Mayan Astronomy

In the Mesoamerican culture, the practice of astronomy was extremely important. To the Maya of Mesoamerica, this ancient science reflected order in the universe and the gods' place in it. This order reflected an inherent harmony present in their general religious view of the universe. To the Mayans, capturing the essence of time was of the utmost importance. In their cosmology, space and time were inevitably intertwined, as is evidenced by their complex calendar system that combines spatial attributes of the universe, such as animals and plants, with temporal movements of astronomical objects (such as eclipses and constellations). Although the Mayans never invented water clocks or other specific time-keeping devices, they used the sky as a method of measuring the passage of time.

Although the Maya appreciated the sky as a whole and its infinite dimensions, they were particularly interested in certain specific astronomical objects. The sun, the moon, Venus, and specific star clusters and constellations were most important. These objects were given the most attention by the priest-astronomers, who spent generations finding the precise paths of these objects across the sky and through the seasons.

The most important object in the sky is the sun, which is universally recognized as the prime life-giver on Earth. Tonatiuh, a red eagle with a large and all-seeing eye, was the god associated with the sun. Because of the tilt of the Earth's axis, the sun appears at different positions in the sky depending on the time of year. This tilt is what produces the seasons experienced on Earth. The Maya accurately calculated times when the sun would rise and set, and even more amazing, they determined the length of the solar year to be 365 days.

Mayan cities all show signs of astronomical orientation in the construction of buildings. Many of these were actually observatories that had special viewing windows set into the walls. Each window corresponded to a celestial event, for instance the rising of the star Sirius or the setting of the Pleiades. Buildings were purposefully aligned with bright stars like Capella and Sirius, or with Venus, or with the position of the sun's transit.
Mayan Cacao

Chocolate has a long and interesting history in Mesoamerica. From the very beginning of Mesoamerican culture some 3500 years ago, it has been associated with long distance trade and luxury. The Pacific Coast of Guatemala, thought to be the original source of Olmec culture, was, and remained, an important area of cacao cultivation. The Maya passed on the knowledge of cacao through oral histories, in Jade and Obsidian among other stonework, pottery and the creation of intricate, multicolored documents (codices) that extolled cacao and documented its use in everyday life and rituals, centuries before the arrival of the Spanish. In the centuries after initial contact between the Spaniards and indigenous peoples of the New World, hundreds of descriptive accounts, monographs and treatises were published that contained information on the agricultural, botanical, economic, geographical, historical, medical and nutritional aspects of cacao/chocolate.

Chocolate was made from roasted cocoa beans, water and a little spice: and it was the most important use of cocoa beans, although they were also valued as a currency. An early explorer visiting Guatemala found that: A large tomato was worth one bean, a turkey egg was 3 beans, 4 cocoa beans could buy a pumpkin, 100 could buy a rabbit or a good turkey hen, and 1000 a slave. Cacao beans were worth transporting for long distances because they were luxury items. In Maya times, one of the privileges of the elite (the royal house, nobles, shamans, artist, merchants, and warriors) was to drink chocolate.
Mayan Mathematics

General predictions concerning the placement of astronomical objects in the sky at a certain time were not necessarily difficult to make, considering that there was an entire crew of priest-astronomers who had the sky entirely memorized. However, it is a completely different story to make accurate and specific predictions about certain astronomical events. We have already seen how the Maya determined synodic periods of several objects with amazing accuracy. On the whole, these calculations were simply done by counting, for instance, the number of lunar revolutions in a certain time period. For more complex calculations, however, mathematics was invented.

The Maya mathematical system on which all this was based was incredibly advanced, and it was developed starting about 500 B.C.E. During the period of the Dark Ages in Europe, the Mayan system was more refined than any in the world at that time. They used a vigesimal, or base 20, number system, which seems foreign to us but is actually quite easy to use with practice. Mayan numbers consist of a series of dots and bars, where dots have a value of one and bars represent five. The numbers one through nineteen, and a series of glyphs representing the number zero, is shown in the picture below.

Our base 10 number system uses a decimal system based on powers of ten, i.e. 1; 10; 100; 1000; and so on. The Mayan system operated on exactly the same principles, except that the 'decimals' were based on powers of twenty, i.e. 1; 20; 400; 8000; 160000. An example of simple addition of a large number is shown in the figure below. The Maya also developed the concept of zero, which had immense benefit as a place-holder and vastly simplified basic arithmetic, along with making it possible to do more complex calculations.
Mayan Warfare

Archaeologists for a long time believed the ancient Maya to be gentle and peaceful people. We now know that Maya warfare was intense, chronic, and irresolvable, because limitations of food supply and transportation made it impossible for any Maya kingdom to unite the whole region in an empire. The archaeological record shows that wars became more intense and frequent toward the time of the Classic collapse. That evidence comes from discoveries of several types since the Second World War: Archaeological excavations of massive fortifications surrounding many Maya sites; vivid depictions of warfare and captives on stone monuments and on the ceramics and murals; and the decipherment of Maya writing, much of which proved to consist of royal inscriptions boasting of conquests. Maya kings fought to capture and torture one another.

Maya warfare involved well-documented types of violence: wars among separate kingdoms; attempts of cities within a kingdom to secede by revolting against the capital; and civil wars resulting from frequent violent attempts by would-be kings to usurp the throne. The affiliation of several cities changed with time, all of these events were described or depicted on monuments, because they involved kings and nobles. Not considered worthy of description, but probably even more frequent, were fights between commoners over land, as overpopulation became excessive and land became scarce.

Weapons used by the Mayans included: the bow and arrow, blowguns, spears, axes, and knives. All of which were primarily made with blades of volcanic glass rather than metals, and spear-throwing slings called ‘atatls’. Helmets were not common, and most armor was simply tight-woven cotton, with shields made of with animal skin, reed matting, or carved wood. Barricades and trenches were popular devices in Mayan warfare, and armies had an elaborate signaling system using whistles and drums. Indeed, much of the Mayan system of warfare was based on the element of intimidation and surprise – the war chieftains are known from wall paintings to have dressed in elaborate animal-inspired robes and headdresses; painting one’s body with religious insignia was also common before battle. Unfortunately for their enemies, the Mayans were keen on taking prisoners… for the express purpose of sacrificing them on a temple altar, in front of the entire tribe. The belief was that by eating the heart of an enemy warrior, you could gain a portion of that warrior’s strength.
Mayan Religion – 117 total male and female Deities

In mythological times, the deities underwent birth, stages of growth, rites of passage, transformations, death and rebirth. They created cornfields, planted and harvested corn, performed divinations, conducted business, fought wars, formed alliances and intermarried. From all of these actions and interactions a hierarchy was formed in which members had overlapping duties and responsibilities. The behavior of the deities was a model for appropriate human conduct and provided justifications and rationalization for elite activities, social hierarchy and political structure. Maya elites are frequently illustrated wearing the costumes of certain deities, including face masks in the likeness of the god. When humans donned the costume of a deity, they assumed the traits of the deity or were temporarily transformed into the deity. They also had alter Egos in animal forms as well as their gods had.

In the long darkness before creation, the Maya gods pondered the dawning of a new age and the making of a people who would give them honor. They sought yellow corn; they sought white corn, (Maize) for Mayans believed that these were the ingredients for the creation of man. Water was ground with the maize to yield blood and flesh. The gods had tried to create humankind before, but their first attempt at creation, the animals of the earth, could not praise their makers. When the gods formed humans of earth, they collapsed as mud; when the gods carved humans out of wood, the forms looked like people, but they could not worship the gods and so the gods destroyed them. The gods succeeded in populating the earth only when humanity was shaped from maize, the very staff of human life.

From the beginning of their recorded time, sometime in the first millennium B.C., the cycle of maize, the cycle of seasons, and the cycle of life guided the understanding of the world shared by Maya king and Maya peasant, man and woman, victorious warrior and humiliated captive, hunter and hunted. The primary creator god was likewise recognized as an aged Maize deity known, in pre-Spanish colonial times, as Itzamna.

Accordingly, humankind held maize to be sacred. During Classic times (A.D. 250-900), The Maize God figured prominently in Maya art. Recognized as young and beautiful, the image of the Maize God was the image emulated by Maya lords, many of whom donned his attire. Handsome young faces, multiple Maize Gods, formed ears of maize, their luxuriant tresses creating the corn slid, and a strand for every kernel. In life, maize plants sway to and from, their crisp green leaves moving like limbs of the human body; the Maize God, too, is in motion, often seeming to dance and sway. The Maize God wears enormous back racks in which small creatures are wedged among mat and feather frame; he often dances in the company of a tiny dwarf or hunchback.

One central aspect to Maya religion is the idea of the duality of the soul. The Maya saw one part of their soul as indestructible, invisible, and eternal. The Maya referred to this soul as "k’ul". The second soul is defined as the "supernatural guardian" or "protector": This is a supernatural companion, which usually takes the guise of a wild animal and shares life with a person from birth. The fates of the baby and the animal spirit are intertwined, so that what befalls the one affects the other.
Mayan Education

The Dresden Codex is one of four remaining "books" attributed to the Maya culture, which flourished in the Yucatan Peninsula, Guatemala and Belize centuries before the arrival of Europeans in the Americas. The book is not filled with words, but instead contains images with meaning known as Mayan hieroglyphs (Glyphs for short). The Dresden Codex is one of the most important original sources of information about Maya culture. Translations of the Maya glyphs in the document reveal that it was mostly about astronomy, religion and rituals. It is one of only four surviving Maya codices in existence. Mayan hieroglyphs are actually a combination of symbols using both logographs (words) and syllabic signs (units of sound).

The Dresden Codex, like other Mesoamerican texts, does not have leaves like a standard book: instead, it opens up like an accordion. There are 39 “pages,” each double-sided. It is about 20 cm high and 9 cm wide. When completely folded out, the codex is approximately 3.5 meters long. Like other codices preserved from the time, it was drawn on the prepared inner bark of a fig tree, which was then covered in a very fine layer of stucco to ensure a smooth surface. The drawings on the pages were done by no fewer than eight scribes over an unknown period of time. The text consists of glyphs alongside pictures: sometime red lines sub-divide a page.

The codex was used in the Maya world for a long time until the arrival of the Spanish in the early sixteenth century. The codex then somehow miraculously survived the zealous priests, who burned thousands of similar books. It is not known how or when the codex came to Europe, but it was purchased by the Royal Dresden Library in 1739 as part of a collection of ancient books from a private collector in Vienna. As dedicated researchers diligently studied the glyphs in the codices, stone carvings and pottery of the ancient Maya, the meaning of the codex began to become clear. It deals with the calendar, astronomy and rituals, particularly those rituals involved in the Maya New Year, which was an important event in Maya religion. The cycles of Venus, the Sun and Moon are included, as are prophecies for coming days and years. There is a section on good days for agriculture and a multiplication table. Much of the information was sound: the charts in the codex could have accurately predicted the movements until the end of the fifteenth century: some 200 years after the last date noted in the text.

The Dresden Codex is the most complete and best-preserved of the four surviving Maya codices. As such, it is a priceless resource for understanding Maya history and culture. As the Maya stone carvings tended to be about politics and war, the codices and their information about religion and prophecy are that much more priceless to Mayanists.

Mayan Architecture

The most famous of all Maya sites, Tikal was also the Economic and warfare Super Power of The Classic Maya world, and the largest City in America during the Classic era.

Tikal was the capital of a state that became one of the most powerful kingdoms of the ancient Maya. Though monumental architecture at the site dates back as far as the 4th century BC, Tikal peaked during the Classic Period, about 200 to 900 AD. During this time, the city dominated much of the Maya region politically, economically, and militarily, while interacting with areas throughout Mesoamerica such as the great metropolis of Teotihuacan in the distant Valley of Mexico. It often clashed, conquered, traded with and engaged with other cities in the region, and was prosperous until the general decline of Mayan civilization about 900 AD, at which time it was abandoned. Tikal at its height, was a dominating and important economic and political power in Mesoamerica, but fell into ruins as did all the other such centers around 800 – 1000 AD.

The pyramids at Tikal are turned to face one another, and the rooms which are built at the top of the pyramid have depressions in the stone walls that serve as amplifiers of the voice which are broadcast in all directions. At the top of the pyramid the priest acquired god-like qualities. The design of the Mayan architects is expressed in its fullness. Due to the stone resonators, the voice of a person at the top of one pyramid, speaking at a normal volume, can be heard by another person standing at the top of another pyramid some astonishing distance away.

The population of Tikal grew continuously starting in the Pre-classic Period (approximately 2000 BC – AD 200), and peaked with the population of an estimated 120,000 by the year 830 AD. This was followed by a sharp decline in population in line with the general Mayan collapse.

The lack of springs, rivers, and lakes in the vicinity of Tikal brings to light an amazing accomplishment: building a highly populous city with only supplies of stored seasonal rainfall. Tikal was able to prosper with intensive agricultural techniques which allowed the area to feed itself, but left it vulnerable to drought, which is thought by some to have played a role in the collapse of the Maya civilization. It is theorized that the most likely cause of collapse at Tikal is overpopulation and agrarian failure. The fall of Tikal was a blow to the heart of Classic Maya civilization, the city having been at the forefront for over a thousand years, with an ancient ruling dynasty. As Tikal and its hinterland reached peak population, the area suffered deforestation, erosion and nutrient loss followed by a rapid decline in population levels.
Mayan Decline

From the late eighth through the end of the ninth century, something unknown happened to shake the Maya civilization to its foundations. One by one, the Classic cities in the southern lowlands were abandoned, and by A.D. 900, Maya civilization in that region had collapsed. The reason for this mysterious decline is unknown, though scholars have developed several competing theories.

Some believe that by the ninth century the Maya had exhausted the environment around them to the point that it could no longer sustain a very large population. Other Maya scholars argue that constant warfare among competing city-states led the complicated military, family (by marriage) and trade alliances between them to break down, along with the traditional system of dynastic power. As the stature of the holy lords diminished, their complex traditions of rituals and ceremonies dissolved into chaos. Finally, some catastrophic environmental change--like an extremely long, intense period of drought--may have wiped out the Classic Maya civilization. Drought would have hit cities like Tikal--where rainwater was necessary for drinking as well as for crop irrigation--especially hard.

All three of these factors--overpopulation and overuse of the land, endemic warfare and drought--may have played a part in the downfall of the Maya in the southern lowlands. In the highlands of the Yucatan, a few Maya cities--such as Chichén Itzá, Uxmal, and Mayapán--continued to flourish in the Post-Classic Period (A.D. 900-1500). By the time the Spanish invaders arrived, however, most Maya were already living in agricultural villages, their great cities buried under a layer of rainforest and the majesty of their empire forgotten.
**Maya Political Structure**

The Ancient Maya shared a similar ideology and worldview, but they were never united as a single empire. Instead, the Maya lived in individual political states that were linked together through trade, political alliances, and tribute obligations. Some of these states were independent, while others were part of larger political hierarchies. The Maya states were initially governed by simple chiefdoms. By the Classic Period, Maya governance had taken on the form of powerful centralized leaders who legitimized their authority through their political connections and their divine lineages. Individuals who disobeyed their rulers faced severe punishment because the Maya people believed that obedience to their leader was critical to maintaining the harmony of the Maya universe. Human sacrifice had begun prior to the Classic Period, and was used as a tool of social and religious control to demonstrate the power of the ruler and the gods.

At the time of the Spanish conquest, the Yucatan was divided into 18 separate Maya states, with many smaller towns and villages under the jurisdiction of a capital city. Nine of these states were ruled by a single ruler called a halach uinic (or ahaw), while the others were led by councils of nobles of elite lineage or were allied with larger states. The halach uinic’s power was limited by his council (holpop) and special military and foreign advisors, but he was still considered to be the highest authority in his state and was required to be from an elite lineage. Rulers were succeeded by their sons, brothers, or a suitable candidate who was selected by the priests and council if no relatives existed.

Each of the Maya states had a supreme military commander called a nacom. The nacom served a three year term and was responsible for formulating military strategy and calling troops to battle. The individual states also had a high priest who led a hierarchy of priests, determined the dates for festivals and ceremonies, and foretold auspicious events for the ruler. The halach uinic appointed the batabs, who were the overseers and administrators of dependent cities and villages within the state. Batabs usually held administrative, judicial, and military authority over their towns, ensured that tribute was paid to the halach uinic, and supplied troops in times of war. Batabs were not paid tribute, but were supported by the people who lived in their town.

Hint – Although some cities had kings that made decisions and some had ruling groups of priests, remember that all of the city-states were tied together by cultural traits and trade and therefore were loosely connected to one another politically in the pre-colonial era.