

Of Mayans and Monarchs

By: Rick Poling

Many thoughts of Fall always accompany the arrival of September, but two in particular never cease to capture interest: of Mayans and Monarchs.

The Mayan civilization historically dates back to well before 1800 BC (some carbon dating suggests as early as 2600 BC), and it reached its peak in southern Mexico and Central America during the period of approximately 250 AD to 900 AD, when many large Mayan cities were completed and thrived. During this time, the Mayans had a fully developed written language, and their art, architecture, mathematical and astronomical systems were highly advanced even by modern standards. They were astute students of both daytime and nighttime skies, but they are most renowned for their precision in their study of "time." In fact, their calendar, known as a "Mesoamerican Long Count Calendar," begins on a date equivalent to August 11, 3114 BC, and is considered by many astronomers to be more accurately in sync with the movements of the planets and stars than the calendar we use today.

A glimpse of the extent of their mastery of astronomy, time and architecture is evident each September at El Castillo (The Kukulcan Pyramid) in the ancient Mayan city of Chichen Itzá on present-day Mexico's Yucatan Peninsula. El Castillo is a square-based, terraced pyramid that is 181 feet wide at the base and stands approximately 98 feet tall, with a ninety-one step staircase on each side. The four staircases, plus the final step up onto the massive stone platform at the top, provide a total of 365 stairs, one for each day of the year. The platform at the top also supports a temple, which accounts for the top 20 feet of the structure's overall height.

On the Autumnal Equinox in September of each year (and also on the Vernal Equinox in March of each year), at approximately 3:00pm in the afternoon, the Mayan's ingenuity behind the pyramid's design, placement and construction is demonstrated when the shadows produced by the sun create the appearance of a large snake crawling down the balustrade of the northern staircase from the top to the bottom of the pyramid. Other than those two times each year, this complex series and patterns of shadows are absent.

Imagine first acquiring and developing the understanding of astronomy and of the relationship of the sun and the earth necessary to fully understand intricate concepts of the solar and lunar calendars and the spring and autumn equinox. Imagine then designing a pyramid with a base wider than the width of a football field and the height of a ten-story building with a series of terraces and with geometric angles and shapes such that the sun striking the northwest corner of the pyramid two afternoons each year would produce shadows of seven isosceles triangles which, as the sun continues its movement across the sky, create the appearance of a serpent roughly 111 feet long that creeps downwards until it joins the huge serpent's head carved in stone at the bottom of the stairway. Imagine then precisely determining the structure's positioning on its site so that the sun would strike the pyramid exactly as designed on those exact times twice each year. And, imagine then building that massive structure, with all the necessary accuracy and precision, by cutting enormous stone blocks, transporting and elevating them into place, then fitting and securing each stone so that the entire work would endure fully intact for centuries to come.

Now . . . imagine doing all of that over a thousand years ago . . . because that's when it was done by the Mayans.

And, the Mayans correctly and fully understood our solar system and did all of this more than 600 years before western scientists and thinkers finally began to adopt the theory first advanced by Copernicus in the mid-1500s (and later championed by Galileo in the early 1600s) that the sun was at the center of our universe, not the earth, and that the earth therefore rotated around the sun rather than the sun around the earth. This Copernican Theory (also known as Heliocentric Theory) was so controversial at the time that the Roman Catholic Church officially decreed the theory to be “false and contrary to scripture.” In fact, Galileo, whom is often called “The Father of Modern Science,” was convicted of heresy by the Roman Inquisition in 1632 for his persistent defense of the theory, and spent the remaining ten years of his life under house arrest!

Although about as opposite of El Castillo in size and weight as it could possibly be, the Monarch butterfly is no less fascinating. Monarch butterflies begin life as eggs and hatch as larvae that eat their eggshells and, subsequently, the milkweed plants on which they were placed. The larvae transform into juicy, colorful caterpillars, then create a hard protective case around themselves as they enter the chrysalides (pupa) stage. They emerge from their cocoons as beautifully colored, black-orange-and-white adults. Their distinctive colorful pattern makes monarchs easy to identify, and also warns predators that the Monarchs are foul tasting and poisonous, largely as a result of the milkweed they nearly exclusively feed from as larvae.

Monarchs appear each summer across the United States and as far north as southern Canada. Each September, in our general latitude of North America, the Monarch butterflies east of the Rockies begin a journey of over 2,000 miles to an area of only a few square miles located west of Mexico City in the Mariposa Monarca Biosphere Reserve. There, up to a billion Monarchs will spend the winter in the very same pine-oak forest as they have annually for over a century.

That the Monarchs migrate such long distances is remarkable enough (they are even capable of trans-Atlantic and trans-Pacific flight from the Mariposa site), but what’s even more remarkable is that the Monarchs leaving our area this month will accurately navigate over 2,000 miles to a precise spot they’ve never been before . . . to the spot their “great grandparents” occupied the previous winter. Since the Monarchs that breed during the summer live for just two to five weeks, the Monarchs performing the migration each fall are three to four generations removed from those that made the same journey the previous year. The generation born in late summer/early fall, however, is a “super generation” – the one that makes the long journey to Mexico, overwinters there in a dormant state, and awakens in the spring to begin the mating process and migration back northward to U.S./Mexican border areas to deposit eggs that will form the next generation. This “super generation” can reach eight to nine months of age, and may have the greatest longevity of all butterflies.

How do they navigate with such pin-point accuracy over thousands of miles? Their navigation appears to be based on a combination of the position of the sun in the sky coupled with a time-compensated Sun “compass” which depends upon a circadian clock that is based in their antennae. In other words, they navigate based upon the shadows their antennae cast across their eyes, taking into account the changing angles of the sun as fall progresses.

So simple, yet so elegantly complex. Isn’t that the way most wondrous things are?

QUOTE OF THE MONTH: “The universe is full of magical things patiently waiting for our wits to grow sharper.” Eden Phillpots