

CHAMPIONS OF INVENTION

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This book is dedicated
to
Hite and Glenda Tiner.

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BOOKS BY THE MILLIONS

What is the most important invention of all time? Experts agree that the printing press had the greatest impact on the world. It was invented by John Gutenberg. He was born in Germany about the year 1400. We know little about his early days. He earned a living at various times as a goldsmith and as a stonecutter.

He grew up at a time when people made books by carefully copying them by hand. All books were copied with great care. Those who copied the Bible took special precautions to guard against errors. They proofread a finished page carefully. As an added check, they counted every letter on the page. Each page had to have the same number of letters as the same page in the original document. A person working alone needed about seven years to copy the complete Bible.

People also copied writing by carving a page on a block of wood and printing from it. They carved these wooden blocks exactly like the page, but with writings and drawings reversed. A few hundred sheets could be printed from one block. Ink would then soften the wood and cause blurred, messy pages.

Books were few in number and far too expensive for most people. Only governments, churches, and universities could

have large libraries. The owner of a Bible or a dozen other books could be considered a rich person.

Churches would put an open Bible on display. They would turn the page once a week so people could read it.

In 1436, Gutenberg studied how to make mechanical copies of books. He had the idea of using movable type for printing. Each letter would be on the end of a separate bar. A printer could assemble individual letters as a block of type for the page of a book. He could print the page time and again. Then the printer could rearrange the letters to make the next page. A printer could make several hundred identical copies of a book.

Gutenberg worked for years to perfect the process. The metal for the type gave him trouble. Lead flattened under pressure. Iron cracked. Set type inked unevenly. The paper blurred. Unsuccessful experiments took all of his money.

Gutenberg felt certain his idea would work. He needed money desperately. In 1450, he formed a partnership with a business associate. This time he started from the beginning. He realized that printing was a process that involved several steps. A single invention alone would not ensure success. He began fresh and worked on each part until he had it right — the type, printing press, paper, and ink all had to work together.

He began with moveable type. The tiny metal letters had to all be the same size so he could interchange them with one another. They had to lock together evenly as a flat surface. They had to stand up to repeated impressions. He made the type from copper and this time the letters worked perfectly.

The press would push the paper evenly against the block of type. His first machine used parts from a press that squeezed juice from grapes. Instead of flattening grapes, a handle turned a screw to flatten the paper firmly against the block of type. It gave an even impression across the entire sheet of paper.

He experimented with ink. It had to stick to the metal type and then transfer to paper. He developed a new oil-based ink. It was entirely different in chemical composition from ink for wood blocks. He mixed the ink himself.



He even tested paper. Was it the best surface for printing? The Egyptians had written on papyrus, a rough surface made from reeds. The Chinese had made a paper from bamboo. They also wrote on silk. Europeans wrote important documents on parchment made from the skins of sheep or calves.

Paper had come in use as a writing surface in Europe only a couple of hundred years before Gutenberg's time. Both parchment and paper had a smooth surface that would accept ink. For expensive books, he would use parchment. For less expensive books he would use paper so that ordinary people could own books. Paper was the only part of the printing process that he didn't invent himself. Even so, he sought out and ordered the best paper he could find.

Gutenberg combined his many different inventions and improvements. He now had a method to mass-produce books, all with identical pages. In 1454, one of the greatest events of world history occurred. Gutenberg began to print the first book made by movable type. Until then, he had experimented with smaller manuscripts such as single sheets, calendars, and

religious tracts. He put six presses in operation. He set type for his most monumental task: printing the entire Bible.

John Gutenberg wanted the printed Bibles to be as beautiful as any handcopied one. He chose attractive type design and took pains to make each page perfect. His excellent workmanship paid off. Gutenberg's Bible was not only the first book ever printed, but many people consider it the most beautiful book as well. Seldom does a new invention begin at its greatest point. His achievement has never been matched.

Each Bible had 1,282 pages, 42 lines on a page, divided into two columns. He printed 300 copies of each page and bound them together to make 300 identical Bibles. Of the 300 original books, only 45 complete copies are still in existence today. Each is priceless. Today, loose sheets from incomplete Bibles sell for thousands of dollars. At the time, however, the books Gutenberg printed were less expensive than those made any other way.

Until the invention of the printing press, Bibles were rare and difficult to find. Martin Luther, the German religious leader, did not see a complete Bible until he was an adult. Soon printers published Bibles on paper in everyday languages such as German, English, and French. The price dropped so low even ordinary people could own a Bible. For the first time, common people had a Bible they could own and read for themselves. Printing swept Europe. It became a new and successful profession. Within 50 years more than nine million copies of books had been printed.

Little is known about Gutenberg himself. Not a single portrait was made of him during his lifetime. Not a single line of his own handwriting has been uncovered. We do know that Gutenberg's printing press made it possible for new ideas to spread with explosive suddenness. Scientists, religious scholars, and thoughtful citizens could share their ideas easily and quickly. Gutenberg's invention started several separate revolutions.

Books by the founders of modern science spread the news about recent discoveries.

On May 24, 1543, Polish astronomer Copernicus published *On the Revolution of the Celestial Sphere*. In that book he gave evidence that the sun and not the earth was at the center of the planetary system. He correctly stated that the earth is a globe that spins on its axis. The earth and all the planets revolve around the sun.

Andreas Vesalius was a Flemish scientist who lived at about the same time as Copernicus. Vesalius studied the human body and taught at a medical school. He discovered that many of the ideas about the construction of the human body were in error. In 1543, he published *The Fabric of the Human Body*. This major work was published in seven volumes. Vesalius detailed his own discoveries and corrected the more than 200 errors he had found in ancient books. It created a revolution in medical studies. These two books, Copernicus' *On the Revolution of the Celestial Sphere* and Vesalius' *The Fabric of the Human Body*, began revolutions not only in astronomy and life science, but in all of science. The two books, which were published the same year, mark the start of the Scientific Revolution.

Vesalius also included 300 illustrations in his book. He chose Jan Stephen van Calcar, a young student of Titian, to refine his sketches so the essential points could be quickly grasped. The drawings showed the human body in natural poses. Printers saw that illustrations helped increase the sale of their books. They began to hire artists to provide illustrations. In addition to illustrating books, the drawings could be sold as single sheets. Even poor people could afford a single drawing. The printing press increased an interest in art that was part of the Renaissance, or rebirth, in Europe that began in the 1500s.

At the same time, people read the Bible in their own language. Until the time of the printing press, Bibles were written in Latin or Greek, the language of scholars. William Tyndale translated the whole New Testament into English in 1525 and Martin Luther translated the New Testament into German in 1534. This started a spiritual awakening known as the Reformation that swept across Europe.

Printing also made it possible for ordinary citizens to become informed about current events. Before the development of movable metal type, news spread by word of mouth, by written letters, or by single sheets of paper posted on walls or doors. The first newspapers were printed starting early in the 1600s. People read the news and demanded a greater role in governing their day-to-day lives. This caused governments to be more democratic. It led to the American Revolution, the Declaration of Independence, the Constitution, and the Bill of Rights.

Before the invention of the printing press, new ideas had to be circulated by handwritten manuscripts. Those in power did not encourage original thought because new ideas led to unrest. Dictators could hunt down and destroy a few handwritten manuscripts. It was far more difficult to silence new ideas once they were expressed in hundreds or thousands of books.

Do you judge the success of an invention by the number of people it has affected? If the answer is yes, then Gutenberg was the most successful inventor of all time.

Why did Gutenberg succeed when many others tried the same task and failed? What did Gutenberg think about his success?

As his life drew to a close, Gutenberg stated the reason for his success. In a large dictionary published in 1460, he explained that his work had been under “the protection of the All-Highest, Who often reveals to the humble what He conceals from the wise.”