

5. Ancient China (3468 BC - 1279 AD)



General

Chinese civilization is the current civilization with the oldest direct origins. For more than 4,000 years, successive dynasties have developed an elaborate bureaucratic system, giving Chinese peasants a significant advantage over neighboring nomads and mountain dwellers.

Scientific and biological practices

- **Writing**

Bamboo has played a vital role in the development of Chinese culture and civilization. Young bamboo stems were used to make paper pulp.

Paper was certainly one of China's great discoveries. From the 3rd century BC, paper was being produced in Asia on a very small scale using a wide variety of materials. Mulberry bark paper is thought to date from the 2nd century BC. 1st century BC Silk, bamboo, linen, rice or wheat straw were used interchangeably.

Paper made from silk thus became the first luxury paper. Evidence of writing on silk from that time was found in the tomb of a marquise who died around 168 in Mawangdui (Hunan). The material was certainly more expensive, but also more practical than bamboo.



Figure 01 : Chinese Bamboo

- **Biology and medicine**

Already at that time, the Chinese had very important biological knowledge about various animals such as silkworms that they raised to make valuable textiles. The practice of sericulture

(breeding of silkworms) shows that the Chinese already had important knowledge in biology at that time. They were also very early interested in other insects (lacquer scale insects, crickets used in fighting), birds used for fishing and hunting, fish and domestic mammals

They gave the oldest known diagrams of human anatomy. For them the organism was summarized in 5 organs (Lungs, heart, liver, spleen and kidneys) in relation to the 5 cosmic elements (Wood, earth, metal, water and fire).

The practice of *Acupuncture* is one of the specific aspects of Chinese medicine.



Figure 02 : The Ancient Chinese Medicine

Many animals and plants have been cited by the Chinese in medicine, because of their therapeutic properties. Chinese popular belief is that the consumption of certain animals and insects allows the absorption of their attributes for example:

Flying squirrel: Feces were used to energize blood vessels if eaten raw and to stop bleeding if dried or fried.

Snake :They are found in jars, soaked in alcohol to consume. It is useful for treating stiffness such as arthritis.

They were also the first to use vaccination: they understood that by contracting a disease without dying from it, one could become immune to it.

- **Mathematical chinese**

In 200 BC, they invented the rod system.

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1	2	3	4	5	6	7	8	9

Figure 03 : The chinese rod System

- **Physical Chinese**

Physics is based on two principles: Yin and Yang (Yin: dark, cold, humid, feminine, odd; Yang: light, hot, dry, masculine, even) and on five elements: earth, fire, metal, water and wood. The two principles are in constant opposition and nature always seeks to restore balance.

- **Astronomy Chinese**

astronomy also sees a development. It deals with the symbolic interpretation associated with the different stars mentioned. They include the periodicity of eclipses.

Chinese inventions that changed the world

The four great inventions that changed the world are:

- The gunpowder,
- The magnetic compass,
- Mechanical watchmaking
- The printing.



Gunpowder

The mechanical Watch making



The magnetic Compass

The Chinese Printing



NB :

These techniques are all inherited from the Chinese empire. If modern science was born in 17th century Europe, many scientific inventions and discoveries were made in China and are now part of our daily lives.

The fruits of nearly thirty centuries of Chinese technological and scientific development were transmitted from the East to the West via Islamic civilization.

- Many other inventions were made by the Chinese such as:

the invention of the first seismograph by **Zhang Heng** who also invented the first rotating celestial globe; The Compass (Navigation instrument); Gunpowder made from potassium nitrate, sulfur, and charcoal;

- The Chinese discover what are usually called the Pythagorean theorems;
- Invented iron casting, which Europe only knew about in the 18th century ;

6. Indian Civilization (Around 200 - around 1200)



General

India has one of the oldest history in the world. First of all, let us clarify that the “historical” territory of India is not limited to the current borders but includes the subcontinent as a whole, that is, India, Pakistan and Bangladesh.

➤ **Scientific and biological practices**

Among the ancient Indians, the notions of human biology are reminiscent of those of the Chinese, they consider that the human body is composed of 5 elements: earth, water, fire, wind and space, which are found in nature and physiological phenomena are explained according to these elements.

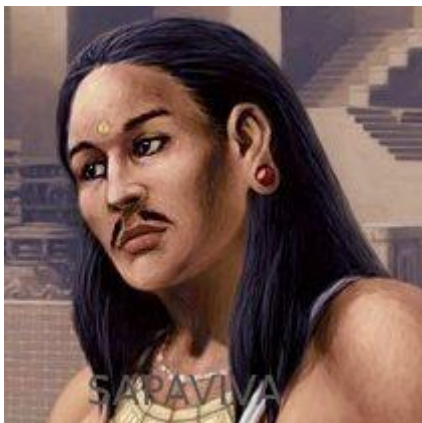
The science of life is at once philosophy, spirituality, medicine, and the art of living.

- Known in the history of science for the emergence of complex mathematics (Ganita). The decimal positional numbering, and the Indian numeral symbols, which will become the Arabic numerals will considerably influence the West. Mathematics Indians mastered zero, negative numbers, trigonometric functions as well as differential and integral calculus, limits and series, Arab-Indian numerals and positional decimal writing , so many innovations now universally adopted.

The main Hindu mathematician was: **Brahmagupta**

Who worked on number series and the definition of zero.

These mathematicians developed a series of words to express very large numbers, up to 10^{12} , and mastered irrational numbers and the square roots of 2 and 3 with several decimal places. They also discovered what is known as the Pythagorean theorem.



- **Chemistry**

They carried out remarkable work in iron smelting, which allowed them to cast large objects such as the Iron Pillar of Delhi, which is over 7 metres high and weighs over 6 tonnes. The special feature of this pillar is that it does not show any alteration or trace of rust

- **Medicine**

They discovered that some diseases were due to changes in the environment (change of seasons, poor hygiene, etc.), but they did not seek to classify diseases. The fundamental treatise of Hindu medicine is *the Ayurveda* (Science of long life).

Ayurveda

The latter explained that diseases are due to an imbalance and that thus to cure a patient, it is necessary to replace the harmful elements with those that are harmonious. In addition to Ayurveda, explanations on various °surgical operations are also present which lead us to conclude that surgery was advanced.



Indian System of Medicine (Ayurveda)

Sushruta (The father of Plastic Surgery)

He was an Indian physician and one of the first surgeons in history. He was the first to describe methods of plastic surgery. He taught his surgical methods to many students who first practiced on vegetables.



Sushruta (The father of Plastic Surgery)

Yoga

It is a school of Indian philosophy that was practiced in India from 2000 BC, a gentle medicine due to its beneficial effects on the mental and physical health of the practitioner.

- **Astronomy**

The Hindus attached great importance to astronomy, because of their deep belief in cycling, that is, the cyclical repetition of the course of the world and events. Their calendar uses a year of 12 months of 30 days (i.e. 360 days) and each day was divided into 15 hours (or moments) of day and 15 hours of night.

- **Biology**

They had empirical knowledge about biology, including animals, namely:

- Adaptation of freshwater fish to their habitats and observation of their reproduction periods.
- Ecological requirement of certain insects such as cochineal.
- Crossbreeding of different domestic animal
- In India, texts describe certain aspects of the life of birds.

7. Mayan Civilization

(Around 2600 BC to 1520 AD)



General

The Mayan civilization (present-day southern Mexico, Belize, Guatemala, Honduras and El Salvador) is one of the oldest civilizations known primarily for its advances in writing, art, architecture, agriculture, mathematics and astronomy. It is one of the most studied pre-Columbian civilizations.

The beginning of the Mayan civilization is dated to around 2600 BC. Its peak was reached around the 3rd century AD. Unlike its neighboring Inca, it did not constitute an empire in the sense that we understand it, with a single sovereign at its head. In reality, the Mayan population was divided into several cities, each governed by its own hierarchy, reigning over a territory of varying sizes.

And all these cities did not automatically speak the same language. The world knew almost nothing about the Mayans two hundred years ago. The forest had reclaimed most of their cities, and shortly after the Spanish conquest in the 16th century, the Mayans were and XVIIe Centuries ago, European priests burned almost all of the fig bark books left by the Maya.

Only four of them have been found. The geographical extent of the Mayan civilization covers for the most part lands located in tropical environments. This wild and inhospitable environment has not helped the preservation of the ruins left by the ancient Mayans. On the contrary, the encroaching jungle has systematically taken over the cleared spaces. The roots getting between the blocks, the growth of vegetation has caused the buildings to explode, often reducing temples and palaces to piles of stones.

In addition, the hot and humid climate has similarly contributed to the disappearance of constructions made of organic materials and other perishable objects that could have given considerably more information.

- **Mayan Society**

The Mayans are a group of peoples of Central America at the time of pre-Columbian civilizations. In Mayan society, we find the following orders: nobility, clergy (priests) and people. The nobility and priests live in the city, which was also the religious center. The people, made up of peasants, lived in the surrounding area.

Scientific and biological practices

- **Mayan writing**

It appeared 400 BC. (IV century BC), each word is represented by a drawing (ideographic principle). Then it gradually evolves towards a mixed form (ideographic and syllabic)

- **The stone**

Limestone is the most commonly used stone. Easy to work when extracted, it then hardens. But the limestone used was of poor quality and the inscriptions, victims of erosion, are now practically illegible.

Ceramics: Generally vases whose text informs us about the artist, the owner of the vase or even its contents;

Wood: This material being extremely perishable, only very rare examples in wood remain. - the cave walls: The excavations yielded inscriptions, painted or engraved.

The paper: The glyphs were painted on sheets of paper, about twenty centimeters wide and several meters long. The manuscript was folded like an accordion, each fold determining a "page" and written on both sides what is called the "**codex**".

Codex: Assemblage of leaves in tree bark, are first religious.

Written in Mayan writing, essentially calendars with astrological indications and drawings which testify to the great artistic sense of the Mayans

- **Architecture**

Mayan architecture is marked by the emblematic shape of stepped pyramids that can reach 60 meters. They were painted red (the color of blood), and represent the mountains from which kings and priests access the supernatural world that allows them to dialogue with the gods.

- **Mayan Art**

The art is very refined, the sculpture adorns the architecture until it completely covers it. There are frescoes in the temples and palaces that represent scenes of religious rituals, torture, human sacrifices, etc. They master the technique of ceramics which is used in daily life and religious ceremonies. The motifs represent women, animals, gods painted with bright colors

- **Astronomy**

When discovering the Mayan culture, one is struck by the enormous gap between the poorly developed general knowledge (the Maya ignore the wheel and the weighing system) and their extraordinary astronomical knowledge. The Maya were worshipers of the Sun, they wrote the Codex as a treatise on astronomy.

They developed the concept of the solar year (the time it takes the earth to make one revolution around the sun and which lasts 365 days) of the Mayan calendar is exact, more precise than the Gregorian calendar introduced in Europe in 1582 (Pope Gregory).

It was to calculate the movements of the sky, for example, that they developed their knowledge of mathematics. The Mayans perfectly mastered the concept of the number zero unlike the Greeks or the Romans. According to the eminent Mayan astronomers, the end of the world was predicted for December 21, 2012.

- **Medicine**

The Mayans used hallucinogenic plants for ritual purposes and to relieve pain; the plants were administered by priests (the equatorial region was very rich in plants). Mayan medicine was also expressed in the form of psychological and spiritual treatments accompanied by body manipulations.

- **Agriculture**

The Mayans invented terraced farming on the slopes of mountains, which were difficult to exploit. They cultivated corn, the yields of which were sufficient to avoid famines.