



Johannes Gutenberg's invention of movable metal type revolutionized the transfer of information in Europe.

## From Gutenberg to the Internet

Around 1450, Johannes Gutenberg invented a printing press that used movable metal type. Before Gutenberg's press, books and other printed materials were made by hand. Printed material was costly to make and to buy. Gutenberg's invention changed Europe by making books more affordable and by spreading information faster and to more people. Today, Gutenberg is known as the inventor of printing in Europe. But his achievements were hard won—and his invention was almost taken away from him.

The year is 1455, and Johannes Gutenberg sits in a courtroom. Across from him is Johann Fust, who has sued Gutenberg. The two men are bitter enemies. Gutenberg shifts nervously, waiting for the judges' decision. If the judges rule against him, he will lose everything—including the printing press that he has worked for 20 years to perfect.

Gutenberg was born in Mainz, Germany, sometime between 1394 and 1400. He found, at a young age, that he loved to work with metal. He worked with craftsmen in the city and slowly learned their secrets. He showed an extraordinary talent, mastering the technology of turning metal into beautiful objects. He was also fired with the ambition to do something special that people would remember.

In 1428, Gutenberg moved from Mainz to Strasbourg. He started a business cutting gemstones to make jewelry. The company thrived, and he formed a business partnership with three other men. Soon they were making mirrors and other quality products.

### Early Printing and Movable Type

During the 1430s, Gutenberg saw the chance to do something even greater—to develop a printing press that lowered the cost of books. Printing was first developed in China and Japan in the 8th century. Craftspeople in those countries spent hours carving an image into a block of wood. They rolled ink onto the raised parts and pressed the image against paper.

Korean craftspeople were the first to develop metal movable type, in which the characters could be rearranged to form different words. During the 13th century, they formed type by heating bronze to a temperature high enough to make it liquid. They poured the bronze into molds formed in sand, and the bronze hardened and formed type. They then used the type to form all the words on a page, applied ink to the type, and rubbed paper against it, producing a printed page.

In 1377, the Koreans printed a text for Buddhists. It is the oldest known book in the world printed with movable metal type.

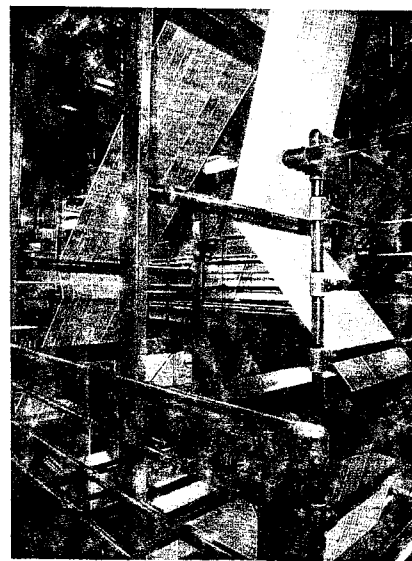
Europeans did not develop movable type for another 200 years. Until then, monks and nuns in monasteries painstakingly copied books by hand. Many of the books were unique works of art. They had huge, colorful capital letters, complex illustrations, and the edge of each page was lined with gold. But these books were incredibly expensive. A person had to work an average of 300 days to make just one book. Historians estimate that the typical book might cost between \$200 and \$250 in today's dollars. Only the very wealthy could afford such items.

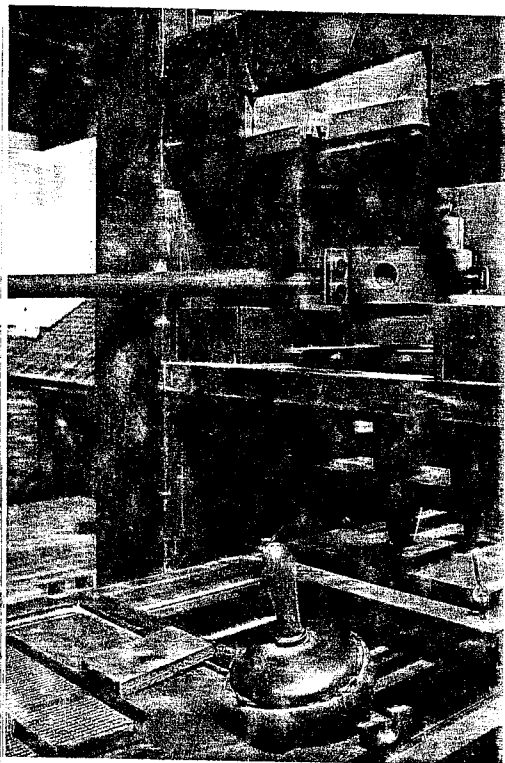
### **inventing Type, a Press, and Ink**

Gutenberg turned his creative genius to developing a way to print books that would cost far less money. He faced three challenges—developing type, creating a printing press, and mixing the right ink. To create type, he had to decide what metal to use. It couldn't be too hard because then it wouldn't melt. It couldn't be too soft because then the type wouldn't last. Finally, he hit on a brilliant idea. Instead of one metal, he would blend different metals. He created an alloy—or combination of metals—which included 80 percent lead, 5 percent tin, and 15 percent of a metal called antimony.

To make the letter *a*, for example, he heated the metal until it melted, poured it into a mold, let it cool, and then removed the metal from the mold. Now he had the type for the letter *a*, which he could use over and over again. He did the same for all the other letters and for punctuation.

With movable type, the printer selects individual letters to form words. The letters can be used repeatedly in different combinations. Although movable type has been mostly replaced by new technology, huge printing presses produce vast amounts of printed information every day.





Although much of the work of type setting and printing books was still done by hand on Gutenberg presses like this one, it was vastly quicker than writing out each copy.

Next, Gutenberg needed to find the right ink. It couldn't be too thin, because then it would leave smudges on the paper. It couldn't be too thick, or it would clog the type. Gutenberg experimented for a long time and finally used linseed oil. To make it black, he added soot, which he got from lamps.

Finally, Gutenberg had to build a press. Historians believe that he probably adapted a press that papermakers used to dry stacks of paper. In his press, Gutenberg set the type and rolled ink onto the type. Then he turned a giant screw that lowered the type onto paper. In a few seconds, he could print a page that would have taken a monk hours to copy. More importantly, he could make many copies of the same page very quickly.

### Printing Success and Business Setbacks

Gutenberg made great progress on the printing press, but he faced some serious business problems. First, one of his partners died. Then the man's relatives sued Gutenberg to get control of the business. Gutenberg was relieved when the court ruled in his favor. But even though he won, the lawsuit kept him from finishing his printing press.

Gutenberg's problems got worse. He ignored the jewelry business, and his income sank. Yet he was spending money to buy metals, a press, and inks. He went into debt, but he kept working on the printing press. Finally, in 1446, he had his first major triumph, when he printed a short poem. Soon after, he printed a grammar book. It became a bestseller throughout Europe.

These early books were plain, and Gutenberg wanted to print something wonderfully beautiful. Money was still a big problem. So Gutenberg formed a partnership with Johann Fust, a wealthy businessman in Mainz. Fust loaned him 1,600 guildens, which at that time was a fortune. Historians have estimated that just 100 guildens could buy a small farm. The two men planned to print a book that would sell extremely well and give them a good return on their investment. But what kind of a book should it be?

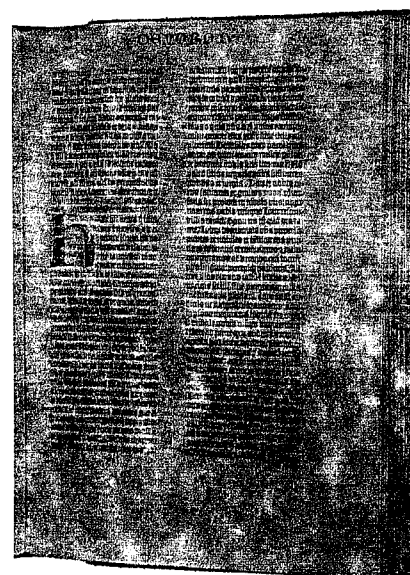
### Printing a Bible

Finally they came up with a brilliant idea—they would print a Bible that was extraordinary in every way. Around 1455, Gutenberg started preparations. The Bible would have two volumes: the Old Testament and the New Testament. It would have 42 lines per page, and the two volumes together would contain 1,282 pages. Every page would have 2,000 letters. For this monumental task, Gutenberg had to create 290 pieces of type, including capital letters, lower case letters, and punctuation. He planned to print 210 copies.

While Gutenberg was aiming for perfection, Fust was growing impatient. He had invested 1,600 guildens in the printing press, but in five years, the investment had not earned him one penny. He filed a lawsuit against Gutenberg, demanding that his money be returned. Gutenberg simply didn't have the money. He desperately needed the judges to find in his favor.

But the judges ruled against Gutenberg. They said that Fust had waited long enough to earn a profit on the money that he had invested. Gutenberg had to repay Fust. Since Gutenberg didn't have the funds, the court allowed Fust to take over the business, including the typefaces and the printing press. Fust even hired away Gutenberg's most skilled assistant. Together, they finished work on the Bible that Gutenberg had started and began to sell it. This remarkable book became an instant bestseller. Fust made a good deal of money from the sweat, tears, and genius that Gutenberg had poured into the project.

Yet Gutenberg was an amazingly stubborn man. Fust had taken away his business, but he couldn't take away Gutenberg's knowledge and skills. He found another financial backer, Dr. Konrad Humery, who helped him set up a printing shop in Mainz. Gutenberg printed philosophical writings, a dictionary, and other works, all with the extraordinary quality that was his trademark. He also trained printers, who spread his printing technology throughout Europe.



One advantage of the new, printed books, like the Gutenberg Bible (bottom), over the earlier, hand-copied versions (top) was that each printed copy was neat and exactly the same.

## Books: The Internet of the Time

Gutenberg's amazing invention made books the Internet of the time. The printing press made it possible to produce books much more quickly and cheaply than ever before. By 1463, printed Bibles cost one-tenth of hand-copied Bibles. The demand for books exploded. By 1500, Europe had more than 1,000 printers and 7,000 books in print.

Like the Internet, books spread new ideas quickly and sped up the process of change. For example, as a young sailor in Genoa, Christopher Columbus read Marco Polo's famous *Travels*, in which he described his journeys to China. Columbus was thrilled by Polo's descriptions. Books also planted the seeds of democracy and human rights in the next generation of thinkers. Newspapers and pamphlets generated information and ideas even faster.

In 1465, the Archbishop of Mainz gave Gutenberg a pension for the "agreeable and willing service" that he had provided to the city and to Germany. Gutenberg died in 1468, and Dr. Humery inherited everything. Yet the Archbishop refused to let the doctor move Gutenberg's printing press. The city was honored to be the birthplace of printing in Europe. Gutenberg would always be known as the father of an invention that truly changed the world.