

SONG DYNASTY TECHNOLOGY

NAME: _____ **HOME GROUP:** _____ **EXPERT GROUP:** _____

Directions: Find your expert group materials (handouts, iPad app, website, etc.) listed in your Expert Group box. Use them to help you answer each question. You must know your content well enough to teach your Home Group about your topic when you return.

Expert Group 1: Papermaking

2 Resources: Paper, Printing, & Books Reading & Papermaking App

1. Reading: What were possibly the most important Chinese inventions according to the reading?
2. Reading: What increased the availability of reading material?
3. Reading: Explain how woodblock printing worked.
4. App: Who discovered how to make paper?
5. App: Quickly explain the 4 steps in papermaking.

Expert Group 2: Printing

2 Resources: The Song Dynasty in China Website, The Development of Printing in China Video

1. Website: How did Chinese craftsmen mass produce books?
 - 1.
 - 2.
 - 3.
2. Website: Printing did what to the price of books?
3. Website: What did printing aid?
4. Website: What is movable type?
5. Website: What happened when movable type reached Europe in the 15th century?
6. Video: What are the 3 woodblock printing weaknesses that led to movable type?
 - 1.
 - 2.
 - 3.

Expert Group 3: Gunpowder (Gunpowder & Weaponry)

2 Resources: The Deadly Irony of Gunpowder Video, The Song Dynasty in China Website

1. Video: What were Chinese alchemists trying to create when they created gunpowder?
2. Video: What weapons did they create using gunpowder?
3. Video: Who supposedly spread the invention of gunpowder across the world?
4. Video: Who is credited for bringing gunpowder back to Europe?
5. Video: List a positive and a negative in regards to the creation of gunpowder.
6. Website: What did the Chinese use to launch their bombs of gunpowder mixed with scraps of iron?
7. Website: What are "fire-spurting lances"?

Expert Group 4: Sailing (Shipbuilding & Compass)

2 Resources: The Song Dynasty in China Website, Song Dynasty Shipwreck Map

1. Website: Who was the world's leader in shipbuilding?
2. Website: What did watertight bulkheads improve?
3. Website: What greatly improved steering?
4. Website: What contributions did the Song dynasty make to the compass?
5. Website: The addition of a movable rudder made it possible for ships to do what?
6. Map: Based on the various goods discovered at a Song Dynasty shipwreck, what did the maritime technological advances allow Song Dynasty sailors to do?

ACTIVATING ACTIVITY

List several technologies and/or inventions that have changed the world.

ASSESSMENT/REFLECTION

After a quick review of Francis Bacon's view of three key Chinese inventions, assess the importance of each invention. How would your life be different if these Chinese technologies/inventions had not been made? Choose at least one technology/invention and elaborate on how your life would be different without it in _____ (teacher discretion on #) complete sentences OR _____ (teacher discretion on #) paragraph/paragraphs.

Francis Bacon on the Significance of Three Chinese Inventions: Printing, Gunpowder, and the Compass

Chinese inventions of printing, gunpowder, and the mariner's compass were brought to Europe by Arab traders during the Renaissance and Reformation. Francis Bacon (1561-1626), a leading philosopher, politician, and adviser to King James I of England, was unaware of the origins of these inventions but deeply impressed by their significance when he wrote:

“It is well to observe the force and virtue and consequence of discoveries. These are to be seen nowhere more clearly than those three which were unknown to the ancients [the Greeks], and of which the origin, though recent, is obscure and inglorious; namely printing, gunpowder, and the magnet. For these three have changed the whole face and stage of things throughout the world, the first in literature, the second in warfare, the third in navigation; whence have followed innumerable changes; insomuch that no empire, no sect, no star, seems to have exerted greater power and influence in human affairs than these three mechanical discoveries.”

— Francis Bacon

In Peter Amey, *The Scientific Revolution* (Greenhaven World History Program: Greenhaven Press), 23.

Resources

Papermaking

- Paper, Printing, and Books Reading from Ancient China (Cotterell, Arthur. Ancient China. New York: DK Publishing, INC., 2005. Print. 24-25)
- Ancient China Kids Discover App (iPad)

Printing

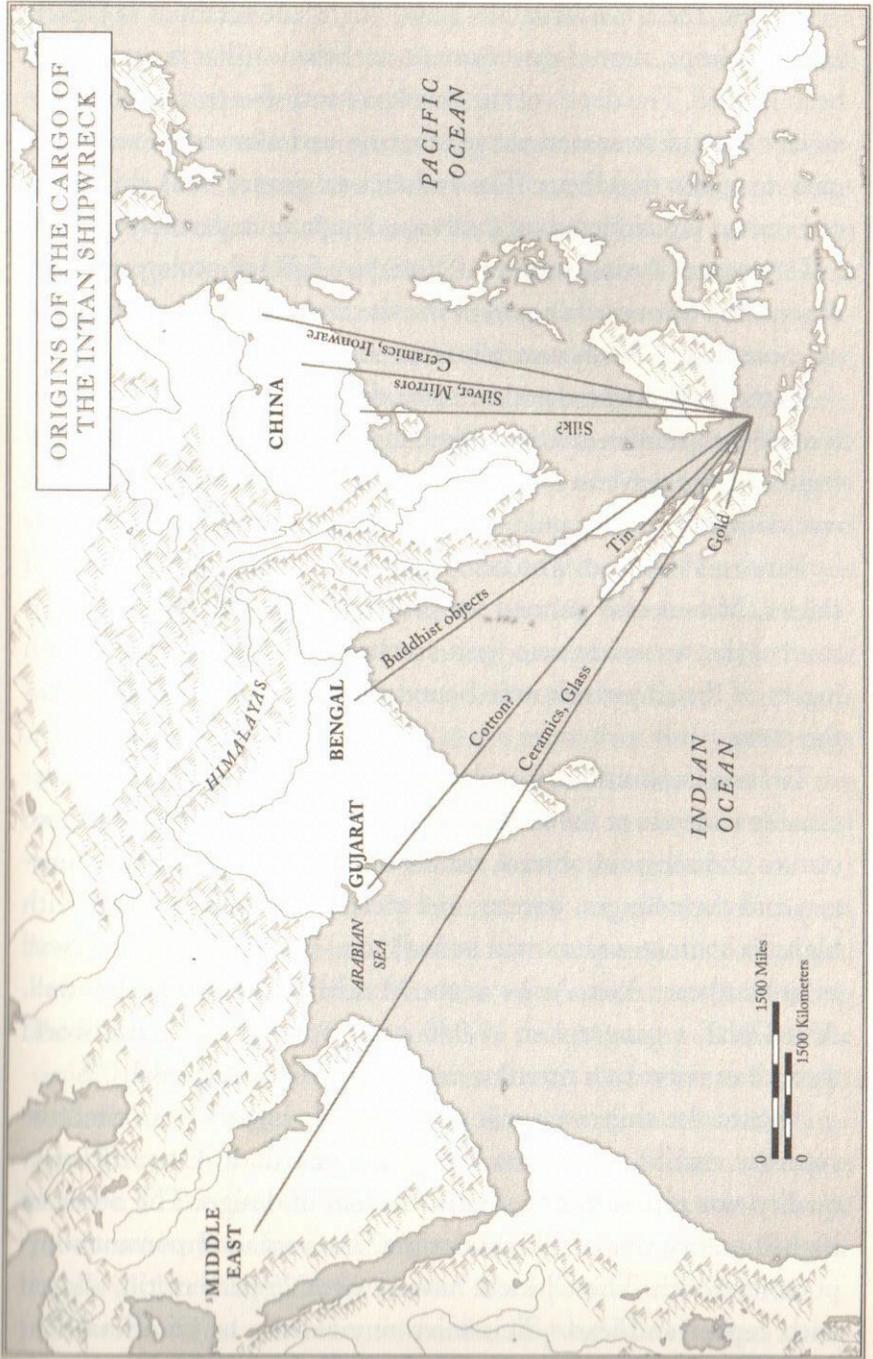
- The Song Dynasty in China (Printing and Movable Type)
 - <http://afe.easia.columbia.edu/song/tech/printing.htm>
- The Development of Printing in China YouTube Video
 - <https://www.youtube.com/watch?v=WHevDzS5TiY>

Gunpowder (Gunpowder & Weaponry)

- The Deadly Irony of Gunpowder Video
 - <https://www.youtube.com/watch?v=mqHVRgCkCDE&list=PLIhqfbAUyfDFCuiQD9ZRAFTiHTA11dPli&index=3>
- The Song Dynasty in China (Gunpowder)
 - <http://afe.easia.columbia.edu/song/tech/gunpowder.htm>

Sailing (Shipbuilding & Compass)

- The Song Dynasty in China (Compass & Rudder)
 - <http://afe.easia.columbia.edu/song/tech/compass.htm>
- Song Dynasty Shipwreck Map from (Gordon, Stewart. When Asia Was the World.) Philadelphia: DA CAPO PRESS, 2008. Print. 59.



Paper, printing, and books



Bamboo symbolized strength and flexibility

竹書
十竹齋

BAMBOO BOOKS

The first Chinese books were made from strips of bamboo, such as those at right, which were tied together in a bundle. These early books were unwieldy to use and took up a lot of storage space.



PAPERMAKING

Before the papermaking process could begin, the raw material was softened by being soaked in water. After that, it was boiled and pounded to form a pulp. To make a sheet of paper, a fine screen was dipped into the pulp to gather a thin film of fibers. The screen was pressed to remove the water, then left to dry on a heated wall. When dry, the finished sheet of paper was peeled off the screen.



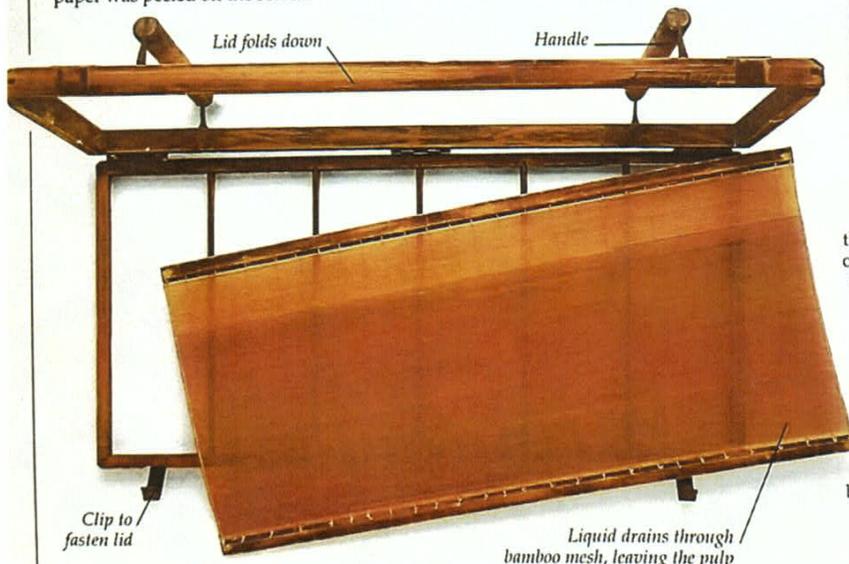
Soaking the bamboo



Dipping the screen in the vat



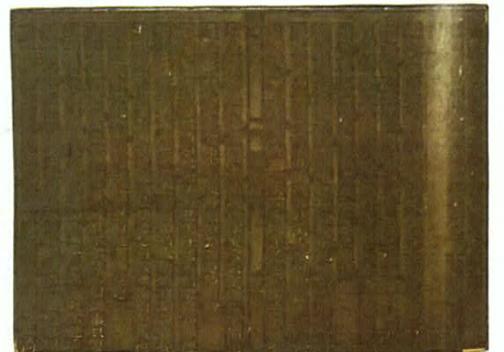
Pressing the screen to remove the water



PAPER AND PRINTING were possibly the most important Chinese inventions. Credit for the successful manufacture of paper is given to Cai Lun, head of the imperial workshops in A.D. 105. The first paper was made from silk rags; later other fibrous materials were used, such as bamboo, hemp, and mulberry bark. There was a great demand for paper from the Han civil service, and it was mass-produced in government factories. Large-scale woodblock printing was developed in the 9th century, increasing the availability of reading material. By the end of the Tang dynasty, bookshops were trading in every Chinese city. Movable type was invented by a printer called Bi Sheng in the Song dynasty, but because at least 80,000 separate type symbols were needed, it did not entirely replace block printing.

SEAL PRINTS

Seals, which date back to the Zhou dynasty, were the first form of printing used in China. They were impressed on official documents, personal correspondence, and works of art. Seals were carved or molded from stone, wood, horn, bronze, or ceramics. This 15th-century soapstone seal was engraved by a famous Ming calligrapher.



WOODBLOCK PRINTING

From the 9th century onward, the Chinese printed books from large wooden blocks. The text of either one or two pages was carved into a block by first pasting a thin manuscript over it and then cutting through the paper. The characters were carved in reverse. A print was taken by inking the surface of the block, laying a piece of paper over it, and rubbing gently with a dry brush.

PAPER MOLD

Chinese papermakers used paper molds like this one, which consists of a fine bamboo screen set in a wooden frame. The mold was dipped into a vat of mushy pulp and shaken gently to settle the fibers onto the screen. The screen was then taken out and pressed to remove the excess water before being left to dry.



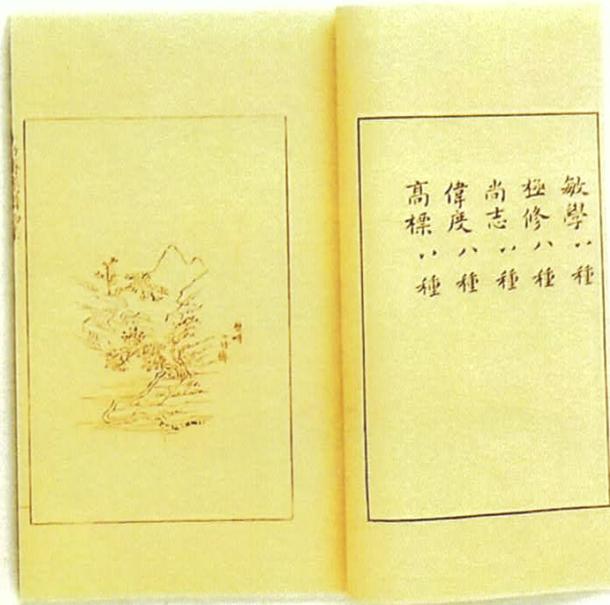
Text reads top down, from right to left

ON A SCROLL
The first Chinese books made of paper were rolled into long scrolls. They were usually handwritten by scholars. As in modern China, the text was written in vertical columns and read from right to left.

PRAYERS IN PRINT
This Buddhist text, called the *Diamond Sutra*, is the earliest known printed book. It was made in China in A.D. 868 using woodblock printing. Buddhists produced thousands of copies of sacred texts and prayers. The *Diamond Sutra* was made for free distribution.



Book cover decorated with colorful chrysanthemums



STYLISH NOTEPAPER
This collection of decorated letter papers is a fine example of colored woodblock printing, which flourished in 16th-century China. It was produced by the Ten Bamboo Studio in 1644. Scholars used beautifully designed letter papers for decorative letters. The delicate illustrations were intended to be written over.

20th-century facsimile of a compendium of letter papers from the Ten Bamboo Studio



EMERGENCY MANUAL
Large-scale printing in the 10th century made books readily available in China for the first time. The spread of books greatly increased the spread of literacy. The most popular printed material was Buddhist texts and prayers. This 1,000-year-old booklet contains a Buddhist prayer called the *Lotus Sutra*. It is a prayer for use in emergencies that calls on the help of friendly spirits.



Illustration from a letter paper