

## Ancient Chinese Astronomy

The Chinese people tended to use astronomy for practical purposes from the very beginning, unlike many of the other cultures studied here that focused mainly on religious aspects of the sky. However, they did develop an extensive system of the zodiac designed to help guide the life of people on Earth. Their version of the zodiac was called the 'yellow path', a reference to the sun traveling along the ecliptic. Like in Western astrology, the Chinese had twelve houses along the yellow path.

The first Chinese written records of astronomy are from about 3000 B.C. The first human record of an eclipse was made in 2136 B.C., and over hundreds of years of advanced sky-watching, the Chinese became very adept at predicting lunar eclipses. They followed a calendar of twelve lunar months, and calculated the year to be 365.25 days long. They translated this 'magic' number into a unit of degrees, by setting the number of degrees in a circle equal to 365.25 (as compared to our use of 360 degrees).

One of the famous observations made by Chinese astronomers was that of a supernova in the year 1054. They referred to this phenomenon in records as a 'guest star', and mention that it remained bright for about a year before again becoming invisible. This supernova created what we see today as the Crab Nebula. The explosion itself in 1054 was also recorded by the Anasazi Indians of the American Southwest, but for some reason there is no known record of this occurrence in European or any other cultures.

In order to mark the passage of time and the seasons, the Chinese primarily used the orientation of the Big Dipper constellation relative to the pole star in early evening. They were also the inventors of the first clock, a water clock which divided a day into 100 equal parts. During the Ming Dynasty, between the years of 1436-1449, an observatory was built in Beijing on the old city walls, and was filled with impressive bronze instruments.

## Ancient Egyptian Astronomy

One of the earliest advanced civilizations, Ancient Egypt, had a rich religious tradition which permeated every aspect of society. As in most early cultures, the patterns and behaviors of the sky led to the creation of a number of myths to explain the astronomical phenomena. For the Egyptians, the practice of astronomy went beyond legend: huge temples and pyramids were built to have a certain astronomical orientation. Although many of the religious aspects of Egyptian life were known for centuries, it was not until recently that a number of archaeoastronomers attempted to find out how important astronomy really was in ancient Egypt. Foremost of the archaeoastronomers, and one of the pioneers in the field, was Sir Norman Lockyer, a British astronomer who lived from 1836-1920 and extensively studied Egyptian astronomy. In his wonderful book 'The Dawn of Astronomy', Lockyer breaks ancient astronomy into three distinct phases. First, a civilization goes through the worship stage, where astronomical phenomena are viewed only as the actions, moods, and warnings of the gods. Next, a civilization progresses to using astronomy for terrestrial purposes, such as for agriculture or navigation. The final step is to study astronomy solely for the sake of gaining knowledge. The Ancient Egyptians started in the worship stage and eventually began to see how astronomy could help them in their everyday lives.

### Astronomical Worship

The Egyptian gods and goddesses were numerous and are pictured in many paintings and murals. Certain gods were seen in the constellations, and others were represented by actual astronomical bodies. The constellation Orion, for instance, represented Osiris, who was the god of death, rebirth, and the afterlife. The Milky Way represented the sky goddess Nut giving birth to the sun god Ra. In the picture below, Nut is shown bending over the Egyptians. The stars in Egyptian mythology were represented by the goddess of writing, Seshat, while the Moon was either Thoth, the god of wisdom and writing, or Khons, a child moon god. The horizon was extremely important to the Egyptians, since it was here that the Sun appeared and disappeared daily. A hymn to the Sun god Ra shows this reverence: 'O Ra! In thine egg, radiant in thy disk, shining forth from the horizon, swimming over the steel firmament.' The Sun itself was represented by several gods, depending on its position. A rising morning Sun was Horus, the divine child of Osiris and Isis. The noon Sun was Ra because of its incredible strength. The evening Sun became Atum, the creator god who lifted pharaohs from their tombs to the stars. The red color of the Sun at sunset was considered to be the blood from the Sun god as he died. After the Sun had set, it became Osiris, god of death and rebirth. In this way, night was associated with death and day with life or rebirth. This reflects the typical Egyptian idea of immortality.

## Astronomy of the Incas

The Inca empire was a powerful social organization which amazingly only lasted a century before the Spanish conquest of the New World. It began when a military leader named Pachacuti Inca Yupanqui brought western South America under one rule, following the demise of the earlier Huari and Tiwanaku cultures. The new empire was centered politically and spiritually at the city of Cuzco in the Andes Mountains, but it encompassed over 375,000 square miles. The society was very organized, with strict laws and demarcation of classes.

Astronomy played a key role in their culture, particularly due to the importance of agriculture.

The city of Cuzco was laid out in a radial plan which mimicked the sky and pointed to specific astronomical events on the horizon. Like Ancient Egypt and India, this was a horizon-based culture. The most important events to the Inca involved certain risings and settings of the Sun, Moon, and stars. For instance, when the Pleiades star cluster rose, it signaled the start of the Incan year. The Pleiades were called the Seven Kids after the seven brightest stars in the cluster, but the Inca were actually able to see 13 stars due to the clear atmosphere at the high altitude of Cuzco.

Astronomy was used extensively for agricultural purposes. The Inca built carefully oriented pillars on hills overlooking Cuzco, and when the Sun rose or set between the pillars, it was time to plant at a specific altitude. A whole range of pillars was employed so that the most accurate time-keeping was possible for the high altitudes, the valley floor, and everywhere in between. The people ritually made sacrifices to the Sun asking him to rise in the proper place for planting.

The astronomers recognized the planet Venus as the same whether it appeared as the morning or evening star. They believed that Venus was a servant of the Sun and was ordered to go ahead of or behind the Sun, but always remain close.

The Inca built observatories where they captured the first and last rays of the Sun through a series of specially placed windows. Their chief observatory was called the Coricancha, or 'golden enclosure', and was covered completely in gold. A gold sun disk faced the rising sun. As in the case of so many other New World sites, the gold was pillaged by the invading Spanish. A drawing of an Inca sun ceremony is pictured below.