Solving an ancient mystery

A 3200-year-old sanctuary may have acted as a calendar that was centuries ahead of its time, finds Colin Barras

FOR 3200 years they have guarded their secret. The deities carved in limestone near the ancient city of Hattusa are as enigmatic as they are beautiful.

Perhaps no longer. A controversial theory suggests the ancient carvings may have functioned as a calendar, with a level of sophistication way ahead of its time. "It's not only a striking idea, it's reasonable and possible," says Juan Antonio Bernal of the Institute of Astrophysics of the Canary Islands, Spain, who wasn't part of the work.

Hattusa was the capital city of the Bronze Age Hittite empire, based in what is now Turkey. A few kilometres to the north-east of Hattusa are the ruins of an ancient religious sanctuary centred on a large limestone outcrop.

Archaeologists believe it was one of the holiest of Hittite sites, but its exact purpose is unknown. Even its original Hittite name is a mystery: today it is known simply as Yazılıkaya, a Turkish term meaning "inscribed rock". "Yazılıkaya has an aura to it," says Eberhard Zanger, president of Luzian Studies, an international non-profit foundation. "Part of it is because it's an unsolved enigma, part of it is the beauty of the place."

The site has been described as the Sistine Chapel of Hittite religious art for the quality of the rock carvings preserved there. Yazılıkaya and Hattusa have UNESCO World Heritage Site status; the carvings on the rock have been studied by scholars for decades. But according to Zanger, they all overlooked something.

On the northern wall of a roofless limestone chamber at Yazılıkaya, there is a panel on which the carvings of 30 deities corresponded to the lunar cycle and marked a lunar month, which contains on average 29.53 days. At the beginning of the month, the marker would be placed beneath the deity at the front of the procession, and each day the Hittites shifted it one deity backwards. (Local hieroglyphs are always read in the opposite direction to the way any figures or faces are looking.)

Significantly, says Gautschi, if the Hittites started the month with a new moon then, on the night of a full moon, the marker would always lie below one of two unusual bull-like figures in the procession who together hold up a large dish. The researchers say it would make sense for the Hittites to pay particular attention to the full moon because it was the one part of the month in which some call Yazılıkaya in Turkey the Sistine Chapel of Hittite religious art which the supreme couple among Hittite gods are carved. On the western and eastern walls, more carved deities form two long processions marching towards the supreme couple. The eastern procession currently contains 17 deities, but Zanger and his colleague Rita Gautschi at the University of Basel, Switzerland, argue there were originally two more based on engraved symbols and deity-shaped gaps.

The western procession is divided into two groups: one containing 20 deities and the other 30. Finally, there are curious horizontal benches carved into the rock below each procession.

Zanger and Gautschi suggest the Hittites used the carvings as a calendar, keeping time by moving heavy stone markers along the benches beneath the processions. They believe the procession of 30 deities corresponded to the lunar cycle and marked a lunar month, which contains on average 29.53 days. At the beginning of the month, the marker would be placed beneath the deity at the front of the procession, and each day the Hittites shifted it one deity backwards. (Local hieroglyphs are always read in the opposite direction to the way any figures or faces are looking.)

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when a portentous lunar eclipse might occur.

The marker lay below the deity at the rear of the procession, the month was up and the Hittites would have moved the marker back to the front of the procession to start again, say the researchers. At the same time, the Hittites moved a second marker that lay below the procession of 12 deities, and so helped them track the passing months.

But performing these two operations alone isn’t enough to make an accurate calendar, because 12 lunar months add up to only about 354.36 days. The calendar can be brought roughly back in line with the solar year—about 365.24 days—by adding a 13th “intercalary” month every third year, meaning a total of six additional months are added over an 18-year period. Even then, however, the calendar still drifts.

This drift can be largely removed by adding an additional intercalary month every 19th year—making the timepiece run on what is known as the Metonic cycle. Zanger and Gutscheon suggest that the Hittites used the procession of 19 deities on the eastern wall to keep track of this.

They think a stone marker was moved along this procession once a year to help the Hittites work out when to add extra months over a 19-year cycle.

(“Journal of Skyscape Archaeology,” DOI: 10.1588/jaa.37641.)

We know from earlier texts that the idea of three-year intercalation dates back a couple of millennia before Yazılıkaya was built. But conventional wisdom is that it was only about 2,500 years ago that the more sophisticated Metonic cycle came into widespread use.

“[A]s we would probably not expect knowledge of the 19-year cycle in the 2nd millennium BCE,” says Gutscheon. “If the Hittites did follow such a calendar, they must have been influenced by exceptional astronomers.

It isn’t impossible that there was a Hittite equivalent of the astronomer Kepler in Hattusa at the time, says Ian Rutherford, a classicist at the University of Reading, UK. But he says it is odd that there are no traces of such an astronomer in the vast archives of ancient texts that have been discovered in Hattusa. It is one reason why he is sceptical — although open-minded — about the calendar idea.

Belmonte, however, is enthusiastic. He has previously shown that many Hittite buildings are aligned to important astronomical events like the summer solstice. He enquires about the relationship between the Yazılıkaya and the eastern wall.

“They think a stone marker was moved along this procession once a year to help the Hittites work out when to add extra months over a 19-year cycle,” says Gutscheon. “I had this in front of my eyes and I was unable to see it,” he says.

Other astronomers are more cautious. “The numbers in play—12, 30 and 19—are astronomically suggestive,” says Edwin Krupp, director of the Griffith Observatory in Los Angeles. But he says that is far from proof that the site served as a calendar—a point he adds that many of the deities depicted at Yazılıkaya have their names carved into the rock.

The calendar idea would suggest that each deity name would be associated with a particular day of the month or month of the year, says Krupp—but he points out there is little in the Hittite texts to suggest this was the case.

Researchers believe ancient Hittites used 12 deities to mark the passing of lunar months.

Gutscheon is keen to stress this.

Krupp also sees a couple of problems with the calendar idea. Because of the location of the site, it is difficult for him to be sure the deities were originally contained in 19 deities. If there were just 17 then, the Metonic-like pattern breaks down.

What’s more, many of the deities depicted at Yazılıkaya have their names carved into the rock. The calendar idea would suggest that each deity name would be associated with a particular day of the month or month of the year, says Krupp—but he points out there is little in the Hittite texts to suggest this was the case.

In fact, says Rutherford, the Hittite written records seem to paint a picture of a society that was remarkably unconcerned about the heavens. “It may have something to do with the climate: it rains a lot in the Anatolian highlands,” he says. Cloud cover might have impeded careful astronomical observations.

But Zanger thinks Hittite scholars place too much emphasis on the texts. For instance, archaeological evidence shows the Hittites were impressive hydraulic engineers, but Zanger says they left no records on the subject.

“Hittite society consisted of more than is reflected in the documents,” he says. “Perhaps the carved stones really are just gods walking in a certain sequence—but there seems to be so much more to it.”

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