

History Topic of the Month

Four Great Inventions of China

Many of the greatest inventions in human history were first made in China. By the 13th century, China was an innovative and exciting place to live. Travellers from Europe discovered things there that were beyond imagination in Europe. When the explorer Marco Polo arrived in China, he encountered a country vastly different from his home of Venice.

In his book, *The Travels of Marco Polo*, Polo describes cities with broad, straight and clean streets (very different from his home in Venice) where even the poorest people could wash in great bath houses at least three times a week (again very different from hygiene in Europe).



Contributor: © Patrick Guenette / 123rf

Cai Lun (AD c.57 – 121), was a Chinese courtier official. He is believed to be the inventor of paper and the papermaking process, discovering techniques that created paper as we would recognise it today.

China celebrates four particular innovations as “the Four Great Inventions” — they were even featured as a part of the opening ceremony for the 2008 Beijing Olympic Games. So, what were these four great inventions?

Writing it all down: Paper

The first of the great inventions was something we all use almost every day: paper. Many different materials had been used for writing things down, like bamboo, wood (both hard to store and write on) or silk and cloth (much more expensive). Types of paper have been found in archaeological records dating back thousands of years, but it was very difficult to make. It wasn't until AD c.105 that a quick and easy way of making paper was invented.



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This drawing shows the process of creating paper from mixing the materials to form a pulp to forming the pulp into sheets of paper using frames.

The inventor of this new technique was a man called Cai Lun (AD c.57-121). He was an official at the Emperor's court and an advisor to several Emperors. Cai invented a new way of creating the pulp that forms paper. He took materials like bamboo, mulberry tree bark, plant waste and rags. These were mixed together, beaten, then mixed with water, and then poured over a flat woven cloth to let the water drain out.

When the mixture dried out only the fibers remained forming a lightweight paper. This was a cheap, easy method of creating large amounts of paper.

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Cai was inspired by watching how wasps make their nests. The invention helped make Cai one of the most powerful people at court. Over 500 years later Cai Lun was named as the national God of papermaking. Cai Lun is also the only "name" that history has recorded in connection with any of the four great inventions.

As well as being the main way of keeping records in China, paper was also used for a range of purposes, from tea bags, toilet paper, packing and, by the 11th century, as money.

Working out where we are going: the Compass

The second great invention was the compass. Navigation was very difficult in the medieval world. Maps were unreliable and large parts of the world were unknown. The only real points of reference were the stars and landmarks, like mountains. It was often very hard to know exactly where you were or which direction you were travelling in. The compass helped to change all of that, by telling people exactly which direction was north.

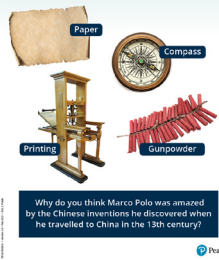
In Han Dynasty China (between the 2nd century BC and 1st century AD) lodestone compasses used magnetic pieces of rock. These were shaped like spoons and placed on a wooden plate with the directions marked on it. The handle of the spoon always pointed south – these early compasses were called "south-governors". These compasses were also used for spiritual guidance, to help people make decisions about their lives by pointing them 'the right way'.



Contributor: © CPA Media Pte Ltd / Alamy Stock Photo

Shen Kuo (AD c.1031-1095), was a famous courtier and scholar. It is thanks to his writings about the great inventions that we know as much as we do about how these discoveries were made.

By 1088, the famous courtier and scholar, Shen Kuo, wrote about the first magnetic needle compass, which was being used to help people navigate. This used a lodestone sealed in wax within a box frame, with a needle at the top. As the lodestone moved, the needle always pointed towards north. This was the first recorded use of a navigation compass in world history.



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Spreading the word: Printing (11th century)

The earliest known printed book, published at some time around AD 868, was the *Diamond Sutra*, a book of Buddhist philosophy originally from India. The book was a Chinese translation, and it existed because the Chinese had invented the woodblock printing press. This method of printing involved carving an image or a block of text onto a block of wood. These were then dipped in ink and printed onto a surface, like paper or fabric. A whole page of a book – with any pictures – would be carved onto a single block.



Contributer: © Classic Image / Alamy Stock Photo

This copy of the Chinese version of *Diamond Sutra*, found among the Dunhuang manuscripts in the early 20th century by Aurel Stein, was dated back to May 11, 868 and is the earliest complete printed book.

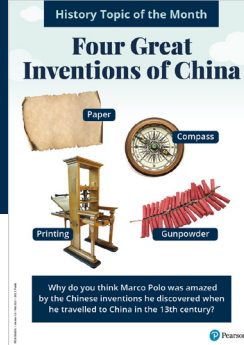
Evidence of woodblock printing on fabric has been found dating back to AD 220. But technology in China kept moving on! In c.1088 Shen Kuo wrote about a tradesman called Bi Sheng (AD c.990-1051) who invented what is called "movable type printing". This method used small ceramic blocks (called types), each containing a single letter or symbol. They are combined together to make an entire page of text which is then printed onto paper.

Shen Kuo described how moveable type printing worked:

"When [Bi Sheng] wished to print, he took an iron frame and set it on the iron plate. In this he placed the types, set close together. When the frame was full, the whole made one solid block of type... If one were to print only two or three copies, this method would be neither simple nor easy. But for printing hundreds or thousands of copies, it was marvellously quick."

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The quickness was the key! Before Bi Sheng, each page of a book still needed to be specially created on wood blocks. This meant it took a long time to create. But Bi Sheng's technique made printing huge numbers of books quicker and cheaper. Government officials quickly started using this technique to print their own documents.

Moveable type only arrived in Europe in the 1440s, when Johannes Gutenberg used it to start printing the Bible – all bibles before then were hand made. Like the Chinese, Gutenberg was able to use moveable type to print hundreds of bibles in far less time than it took to make one by hand.

Finishing with a bang: Gunpowder

The Chinese never stopped challenging themselves to invent things that would make their lives easier. That's what pushed a team of 9th century Chinese alchemists to try and find a chemical that would grant eternal life. They didn't find that: but instead discovered a fast-burning powder that had huge explosive power: gunpowder!

The *Zhenyuan Miaodao Yaolue* was a 10th century alchemy book that made the first ever reference to gunpowder: "Some have heated together sulfur, realgar and saltpeter with honey; smoke and flames result, so that their hands and faces have been burnt, and even the whole house where they were working burned down."

Alchemy is a sort of Medieval chemistry, where alchemists tried to change objects from one thing to another – most famously ordinary metals into gold.



Contributer: © Classic Image / Alamy Stock Photo

In this artwork the artist has taken artistic license by picturing the Chinese Emperor Yao Wang (Zhou Dynasty) using gunpowder to make loud noises to entertain his guests.

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By 1044 there were several formulas for creating gunpowder in China. It was quickly worked out that it could be used as a weapon. At first it was used to help light fire arrows. But soon – as the Chinese mastered working with iron and steel – it was used in cannons. Gunpowder did not start to appear in Europe for almost another two hundred years.

The invention of gunpowder also led to the invention of fireworks, with gunpowder being one of their main components. In traditional Chinese culture it was believed that explosive sounds of the fireworks would scare away evil spirits. Fireworks are widely used around the world today for celebratory events such as Chinese New Year.

In the 13th century, Chinese technology and discoveries were so far ahead of Europe in so many areas, and you can see why Marco Polo was so amazed when he arrived in China. The Chinese not only pioneered these four inventions that changed the course of human history, but they also made countless innovations in everything from hygiene to metal working. We owe many of the things that we would consider normal and every day to Chinese inventors – and although many of their names have been lost, their legacy will last forever.

Discussion points

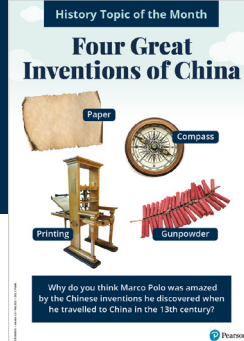
- Why do you think Marco Polo was amazed by the Chinese inventions he discovered when he travelled to China in the 13th century?
- Which of these Chinese inventions do you think has had the biggest impact on society today?
- Can you find 5 items that are made from paper and paper by-products today? You might be surprised by your findings!
- Why do you think the invention of the compass was so important?
- Do you know how to use a compass? Why do you think it is useful to be able to use one?
- What do you consider to be the four greatest inventions of the 20th century (1 January 1901 – 31 December 2000)?
- What date does Chinese New Year fall in 2021? What animal is symbol of the 2021 Chinese zodiac? What else can you find out about Chinese New Year?

About the author

Alistair Nunn, Pearson's Senior Product Manager for Humanities Teaching and Learning resources has a degree in History from Cambridge. He created this worksheet using various sources including Pearson's Key Stage 3 textbook and the websites included in our reading list.

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Reading list

Books

The Story of China by Michael Wood, September 2020

Marco Polo: From Venice to Xanadu by Laurence Bergreen, March 2009

A Short History of China by Gordon Kerr, January 2013

The Travels of Marco Polo by Marco Polo, (Everyman's Library Classics & Contemporary Classics) Hardcover – Illustrated, 21 Oct. 2008



Articles and Videos

[Four Great Inventions of Ancient China](#)

[China Highlights](#)

[Four great inventions](#)

[The Four Great Inventions of Ancient China](#)

[China Culture](#)

[Live Science](#)

[YouTube Video – The deadly irony of gunpowder](#)

