRA

The Diamond Sutra, the British Library. https://www.bl.uk/collection-items/the-diamond-sutra (Accessed: 5 Nov. 2016)

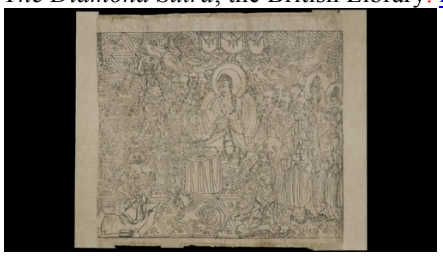


Illustration: This copy of *The Diamond* Sutra is the world's earliest complete and dated, printed book. Source: The Diamond Sutra, British Library, https://www.bl.uk/collection-items/the-diamond-sutra (Accessed: 5 Nov. 2016)

BOOKS BEFORE GUTENBERG WERE WRITTEN AND COPIED BY HAND

See "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University. of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

The Roman Empire survived five hundred years (27 B.C.E. – 476 C.E.) and at its peak, it stretched from present-day India to the United Kingdom. During its last century, it became increasingly weaker and unstable as cracks appeared, caused by internal and external pressures such as foreign and civil wars; natural disasters (plagues, famines, and earthquakes); corruption and moral decay; and the burden of maintaining and protecting a vast empire. Under attack from Barbarian and Hun invaders, people abandoned the cities and scattered to the countryside. The western portion of the Roman Empire (Western Europe) declined, but political, economic, and cultural stability continued in the eastern portion of the empire centered in Constantinople. Most of the classical texts of the Greeks and Romans were lost at this time; however, some were carefully preserved in the libraries of the Byzantine and Muslim empires, and in the ***scriptoria*** of European monasteries.

Large monasteries had rooms called ***scriptoria*** where monks copied manuscripts. Each time a manuscript was copied the scribe might introduce a mistake, so errors grew in each generation of a manuscript as the original document. If a manuscript included a mistake, it was said to be "corrupted." After the first universities were established in the twelfth century, scribes who were not monks, set up shop in areas where students gathered because they were potential customers. Like other artisans, scribes organized ***guilds*** to control training, quality, prices and other aspects of their trade.

The scribe began by outlining the margins on the parchment leaf with a compass, pricking marks down the side of the page and drawing a straight line between the points. Lines on the parchment were made in a similar fashion. The scribe laid out the page with great precision, calculating the location of the large initial letters and illustrations. He wrote with a goose quill using his own recipe of iron gall ink made from organic material, including iron vitriol (ferrous sulfate) and oak leave galls mixed with water, wine, or vinegar. The scribe broke up the galls, placed them in a pot with the iron vitriol and other liquid, stirred, and waited about two weeks.

Until the ninth century, there were no divisions between the words in either Greek or Latin manuscripts, so you would encounter text such as this "thereaderwouldhavetoknowwhenonewordleftoffandanotherbegan." Once the text was completed it was checked for errors and then the **rubricator** added the titles, initial capitals, and paragraph marks. (Rubric comes from the Latin word for red, because these important headings were often inked in red.) After the rubrics were added, the manuscript was ready for the **illuminator**. During the Middle Ages, books were illustrated in a style referred to as **illuminated** because they were illuminated or enlightened by the addition of gold, vivid colors, and ornamental letters. Illuminators or manuscript painters made their own paints and pigments, too. The subject of a book, how it was to be used, and for whom it was intended,

influenced its size, lettering, and decoration. For example, a Bible used for Church services was large and ornately decorated, but personal books were smaller and either more or less decorative depending on the owner's wealth and status.

The paintings accompanying the text are often called **miniatures** because the red lead pigment, called *minium* in Latin, was frequently used to decorate the initial letters. There were varieties of pigments in use for each color Illuminators applied the pigments to the page with egg white, which acted as an adhesive, using paintbrushes sometimes as small as a single hair. There were no substitutes, however, for gold leaf or gold powder. Gold does not tarnish like other metals. Gold leaf was made by pounding gold to the thickness of spider silk, and to make the gold appear thicker, more lavish, and three-dimensional, illuminators built up a layer of chalk, and then add a layer of pinkish clay called ***bole*** before applying the gold. Over the years, as the gold wears away, the pink bole often becomes visible.

Some illuminators copied the original manuscript decorations detail for detail; however, other may have added flora and fauna, mythical beasts, and exotic creatures to the borders and margins of their pages. Manuscript books can be dated and localized, sometimes down to which monastery they originated from, according to the styles of illuminations and scripts used. Some scribes, however, did sign and date their finished works. Illuminations gradually took up more space and by the fourteenth and fifteenth centuries—widely considered the height of manuscript illumination—some books were almost entirely filled with illuminations. The first printed books were made to look as much as possible like traditional manuscript books. Many, including the Gutenberg Bible, were illuminated and rubricated before use.

(See "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

Large miniature of two battle scenes from *The Chronicles* by Jean Froissart, about the Hundred Years' War between France and England. HRC MS. NO. 48. Mid-15th century, France. Written in French. Page 1r. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

Illustration: Cherubs and Camel, *Book of Hours*. HRC MS. NO. 2. Text and borders 15th century, illumination 19th century. Page 52r. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

Illustration: St. Jerome, the Translator of the Bible. Belleville, *Book of Hours*. HRC MS. NO. 8. Mid-15th century, France. Written in Latin and French. Page 231v. There is evidence of four scribes working on this manuscript. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

Illustration: Psalter, Book of Psalms, from England. Early 15th century, written in Latin. HRC MS. NO. 14. Page 68r. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

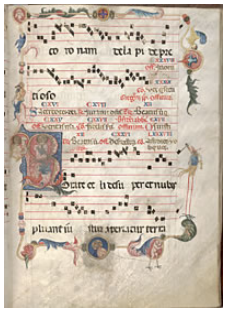


Illustration: Dominican Gradual, chants for the Mass, from Italy. HRC MS. NO. 13. It was started in the 14th century and finished in 1517. Written in Latin. Page 29r. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

Illustration: Drawings of the constellations from *De natura rerum*, by St. Bede the Venerable. HRC MS. NO. 29. Early 11th century from Germany, and written in Latin. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

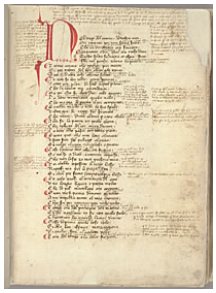


Illustration: Beginning of *The Inferno* from *The Divine Comedy* by Dante Alighiere. HRC MS. NO. 45. Manuscript dated 1363, possibly from Venice, and written in Italian. Page 7r. There are over 600 surviving manuscript copies of *The Divine Comedy*. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

Illustration: End of *The Pardonner's Tale* and the beginning of *The Shipman's Tale* from *The Canterbury Tales* by Geoffrey Chaucer. HRC MS. NO. 46. 15th century, England. Written in Middle English. Page 1r. Source: "Books Before Gutenberg, Written by Hand, the Scribe at Work and the Illuminator," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/before/ (Accessed: 24 Feb. 2016)

GUTENBERG'S WORKSHOP:

In 1925, the Gutenberg- Museum Mainz, installed a reconstruction of Gutenberg's printshop based on fifteen and sixteenth-century woodcuts. The staff demonstrates type founding, typesetting, and printing every day the museum is open.

Illustration: Replica of Gutenberg's Workshop, Gutenberg-Museum Mainz, http://www.gutenberg-museum.de/132.0.html?&L=1 (Accessed: 17 June 2016)

GUTENBERG'S INVENTIONS AND INNOVATIONS AND THE PRINTING PROCESS:

How was the Gutenberg Bible **printed**?

Useful websites:

Typefounding, http://ethw.org/Typefounding (Accessed: 9 Nov. 2016)

Exhibition: Johannes Gutenberg, Gutenberg's Inventions, Gutenberg-Museum Mainz, http://www.gutenberg-museum.de/118.0.html?&L=1 (Accessed: 17 June 2016)

Johann Gutenberg Exhibit: Gutenberg Bible, Harry Ransom Center, University of Texas at Austin. http://www.hrc.utexas.edu/exhibitions/permanent/ (Accessed: 24 Feb. 2016)

Gutenberg's Vision

Printing with wooden formes on paper was something Europe had been familiar with since the late 14th century. Gutenberg's concept was that any text could be reduced to its individual components, to its letters, numbers and punctuation marks. He envisioned a process which would enable these elements to be produced in large quantities, the texts they composed to be printed to faultless perfection, and the elements themselves to be reusable, which in turn would save not only materials but also space.

Making the Type - Punches and Matrices

Johannes Gutenberg devised a lead-tin-antimony alloy to cast in copper alloy molds to produce large and precise quantities of the type required by his printing press. The various steps he took to turn his ideas into practice included producing individual letters and characters. –These dies, uniform in size and style, were engraved in a hard metal (probably steel) and could be vertically "punched" into a softer metal when and as often as required. This produced a negative or a matrix, made of a square of copper or any other soft metal.

Gutenberg developed a method of casting individual pieces of metal type. His type was made of a metal alloy that would melt at a low temperature but was strong enough to withstand being squeezed in a press. It was long thought that Gutenberg had originated the punch-matrix-mold system of typecasting used for centuries by subsequent typemakers. Recent research, however, indicates that he may have used a cruder sand-casting system in which the character is carved into the sand and the metal alloy is poured into this mold to create the type piece. This process would have been a long and laborious because nearly 300 different pieces of type are used in the Bible, each one requiring its own sand-cast mold.

Making the Type - The Hand Mould

The hand mould or casting instrument was developed. The caster was a hollow mould or cast made out of metal with wooden clamps which could be separated into two and placed in the matrix. This saved vast numbers of hollow moulds having to be produced. The casting metal, an alloy of lead, tin and other admixtures, presumably antimony, was heated to almost 300°C and the typefounder poured the molten metal from a heated cauldron using a dipper a little bigger than a thimble. After pouring, tapping the mold assured the cavity was filled completely. Letters could be removed immediately and only had to have the metal casting tip removed with a hammer. The letters were then placed in a type case and sorted according to the frequency with which they were used. The first forms of letters, the fonts, duplicated the Gothic script manually produced by scribes.

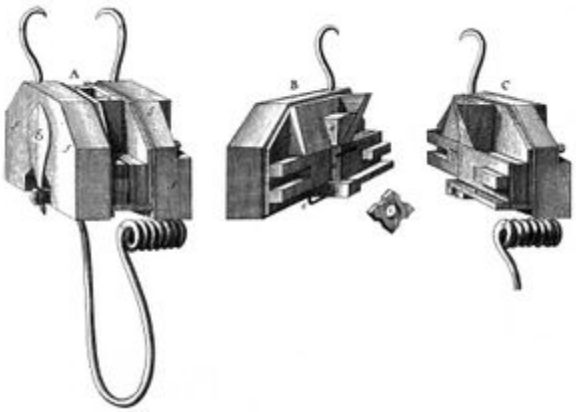


Illustration: Molds. No contemporary records exist of Gutenberg's type-making tools; he may have used molds like these 17th-century French designs. Source: Typefounding, http://ethw.org/Typefounding (Accessed: 9 Nov. 2016)

Setting and Printing

The compositor made up one or more lines in a composing stick. These lines were then arranged in a galley (a wooden tray) to make up the printing form for the page. The form was then lifted into the wooden press and locked into place for printing.

The Press

Gutenberg's press was made of wood and was modeled on the typical screw press used to make olive oil, wine, and paper. The exact number of presses in Gutenberg's shop is unknown, but his large production indicates that more than one press and perhaps as many as six presses were used. A skilled typesetter selected the individual characters of type for each line of the text

and set them backwards in a frame, from right to left, so that the text would read correctly when printed. The frame was then placed on the bed of the press, where ink was applied to the type. The sheet of paper was slightly moistened before being placed over the type and frame, and then a pull by the pressman pushed the paper down onto the ink and type, completing the printing process.

WHAT DID GUTENBERG PRINT AT HIS WORKSHOP?

INDULGENCES

Before beginning work on the Bible around 1450, Gutenberg experimented with printing single sheets of paper and even small books, including a simple Latin grammar textbook. He also printed indulges for the Church. In the fifteenth century, indulgences were awarded by the Catholic Church. A letter of indulgence took the form of a ready-made receipt with an empty space for the name of the purchaser, who then took the document to a father confessor (priest) as proof of having paid the fee for the right to have their sins forgiven. Initially, each indulgence was written by hand, but with the printing press it became quicker and less expensive to duplicate the forms. Gutenberg may have printed indulgences as early as 1452, and he certainly printed them by 1454-1455. He needed to raise money and secure an income because printing the Bible was a multi-year project, which consumed tremendous capital and raw material. . By the end of the century, one indulgence was said to have been printed in as many as 142,950 copies.

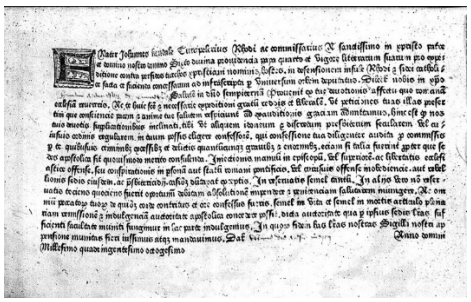


Illustration: An Indulgence Form.

THE GUTENBERG BIBLE

Printing the Bible was Gutenberg's monumental project and his reputation, workshop, and future hinged on its quality. He used fine, handmade paper imported from Italy. Each sheet has a watermark left by the paper maker, which can be seen when the paper is held up to the light. There are four different watermarks in the Ransom's copy of the Bible: a bull's head, a trotting ox, and two variations of grape clusters. Gutenberg also devised an oil-based ink that clung to the metal type and was exceptionally dark. The 42-line Bible, printed between 1452 and 1455 in a workshop holding up to six presses and employing approximately twenty 20 craftsmen. The black lines of the text are all printed. The initials of the 180 copies originally produced on the printing press were colored at various workshops by illuminators, so each one of Gutenberg's Bibles is unique.

The Gutenberg Bible (two volumes) had to be decorative, ornate and splendid to look at just like the work of the most talented scribes. Many features were added by hand because they were too complex to print. Rubrics (often in red), the handwritten titles, chapter headings, and instructions, were added to help the reader identify these elements. Illuminations, the large hand-painted initial letters with gold leaf, were added at the beginning of each book of the Bible. Both volumes contain numerous marginalia, or handwritten additions to the text, such as directions as to which passages were to be used in church services on certain days. Finally, the original binding for both volumes was probably brown polished calfskin over oak boards with beveled edges. Although the original cost of the book is not known, most copies were likely purchased by wealthy churches and monasteries.

Most scholars contend 180 copies of the Gutenberg Bible were produced, about 135 on paper and about 45 on vellum. In 2016, there is some discrepancy about the number of surviving as well as complete Gutenberg Bibles. Experts contend there are reportedly forty-eight or forty-nine copies of the Gutenberg Bible, but only sixteen to twenty-three are complete. The Library of Congress copy is printed entirely on vellum. Along with other fifteenth-century books, it was purchased from Dr. Otto Vollbehr by an act of Congress in 1930. The two other perfect vellum copies known to exist are in the British Library and the Bibliothèque Nationale. (https://www.loc.gov/exhibits/bibles/the-gutenberg-bible.html; http://www.bl.uk/treasures/gutenberg/howmany.html; http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/

http://hcl.harvard.edu/libraries/houghton/collections/widener/gutenberg.cfm
http://www.newworldencyclopedia.org/entry/Gutenberg_Bible

In June 2002, the Harry Ransom Center and IImage Retrieval Inc. collaborated on a project to digitize the Center's Gutenberg Bible. The project resulted in nearly 1,300 digital images that constitute an exact digital reproduction of The University of Texas copy of the Bible. It is accessible to the public through the Center's website. To view a copy of the Gutenberg Bible go to the Ransom Center's website. "Turn the pages,"
http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/pages/#top

SOURCE: Illuminated page from a Gutenberg Bible. Missouri State University, Digital Collections, Medieval Manuscripts and Early Printing Collection,
http://digitalcollections.missouristate.edu/cdm4/document.php?CISOROOT=/Medieval&CISOPTR=76&REC=6
(Accessed: 16 June 2016)

Illustration: Page from the Gutenberg Bible. Source: http://ethw.org/File:Gutenberg_bible_Old_Testament_Epistle_of_St_Jerome.jpg#filelinks (Accessed: 9 Nov. 2016)

FACTS ABOUT THE GUTENBERG BIBLE

What are **some facts** about the Gutenberg Bible?
http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/facts/#top

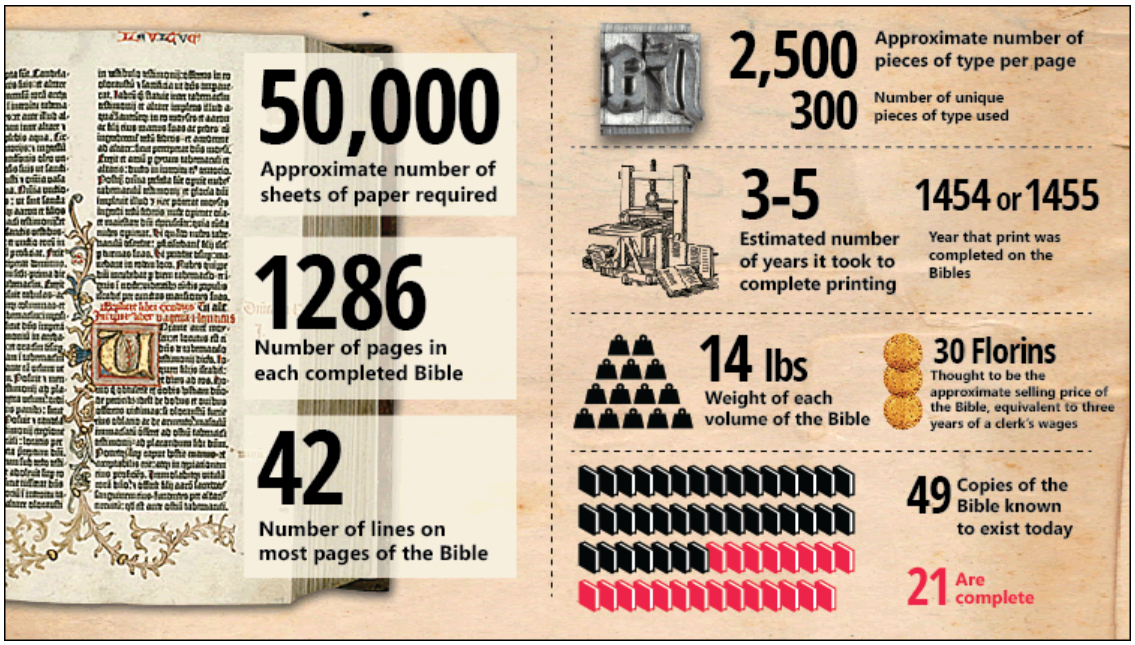


Illustration: Some Facts about the Gutenberg Bible. Source: Facts about the Gutenberg Bible, Harry Ransom Center, The University of Texas at Austin, http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/facts/#top

WHERE ARE OTHER GUTENBERG BIBLES?

Most scholars contend 180 copies of the Gutenberg Bible were produced, about 135 on paper and about 45 on vellum. In 2016, there is some discrepancy about the number of surviving as well as complete Gutenberg Bibles. Experts contend there are reportedly forty-eight or forty-nine copies of the Gutenberg Bible, but only sixteen to twenty-three are complete. The Library of Congress copy is printed entirely on vellum. Along with other fifteenth-century books, it was purchased from Dr. Otto Vollbehr by an act of Congress in 1930. The two other perfect vellum copies known to exist are in the British Library and the Bibliothèque Nationale. (https://www.loc.gov/exhibits/bibles/the-gutenberg-bible.html; http://www.bl.uk/treasures/gutenberg/howmany.html; http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/

http://hcl.harvard.edu/libraries/houghton/collections/widener/gutenberg.cfm
http://www.newworldencyclopedia.org/entry/Gutenberg_Bible

See an interactive map posted on the Harry Ransom Center's Website. "Other Gutenberg Bibles," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/exhibitions/permanent/gutenbergbible/other/#top (Accessed: 24 Feb. 2016)

EARLY PRINTING

Books printed on presses before 1501 are called ***incunabula***, a term rooted in the Latin word for "cradle" or "birthplace." The printing process incorporating a wooden screw press and metal moveable type remained much the same for more than 350 years. However, some changes were made to the format of the book because early examples had no title page, chapter headings or page numbers. Soon printers included the colophon which was an inscription noting the place and year of publication and often the printing workshop. In turn, this information was printed as a title page at the front of the book. The early printed books had stunning illumination and illustrations, clinging to the traditional forms of the manuscript. Beginning in the 1460s, illustrations became more common printers inserted **woodcut** images between blocks of text. This innovation eliminated the need for hand painting and saved both time and money. (See "15th Century: Book and Print," Gutenberg – Museum Mainz, Exhibition, http://www.gutenberg-museum.de/42.0.html?&L=1 (Accessed: 17 June 2016)

The above is an illustration of the Mandrake, or Mandragora plant. Mandrake was used as an anesthetic during the Middle Ages. This is from an herbal called the *Hortus Sanitatis*, printed by Peter Schoeffer, Gutenberg's former assistant, in 1485. Herbals were manuals used to identify plants for medicinal purposes. Source: "Guttenberg's Legacy," Harry Ransom Center, The University of Texas at Austin, **http://www.hrc.utexas.edu/educator/modules/gutenberg/books/legacy/** (Accessed: 24 Feb. 2016)

During the 16th century, copper engravings gradually replaced woodcuts in books as the main form of illustration. Known as intagilo printing it is a process in which the image is physically etched into a copper plate. The ink sitting in the incised line or mark will be printed.

Source: Inking. Intaglio Fine Art: Internet Dealer for Thomas Ross Etchings, http://www.intaglio-fine-art.com/etching-info-printing.php (Accessed: 9 Nov. 2016)

Source: Jan Collaert I, "New Inventions of Modern Times [Nova Reperta], The Invention of Copper Engraving, plate 19," Published by Philips Galle, ca. 1600. The Metropolitan Museum of Art, Accession number: 49.95.870(10). http://www.metmuseum.org/toah/works-of-art/49.95.870%2810%29/ (Accessed: 9 Nov. 2016)

Art historian Wendy Thomson describes the process of the new art of engraving on copper and making the print as follows: "In this plate, we can trace all the steps involved in the new art of engraving on copper. At the lower right, a man with glasses engraves a copper plate, as young apprentices look on. He holds the plate at an angle in order to catch the light and because the only way to cut curved lines with a burin is by rotating the plate—usually the plate is placed on a cushion to make this easier. Several burins of different sizes lie on the table in front of the engraver and it is possible to discern both the lozenge-shaped tip of the tool and its bulbous handle. In the center of the print, the engraved plate is prepared for the press. First it is heated, to make the ink flow more easily into the grooves, then the entire surface is covered with ink using a dabber. Finally, the plate is carefully wiped so that the surface is clean and the ink remains only in the grooves.

The printing process is depicted on the left side of the image. After placing the copper plate, with a dampened sheet of paper on top of it, between protective felt blankets, the plate is run through the press. In order to force the paper into the grooves so that it will pick up the ink, tremendous pressure is required. The rolling press sandwiches the plate between two powerful rollers. In the left foreground, a printer examines a proof impression to see if the pressure needs to be adjusted or other changes made before continuing with the edition. A series of identical impressions (an edition) is being hung to dry on ropes stretched around the walls of the shop."

Source: Thompson, Wendy. "The Printed Image in the West: History and Techniques." In *Heilbrunn Timeline of Art History*. New York: The Metropolitan Museum of Art, 2000–. http://www.metmuseum.org/toah/hd/prnt/hd_prnt.htm (October 2003) http://www.metmuseum.org/toah/works-of-art/49.95.870%2810%29/. Also see http://www.metmuseum.org/toah/hd/prnt/hd_prnt.htm (Accessed: 9 Nov. 2016)

Maps were printed by copper engraving, a process introduced in Europe in the 16th century. Various specialists associated with the print shop worked to produce a map: the mapmaker, the engraver, the printer, the papermaker, the colorist. An engraver created the design in reverse on a copper plate from a tracing made by the mapmaker or from information recorded in an explorer's journal or a ship's log. http://web-static.nypl.org/exhibitions/mapexhib/print.html

THE VERNACULAR

Before 1500, about 75 percent of all books were written in Latin and were used primarily by the clergy and scholars as Latin was the language of the Church and the university. Printing in the local language became more common during the sixteenth century. English editions of Chaucer's *Canterbury Tales* and Italian editions of Dante's *Divine Comedy* were some of the early successes. In addition, the Protestant Reformation movement began in 1517 with Martin Luther and his insistence that all Christians be able to read the Bible in their own language.

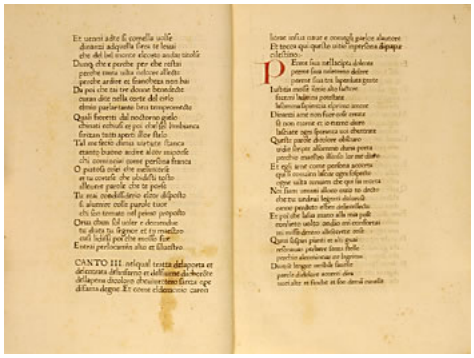


Illustration: Dante's *The Divine Comedy (La Divina Commedia)*, printed by Johann Neumeister in 1472. *The Inferno*, Book I, beginning of Canto 3, Dante passes through the gateway to hell with its ominous warning to "abandon all hope" ("Lasciate ogne speranza, voi ch'intrate"). This book, published in Italian, was so popular that two other editions came out this same year by different printers; this is the first. Source: "Gutenberg's Legacy," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/legacy/ (Accessed: 24 Feb. 2016)

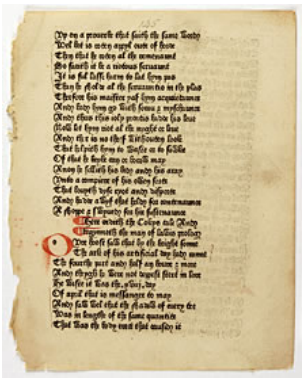


Illustration: The end of the Cook's Tale and the beginning of the Man of Law's Prologue from Chaucer's *The Canterbury Tales*. This is a page from the first published edition of *The Canterbury Tales* printed in Westminster by William Caxton around 1478. Caxton moved his press from Flanders to England in 1476. Caxton was unusual for his time, because he printed most of his books in English rather than Latin. Consequently, he was able to eliminate competition from printers in other countries. Source: "Gutenberg's Legacy," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/legacy/ (Accessed: 24 Feb. 2016)

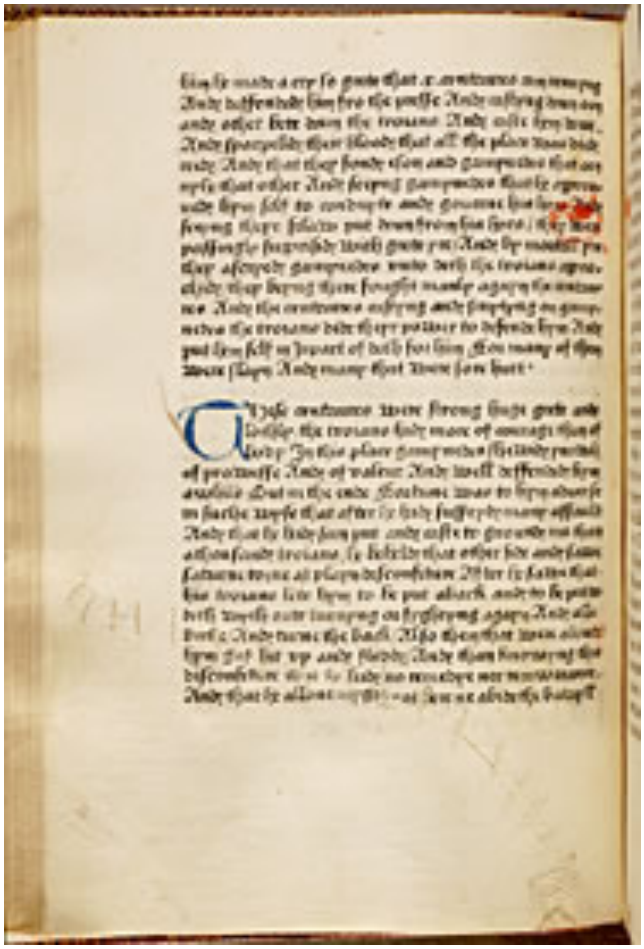


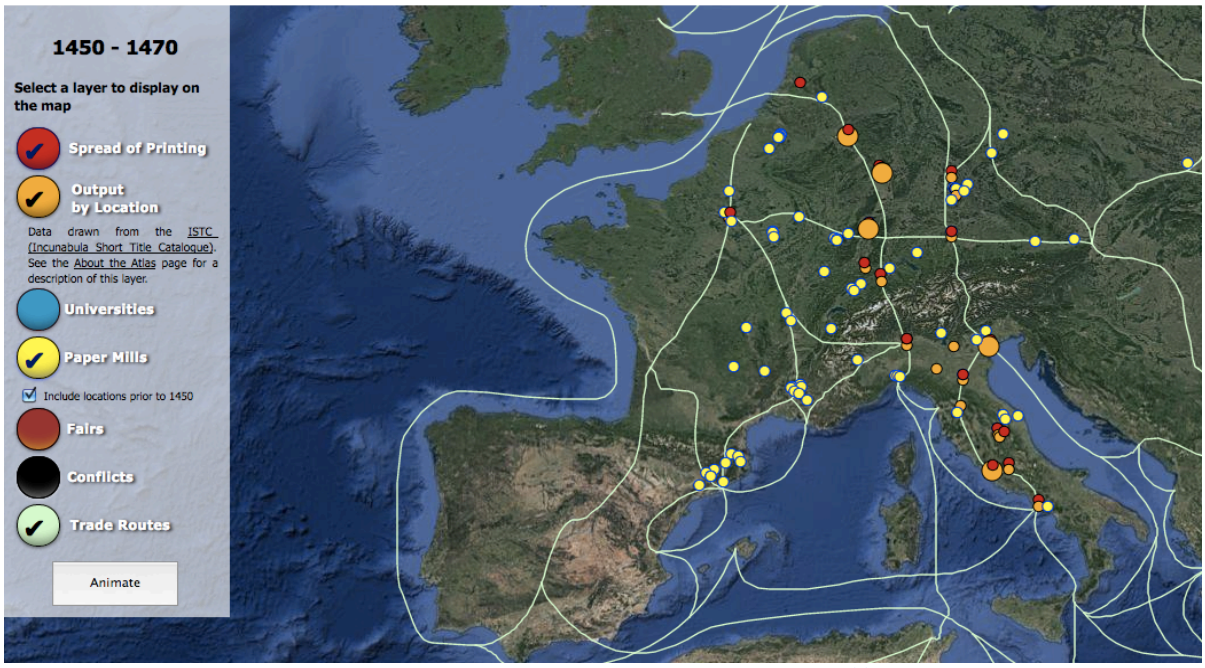
Illustration: *Recuyell of the Historyes of Troye* by Raoul Lefevre. Lefevre's popular telling of the Trojan War was the first book printed in the English language. It was printed and translated by William Caxton, who was living in Bruges, located in Flanders (modern day Belgium), in either 1473 or 1474. Pforzheimer Library, HRC. Notice the sewn repair on the bottom right portion of the page. Tears in parchment (scraped goat or calf skin) were commonly repaired by sewing, so it is unusual to see a paper book repaired in this way. This was probably an early repair made by someone who was more familiar with parchment books. Source: "Gutenberg's Legacy," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/legacy/ (Accessed: 24 Feb. 2016)

Although many of the first books printed were the popular religious texts of the medieval period, many classical Greek and Roman texts were also published, fueling the rediscovery of the ancient world so crucial for Renaissance humanists. Many printers during this time were also scholars and they often corrected the errors (corruptions) in the manuscripts. One of the greatest scholar printers was Aldus Manutius in Venice, who published cheaper, portable, easy-to-read versions of classical literature for scholars and students. These smaller, more affordable books used italic type, which allowed the printer to pack more text on each page. The Aldine Press was one of the first to print regular runs of 1000 copies of their books. The usual output of a printer at this time was probably around 200.

Constantine Lascaris, Erotemata, with the Latin translation of Johannes Crastonus Placentinus. Venice: Aldus Manutius, 1495. IA.24382. Source: "Between Manuscript and Print: Greek Manuscripts from the Circle of Aldus Manutius," British Library http://blogs.bl.uk/digitisedmanuscripts/2014/12/between-manuscript-and-print-greek-manuscripts-from-the-circle-of-aldus-manutius.html (Accessed: 8 Nov. 2016.)

THE DIFFSION OF PRINTING

Gutenberg's printing technology quickly spread from Mainz to Subiaco in Italy (1465), Paris (1470), and London (1476). By the beginning of the 16th century, there were approximately 240 printing shops in Europe. The first press in the Americas was set up in Mexico City less than fifty years after Columbus's first voyage. The first press in what is now the United States was set up in Cambridge, Massachusetts in 1638 and began printing in 1639. The first items printed were a Freeman's Oath, an almanac for 1639, and in 1640 the Bay Psalm Book.



SOURCE: *The Atlas of Early Printing*. University of Iowa Libraries, 2013. http://atlas.lib.uiowa.edu (Accessed: 2 Oct. 2016)

KNOWLEDGE AND INFORMATION REVOLUTION

The Catholic Church quickly realized the potential of the printing press as a challenge to its influence. Censorship was introduced into the print shop in 1487, when Pope Innocent VIII required that Church authorities approve all books before publication. The Church had censored books for centuries, though it became much more difficult to do so after the invention of the printing press. Controlling a dozen painfully copied manuscripts of a forbidden text may have been a manageable task, but controlling the thousands of copies churning off the presses every year was quite another matter. One of these forbidden texts was the Bible printed in any other language than Latin.

In 1517, Martin Luther made public his Ninety-five Theses criticizing the Church and he insisted that all Christians should read the Bible and do so in their own language. During the Protestant Reformation, the printing press helped to spread Luther's message and erode the hold of the Catholic Church over much of northern Europe.

The press as a tool of political and cultural change ensured the world would never be the same again as it launched a knowledge and information revolution. News of scientific and geographic discoveries now quickly circulated. Medical texts were published with detailed anatomical illustrations. Mass communication became possible on a scale that was unparalleled. Gutenberg's invention helped to enlighten the world in a way that was impossible with hand-written manuscripts.

Source: "Gutenberg's Legacy," Harry Ransom Center, University of Texas at Austin, http://www.hrc.utexas.edu/educator/modules/gutenberg/books/legacy/ (Accessed: 24 Feb. 2016)

Illustration: Burning of books from Hartmann Schedel's *The Nuremberg Chronicle (Liber chronicarum)*, 1493. The illustrations were colored by hand. Koberger published both a Latin and a German edition of the Chronicle.