

Mysteries of the ancients

Astronomers around the world are turning away from
their telescopes and towards our ancient past.
Simon Perks finds out more.

■ The Akhet of Khufu.
Image courtesy of Giulio Magli.

Deep in the forests of the Yucatán Peninsula lies the ancient Maya city of Chichen Itza. Dominating the site is a thirty-metre-high square terraced pyramid known as El Castillo, or “the castle”. Down the pyramid’s north-east flanks flows a steep stone staircase, its balustrade terminating in a pair of giant carved serpent heads. On the days around the spring equinox, the rays from the setting sun project the shadow of the corner of the pyramid onto the balustrade, presenting the unmistakable image of a giant snake descending from the summit.

But was this phenomenon created deliberately by the builders of the temple? Is it a representation of the serpent god Kukulcan? Does it have a symbolic calendrical function? Or is it nothing but a charming coincidence? Questions such as these lie at the heart of the growing field of archaeoastronomy, which explores how different cultures have related to the sky and, in particular, how astronomical phenomena have influenced these cultures’ physical structures and landscapes.

The stars in our lives

The movement of astronomical bodies through the heavens has formed an essential part of the

culture of most ancient civilisations around the world. The passage of the sun through the sky, together with its associated solstices and equinoxes, has long marked the progress of the agricultural year. And the cycles of the moon, the presence of different stars and constellations, and the appearance of the visible planets have all held immense practical, symbolic or religious significance.

It was, therefore, only natural for ancient cultures to mark these celestial events in their architecture and in the landscapes that they created. From the megalithic pillars of Stonehenge in the UK to the pyramids of Egypt, and from the pre-Columbian cities of Mesoamerica to the classical world of ancient Greece, structures have been sited, designed and built to interact with the astronomical realm.

Because of the ages of such monuments, though, any archaeoastronomical significance that they have has often been lost to the sands of time. And so it is the role of the archaeoastronomer to seek out such meaning and to explore its significance for the culture concerned. Probably the most common archaeoastronomical phenomenon is the alignment of

structures with the position of the sun at particular times of the year, such as the solstices or the equinoxes. The most spectacular of these produce intense hierophanies – manifestations of the sacred – like the serpent at Chichen Itza.

The how . . . and the why

By identifying and exploring the alignment of buildings and of man-made features of the landscape, archaeoastronomy can yield new insights into these structures and into the cultures that created them. It is not sufficient, however, simply to identify that a particular structure is aligned with, say, the sunrise on a certain day of the year. The archaeoastronomer also needs to show that the alignment was created deliberately.

Given that we are frequently dealing with structures whose creators – and the cultures to which they belonged – have long since departed this earthly realm, this is easier said than done. If we have a hundred examples of a particular structure and ninety-seven of them are aligned in some way with the sunrise on the summer solstice, then we can probably make a decent argument for this being deliberate. But if we only have one example of such a structure, we need to think

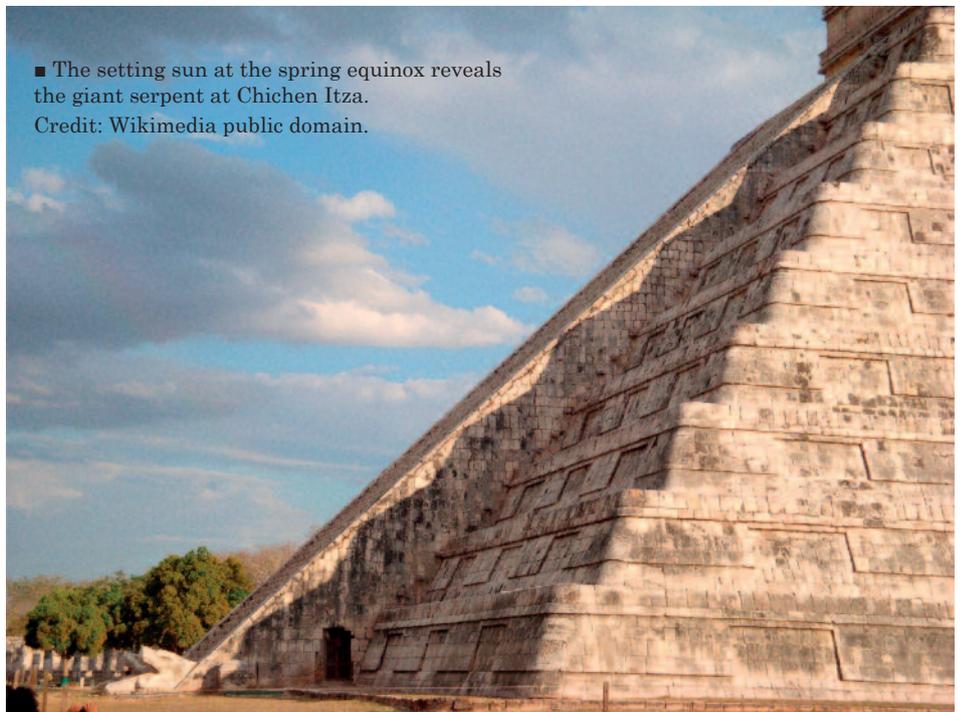
about why such an alignment might be important to the people who created it.

For this reason, archaeoastronomy is becoming increasingly embedded in the broader field of cultural astronomy, which takes a much more people-focused view of the role of the heavens in different societies and cultures, both ancient and modern. Indeed, says Steven Gullberg, Professor of Interdisciplinary Studies at the University of Oklahoma and the International Astronomical Union's world chair for archaeoastronomy, the disciplines of archaeoastronomy and cultural astronomy have much to learn from each other. "Archaeoastronomy brings the scientific principles from astronomy, while cultural astronomy leans more towards anthropology," he says. "Each side needs both."

New insights from current research

Archaeoastronomical research tends to focus on specific cultures or geographical areas, such as the Maya in Mesoamerica, the Inca in Peru, the ancient Egyptians and the peoples of Neolithic Europe. And this research is yielding profound new insights into the ways in which the people of these cultures lived, worked, worshipped and died. Indeed, it has become an essential tool for those who seek to truly understand them.

"Any study of the Mayan sites includes archaeoastronomy," says



■ The setting sun at the spring equinox reveals the giant serpent at Chichen Itza. Credit: Wikimedia public domain.

Professor Giulio Magli of the Politecnico di Milano in Italy, an archaeoastronomer with a particular interest in the relationship between the architecture of ancient cultures and the sky. "You can't understand anything about the Mayan sites if you don't understand archaeoastronomy." The helpful thing with the Maya, he adds, is that they left behind extensive written records, which explain the significance of the structures and cities they had built. This is in contrast to the Inca, much of whose written records were destroyed by the invading Spanish.

This is not to say that the Inca, and other cultures with no

contemporary written records, are not worthy of archaeoastronomical study. "The Inca are fascinating," says Steven Gullberg, whose PhD thesis focused on the cosmology of Inca *huacas*, sacred monuments that could range from a simple cairn of stones to intricate pyramids. The Inca were, he explains, masters of the effects of light and shadow, creating complex structures that would reveal their full intent only when lit by the sun on a certain day and at a particular time.

He tells the story of the carved rock formation at Kenko Grande, near to the city of Cusco in south-eastern Peru. Atop this *huaca*, two rough cylinders are carved onto a small plinth. They look unassuming and could easily be overlooked. Until the morning of the summer solstice and the days either side of it, when the light from the rising sun passes through a small fissure in a nearby rock and illuminates the cylinders so that their shadows project the ears of a cat-like creature and the tops of the cylinders themselves glow like its eyes. Known locally as "the awakening of the puma", the precise purpose of this carving is unknown. But the veneration of the puma by the Inca people is well-recorded and the jungle cat features strongly in Inca folklore.

Projections of power

While the archaeoastronomy of individual sites is fascinating in its own right, it is what it tells us about the cultures that created these sites

▼ The carved rock formation at Kenko Grande. Image courtesy of Steven Gullberg.



Archaeoastronomy resources

If you'd like to learn more about archaeoastronomy, Giulio Magli runs an introductory course online at www.coursera.org/learn/archaeoastronomy. Access to the course materials is free.

Useful introductory books are:

- *Echoes of the ancient skies: The astronomy of lost civilisations*, by Edwin Krupp.
- *Stairways to the stars: Skywatching in three great ancient cultures*, by Anthony Aveni.
- *Archaeoastronomy: Introduction to the science of stars and stones*, by Giulio Magli.

The main professional bodies for archaeoastronomers are the International Society for Archaeoastronomy and Astronomy in Culture (ISAAC), the European Society for Astronomy in Culture (SEAC) and the Inter-American Society for Astronomy in Culture (SIAC).



▲ The “awakening of the jaguar” at Kenko Grande is revealed.

Image courtesy of Steven Gullberg.

that is of even greater interest. And in many cases, this comes down to power. “To understand the archaeoastronomy of a site is to understand its relationship with power,” says Giulio Magli. In many cultures, the power of the ruler was seen to come directly from the heavens. And the alignment of sacred structures with the sun and other heavenly bodies was often used to legitimise and to reinforce this power.

In Egypt, for example, the pyramids of Khafre and Khufu at Giza have a terrace between them, which forms an artificial horizon. In the days around the summer solstice, the sun rises between the two pyramids, forming a real-world representation of the hieroglyph *Akhet*, a sun rising between two mountains, which denoted the place where the dead prepare themselves for the afterworld. Furthermore, the name of the pyramid complex is known to have been ‘The Akhet of Khufu’. The effect of the sunrise at

the summer solstice is to spell out the very name of the structure that creates it and to cement the relationship between the Pharaohs entombed within the pyramids and Ra, the mighty sun god.

Overcoming barriers

While archaeoastronomy has much to teach us about ancient sites and cultures, integrating this relatively new discipline into more traditional archaeological research has been less than straightforward. There has, it is fair to say, been a certain amount of resistance from mainstream archaeologists and anthropologists, who are hesitant to regard archaeoastronomy as a scientific discipline in its own right.

This has not been helped by the publication of various pseudo-scientific archaeoastronomical theories, which generate widespread media interest but are sadly unsupported by much in the way of evidence.

The way in which archaeoastronomers approach their work can also be a barrier to effective interdisciplinary working. “Astrophysicists are reductionists,” says Professor Jarita Holbrook, a cultural astronomer at the University of the Western Cape in South Africa. “But you can’t do this when you’re working with people. Anthropologists deal in anecdotal data. Subjective knowledge is key. But this is anathema to astronomers”. But progress is most definitely being made, with researchers increasingly recognising the value that working with archaeoastronomers can bring. “Our field absolutely needs collaborations from outside the field,” says Holbrook.

Indeed, archaeoastronomy is well on the way to establishing itself as a scientific discipline in its own right. But it is when archaeoastronomers, archaeologists and anthropologists set aside their differences and work together that the secrets of sites like the Egyptian pyramids, the Inca *huacas* and the giant serpent at Chichen Itza can be revealed.

Simon Perks is a science writer and amateur astronomer based in Somerset.



■ The pyramids at Giza.
Image courtesy of Giulio Magli.