

Did ancient astronomers build Stonehenge?

By Dan Falk

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The driving force behind the building of Stonehenge was likely more theater than science.

Some 5,000 years ago, ancient Britons erected a vast circular embankment between the low hills of England's Salisbury Plain. A few centuries later, after several spurts of additional construction, a central circle of 40-ton upright stones stood capped by 10-ton horizontal "lintels." This is Stonehenge, one of the greatest achievements of prehistoric Europeans.

Why did ancient peoples put so much effort – some millions of work-hours – into this and other, similar constructions? Stonehenge and its brethren clearly were important. They often show evidence of astronomical alignments. But how many of these alignments were deliberately designed into the monuments? Were they, in any meaningful sense, Stone Age observatories? What answers scientists can give to these questions haven't come easily.

Guidebooks warn first-time visitors to keep their expectations in check when they visit Stonehenge. A towering monument in our imaginations, the stones often seem surprisingly small in real life. "Sometimes you bring people up here, and it actually doesn't look like much," says David Batchelor, an archeologist with English Heritage who showed me around Stonehenge on an early-morning visit last spring.

"Some days it almost shrinks into the landscape; other days it just stands out," says David Batchelor as we walk towards the world's most famous prehistoric stone structure. Batchelor, an archaeologist with English Heritage, the agency responsible for protecting and promoting Stonehenge, showed me around the monument early one spring morning. He explained that weather conditions dictate how imposing the stones appear.

I suspect the most important factor is simply one's distance. From the low rope barrier that marks the closest approach for most visitors, the stones do, indeed, seem less than spectacular.

Earthmoving

Only when one comes right up to the monument's massive vertical stones does its magnitude really hit home. Batchelor points to the outer circle of large upright stones, the so-called sarsen circle. The builders of Stonehenge, he says, moved these stones from quarries up to 25 miles (40 kilometers) away.

Just inside the sarsen circle is a smaller concentric ring of upright "bluestones." "These are the ones that come from the Preseli Mountains in southwest Wales," Batchelor explains, referring to a mountain range more than 150 miles (240 km) away. One can only imagine the effort required to drag so many massive stones such an enormous distance.

While Stonehenge is the best known and, perhaps, the most impressive Neolithic monument, it's hardly alone. Hundreds of equally ancient stone structures, known as "megaliths," occur across Britain, Ireland, and northwestern Europe. A few sites, such as nearby Avebury and Callanish in northwestern Scotland, rival Stonehenge in size and sophistication.

For centuries, scholars have speculated on the purpose of these ancient structures. Perhaps the most commonly expounded theory — and the one that has taken root most deeply in the popular imagination — is the notion that these monuments were astronomical observatories used to help track the motions of the Sun, Moon, and stars. This claim always has been controversial. It's enlightening to compare the rather cautious reflections of archaeologists and archaeoastronomers today with the often wild speculations of earlier decades.

Trilithons and bluestones

Let's start with Stonehenge itself. The largest stones are arranged in an arc at the very center of the monument. They consist of five enormous "trilithons," each made from two massive uprights and capped with a horizontal lintel. They're laid out like a horseshoe, with the axis of symmetry lying along a southwest-northeast line.

That axis, astronomers long have recognized, aligns with the spot on the northeastern horizon where the Sun rises on the longest day of the year — the summer solstice. The axis also passes by an outlying rock — the so-called “heel stone” — to the monument’s northeast.

One can imagine a Neolithic observer, watching from the center of Stonehenge, using the heel stone as a kind of gunsight to track the rising Sun on the summer solstice. Likewise, an observer at the heel stone could have watched the Sun set over the monument on the winter solstice.

As Colgate University archaeoastronomer Anthony Aveni puts it, Stonehenge probably was “a Sun temple from its very inception.” This basic alignment seems beyond dispute. But Batchelor says scholars continue to debate whether the monument’s builders worshipped at midsummer, midwinter, or both.

The orientations of other nearby structures from the same period, many of which also appear to display a solar alignment, offer support for the interpretation of Stonehenge as a Sun temple. Even the area’s older structures, such as the “long barrow” tombs that pepper the surrounding countryside, typically display a solar orientation, albeit a less precise one. Most align east-west, with the entrance pointing roughly east. But the actual angles cover such a wide range that some scholars suggest they reflect a lunar, rather than a solar, orientation.

A light in the dark

The British Isles’ oldest megalithic structure shows an unambiguous solar orientation. This is the “passage tomb” of Newgrange in County Meath, Ireland, a structure that dates from about 3100 B.C.

From the outside, Newgrange looks like a wide, low, circular earthen mound. A narrow passageway stretches some 80 feet (24 meters) inside. At the tomb’s far end, three small alcoves branch off from the main passage. On the morning of the winter solstice, sunlight streams through a small opening above the main entrance and illuminates the back of the tomb.

The chances of this solstice alignment being accidental are minute, says astronomer Tom Ray of the Dublin Institute for Advanced Studies, who investigated Newgrange's geometry in the 1980s. Today, on the solstice, several minutes pass between sunrise and the first penetration of light into the tomb. This delay is the result of changes in Earth's axial tilt over the past 5,000 years. When Newgrange was built, Ray explains, the summer-solstice Sun would light the passageway exactly at dawn. There's no question the solar alignment was the intention of its builders, he says.

But unambiguous alignments, like the solstice axes at Newgrange and Stonehenge, are the exception rather than the rule. Most other claims of astronomical alignments — especially those involving the Moon or the stars — are more problematic.

Some scholars have argued that the trilithons at Stonehenge could be used not only to track the Sun, but also to monitor significant moonrises and moonsets throughout the year. That's certainly possible — such claims hardly can be disproven — but the evidence is much less clear than with the solar alignments.

Stone Age astronomers?

Other scholars point to the ring of 56 chalk-filled holes at Stonehenge (known as the Aubrey holes), just inside the outer embankment, which archaeologists believe once held upright wooden posts. A few eager writers have claimed the posts served as an analog calculator, allowing Neolithic priests to predict eclipses.

The idea that Stonehenge's builders could use the monument to predict eclipses has fallen in and out of fashion several times over the last few decades. In general, though, archaeologists treat the notion with far more skepticism today than in the 1960s and 70s, when a few authors went to great lengths to expound on astronomical uses for Stonehenge and other Neolithic monuments.

Some scholars express downright embarrassment when they think back to the runaway enthusiasm for “ancient astronomers” in those days. Archaeologist and archaeoastronomer Clive Ruggles, now retired from the University of Leicester, wrote that it “forms one of the most notorious examples known to archeologists of an age

recreating the past in its own image.” He added that there is “no reason whatsoever to suppose that at any stage the site functioned as an astronomical observatory — at least in any sense that would be meaningful to a modern astronomer.”

The problem is largely one of design versus chance. Certain stones may be aligned with certain astronomical phenomena, but what evidence is there that such alignments are more than mere flukes? With enough stones and enough celestial “targets” — the rising or setting position of a particular bright star, for example — alignments become inevitable. As archaeologist Aubrey Burl, retired from Hull College of Higher Education, wrote: “Statistically, the odds are in favour of a good celestial sight-line occurring fortuitously in almost any circle.”

Some of the more extravagant claims involve Callanish, sometimes called “The Stonehenge of Scotland.” Dramatically situated on a cliff on the Isle of Lewis in the Outer Hebrides, the location may have been chosen “because it allows the viewing of a dramatic interaction between the landscape and the movements of the Moon,” says archaeologist Patrick Ashmore of Historic Scotland, the agency responsible for the monument. He believes people gathered at the site at intervals of 18½ years, when the Moon would have reached its southernmost sky position.

Other scholars suggest that one of the monument’s rows aligns with the rising of the Pleiades star cluster (M45). Remarkably, that phenomenon is mentioned by the Greek historian Diodorus, in reference to a “spherical temple” somewhere in Britain. But, as usual, the evidence is ambiguous: There’s no way to know if Diodorus was referring to Callanish, and no proof the Pleiades alignment is anything more than a geometric quirk.

Consider the Drombeg stone circle in County Cork, Ireland. As with Stonehenge, the circle’s main axis often is claimed to be aligned with the Sun’s solstice position. Yet, southwest Ireland hosts some 50 stone circles, and none of them shares this alignment. If astronomy was guiding the builders’ thinking, why is the solstice alignment seen only at Drombeg?

No doubt, the Neolithic builders who erected Stonehenge and the other great megalithic monuments were conscious of — and may have followed closely — the movements of heavenly bodies. But it is not at all clear that astronomy was their foremost concern in placing the stones.

A monument for the ages

Archaeologist Timothy Darvill of the University of Bournemouth acknowledges that the orientation of Stonehenge's main axis gave the structure "some sort of astronomical role in the lives of its builders." But he's more interested in the relationship between the monument and the surrounding landscape. The design, he says, may be largely symbolic, inspired as much by the "sacred geography" of the region as by the sky.

The area's many burials suggest that Stonehenge was, at least in part, a ceremonial center — a place where men and women gathered to pay tribute to their ancestors. Neolithic peoples also may have paused to honor the Sun and Moon, and to mark the seasons. Such activities involved the motions of heavenly bodies, but did not require precise observations.

It's difficult to disentangle religious observance from cosmology, especially when celestial bodies likely were objects of devotion. But Aveni suggests it isn't necessary. Stonehenge, he writes, is best thought of "as a place of social gathering, of religious assembly, as a cultic center, as a place of fortified habitations, a celestial temple, and observatory."

All of these definitions crosscut one another. Perhaps, at different times, the ancient skywatchers stressed some meanings more than others. After all, this was a cultural center that retained its importance for millennia. Aveni agrees they may well have tracked celestial bodies. But he adds: "I am convinced that if Stonehenge has anything to do with lunisolar astronomy, the association between its Neolithic builders and the sky is more closely allied with theater than with exact science."

Unfortunately, the builders of Stonehenge had no written language. No Rosetta Stone will fill in the blanks of their story. Visitors to Stonehenge and the other Neolithic

monuments will continue to marvel at the stones, knowing that a final answer will probably never come.

“It’s amazing,” says Batchelor as we leave the inner circle. “I’ve worked here for 15 years, and I still get a tingle when I come inside. I can’t define it, but there is something very special here.”