

Thinking about the major achievements in technology today probably brings a variety of things to mind—from Steve Jobs, the founder of Apple, to cell phones, and perhaps even military aircraft. Most people would be shocked to learn that many aspects of today's technology have roots in ancient China. In fact, a lot of the technology we use owes much to the Shang dynasty (1600-1046) BCE of ancient China. The Shang people created new systems of communication and warfare. The Shang dynasty is the earliest recorded Chinese dynasty. The Shang left behind a rich archaeological and written record of their accomplishments. Thanks to the written words and uncovered artifacts of the Shang, we now have access to their vast knowledge of tools used for writing, weaponry, and warfare.

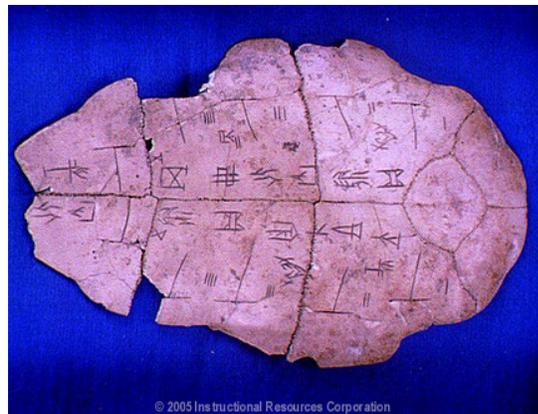
Writing and Printing

Technology is defined as the application of scientific knowledge for practical purposes. Although writing itself may not be considered an example of technology, the tools used to put ideas into print, such as ink brush and woodblock techniques, are examples of innovative technologies. Consider for a moment what life would be like without written words. Without letters, words, or numbers, our technology would be limited. There would be no way to

communicate what needs to be done or what has been learned. Interestingly, the Shang dynasty didn't begin writing to pass along knowledge. The people of the Shang dynasty wrote on animal bones to record requests and questions to their gods. They would often ask questions such as "Will it rain tomorrow?" or write requests that asked the gods to send rain.

Chinese writing has changed very little in 3,500 years. Chinese printing techniques, on the other hand, have gone through many changes. The very first examples of writing were created with a brush pen and ink. The holder was made from bamboo, and the tip was made out of animal hair. Ink was made from a solid stick composed mostly of soot and glue. The stick was ground up and mixed with water to make black ink.

The first form of printing was engraving, or carving into stones and metals. By using a process called *ink rubbings*, writers were able to make copies of a single engraving. To make an ink rubbing, a wet sheet of paper was placed on an engraved stone. The paper would then be pressed into the cracks of the engravings, and ink would be applied to every flat surface. When the paper was



Shang people began by writing on animal bones, such as this tortoise shell.

peeled off and pressed against a flat surface, the surface would show a black background with white characters of letters or numbers. Ink rubbings were like early stamps except that the message would appear white instead of black.

Another form of printing was woodblock printing. This technique is the most similar to today's form of stamping because the message is what appears in black when pressed. Woodblock printing first requires a sheet of paper written on with ink. The paper is then glued backwards to a piece of wood. When the white part of the paper is carved away, the characters are the only raised surface. By painting the raised characters with ink and pressing onto paper, an early form of the stamp was created. Just one wood block could produce more than a thousand copies.

Inventors in the Shang dynasty paid close attention to detail when creating printed Chinese characters, much like the focus Steve Jobs gave to design and fonts when he developed the first Macintosh computers. In a graduation speech delivered at Stanford University in 2005, Jobs emphasized how he first learned to appreciate fonts while attending a calligraphy class. The technology that allows us to print written language today started in the Shang dynasty and continues to influence the development of digital fonts to this day.

Bronze

The Shang dynasty was ahead of the technological curve in more ways than one. Along with writing and printing, great strides were made in bronze molding. The Shang used a technique called piece-mold casting to create bronze objects. The Shang dynasty was the only civilization at the time to use this process and are said to have perfected it. The piece-mold casting process involves creating a clay mold of the object an artist wants to make out of bronze. The clay mold is then filled with melted bronze. After cooling and drying, the clay is broken away to reveal the new bronze creation.

Bronze was used in ancient China for weapons and to create ceremonial vases. These items were of greater importance than any others. Tools were rarely made with bronze, although early molds produced plates for cooking. The ability to create new weapons gave the Shang military a great advantage over their enemies. Their bronze-tipped battle axes and spears made the military strong and more advanced than other armies.



Bronze pots were made through piece-mold casting, a process that the Shang dynasty perfected.

Using today's technology, steel is used to make even stronger weapons, and other metals such as nickel and copper are shaped into cell phone parts. The Chinese practice of casting metal into desired objects has evolved to include more mechanized techniques, finer objects, more metals, and even plastics!

The Chariot

Their enemies soon realized that the Shang dynasty had superior strength in transportation as well as weaponry. Before the military aircraft, tanks, and jeeps we have today, there were chariots. Historians aren't sure if the Shang invented the chariot, but China was the first place it was used for battle. Before then, the chariot looked like an average wheelbarrow. By adding a wooden pole to each side, the chariot could be attached to horses. Many of the chariots were painted and engraved with designs. Some chariots were even decorated with bronze ornaments. The Shang people were so proud of their chariots that they often buried a ruler's chariot with him when he died.

Chariots were not often used for charging into the front lines of battle. Shang military leaders mostly used them for overseeing battles from a distance. If the leaders needed to get closer to battle, the chariot could take them. Commanders could now travel great distances with a minimum number of horses. Soldiers could ride in the chariots, which helped move large numbers of people to places where soldiers were needed. Chariots could also act like wagons to carry weapons or food when supplies were running low. They could also be used to carry the wounded or dead off the battlefield. Needless to say, we still use transportation technology in these ways today, although typically with trucks and aircraft instead.

The Shang dynasty influenced the modern world and technology in several great ways. Some people believe that the Shang writing systems influence modern-day computer fonts. The bronze technology they perfected through the piece-mold casting process led to the development of more refined ceremonial vases and stronger weapons. The chariot they developed from a simple wheelbarrow shape made way for today's advanced military transportation vehicles. In these examples of technology, we owe a great deal to the innovators of the Shang dynasty and the impact they had on writing, weaponry, and warfare.

After reading the passage, answer the following questions:

- 1.** Which of the following is the correct process for woodblock printing?
 - A.** write message on paper → glue paper to a piece of wood → carve away white part of paper → paint raised wood with ink → press onto a flat surface
 - B.** write message on paper → glue paper inverted to a piece of wood → carve away white part of paper → paint raised wood with ink → press onto a flat surface
 - C.** write message on paper → glue paper inverted to a piece of wood → carve away black message → paint raised wood with ink → press onto a flat surface
 - D.** write message on woodblock → carve away message → paint raised wood with ink → press onto a flat surface

- 2.** How did bronze impact the Shang military?
 - A.** Bronze was used to make bullets.
 - B.** Bronze was used for healing and medicine.
 - C.** Bronze was used to create stronger weapons.
 - D.** Bronze made their weapons too heavy to carry.

- 3.** What was the main use of chariots in Shang warfare?
 - A.** charging the front lines of battle
 - B.** overseeing battles from a distance
 - C.** transporting supplies to the front lines
 - D.** carrying away wounded soldiers

- 4.** The Shang dynasty was very creative in developing writing materials. Name some of the ways that the Shang used natural elements for writing. How are those creations similar to modern-day writing tools? Support your answer with details from the text.