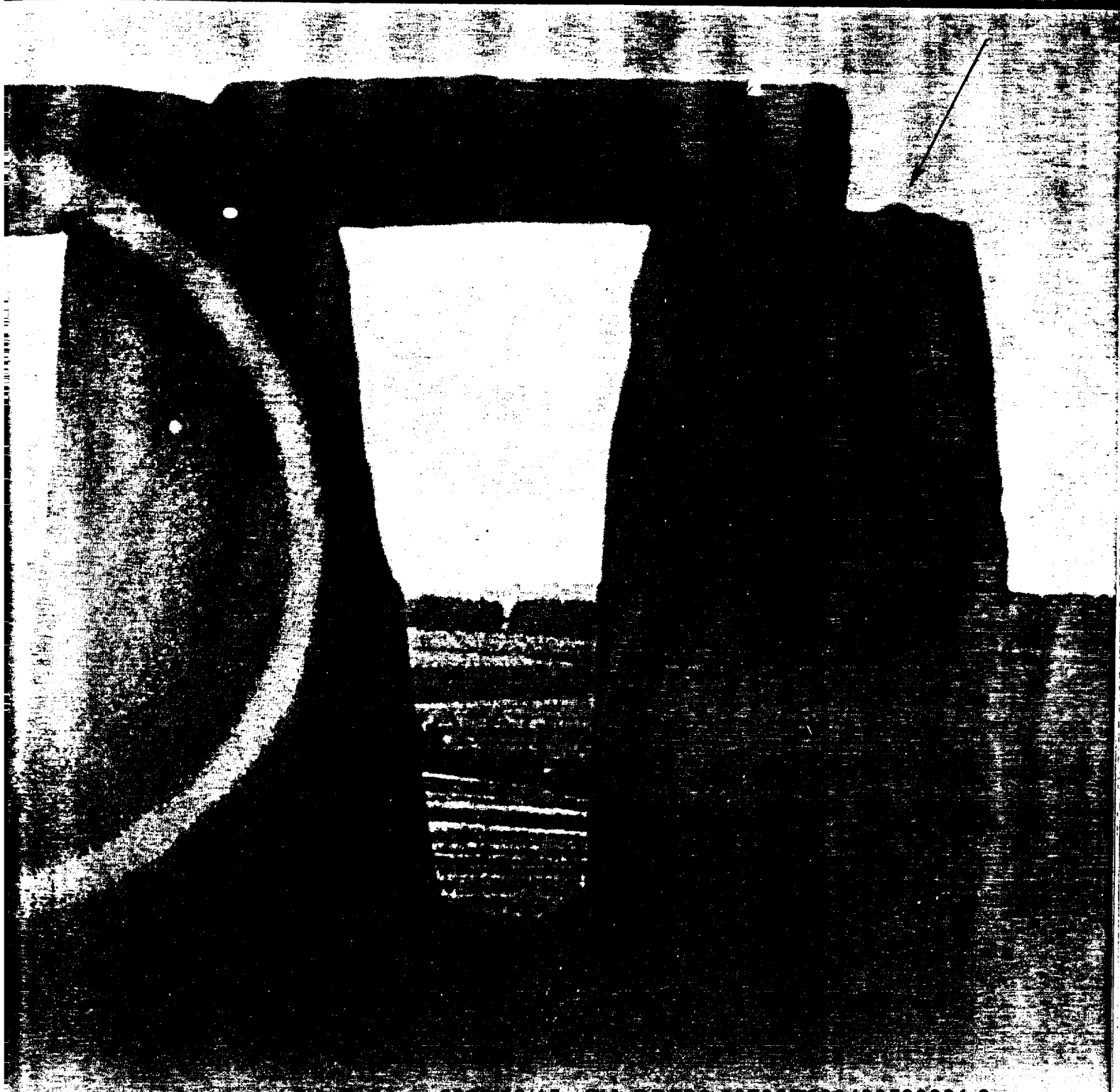
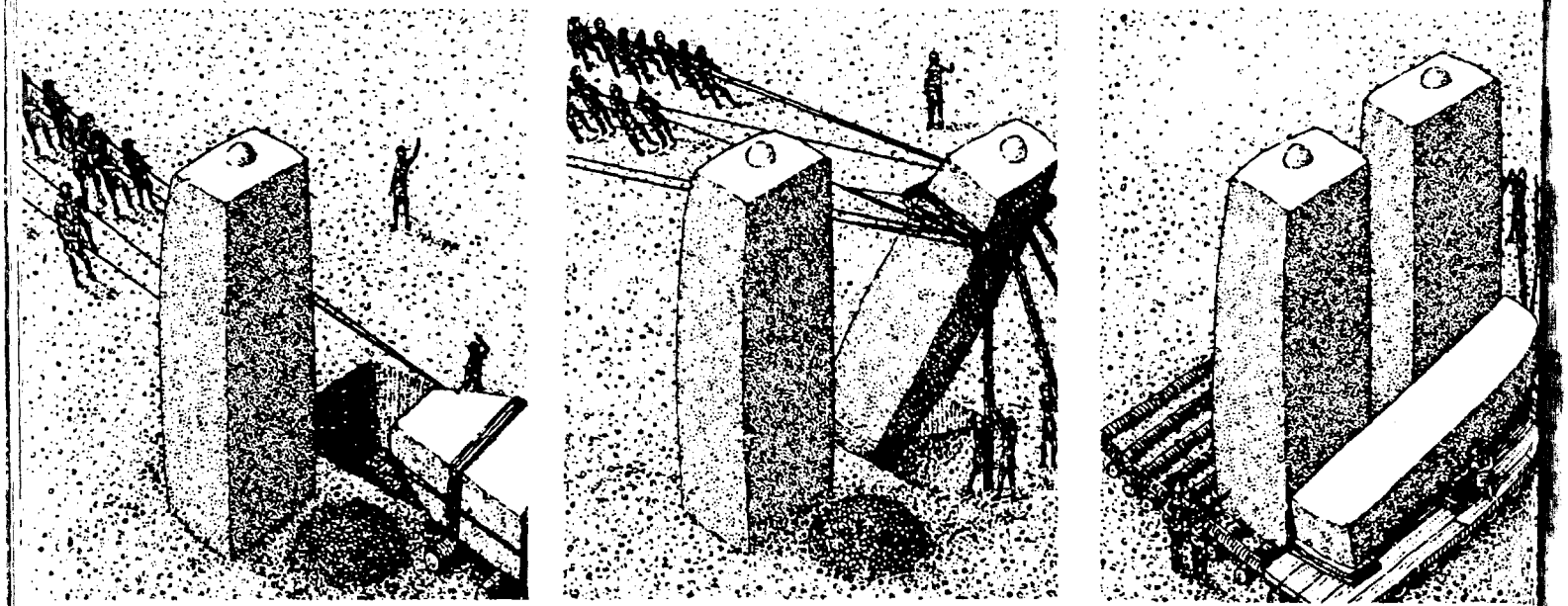
WHO RAISED THE MEGALITHS?



One of the mysteries of Stonehenge is how the huge stones were placed in position. The drawings below explain a possible method of erecting a trilithon. For each of the uprights a hole is dug; then the stone is hauled into position on rollers, the bottom end is tipped into the hole, and the stone is heaved into vertical position by hundreds of men on long ropes. The lintel stone is then raised by levers, in small stages, as a platform is built up under it; finally it is moved sideways until mortises on its underside fit into the tenons on the tops of uprights.

The total lack of agreement among the experts hardly inspires confidence: if Stonehenge was so manifestly a structure designed for predicting eclipses, there should be at least some meeting of minds on how it was done. In 1857, in order to settle whether cuneiform had really been deciphered, the Royal Asiatic Society challenged scholars to submit translations of a newly discovered inscription; four did so, the results were found so alike that there could no longer be room for doubt, and the issue was declared settled. When the astronomers who have been studying Stonehenge come up with at least convergent ideas, then we may be readier to believe that its priests knew how to predict eclipses.

its original position, one is fallen flat, and two have disappeared.) Newham and Hawkins point out that the short sides of the rectangle are parallel with Stonehenge's main axis. So, when one looks along them to the northeast, one sights, just as along the axis, upon the point of midsummer sunrise. If one looks along them in the opposite direction, toward the southwest, one sights upon the point of midwinter sunset. And the line of the long sides marks, in the southeast direction, the southernmost point at which the full moon rises at midsummer, and, in the northwest direction, the northernmost point at which it sets at midwinter. Both men were struck by the same idea as to why Salisbury Plain was chosen for



MICHAEL CRAIG, *THE ATLAS OF EARLY MAN* BY JACQUETTA HAWKES – DORLING KINDERSLEY, LTD

Happily, some of Hawkins' findings do converge with those of another student of Stonehenge, although he was unaware of it. Stonehenge offered sightlines, Hawkins argues, not only for the midsum-

the site; at its latitude the lines of midsummer sunrise and moonrise cross at right angles and so a rectangular disposition of observation points is possible.

The claim that Stonehenge was so sophisticated an

veloped the skill to identify these
erable accuracy.

If, then, this unique megalith
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tions, what of its humbler relat
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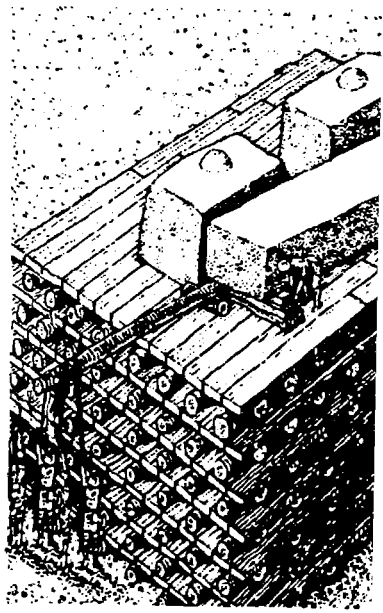

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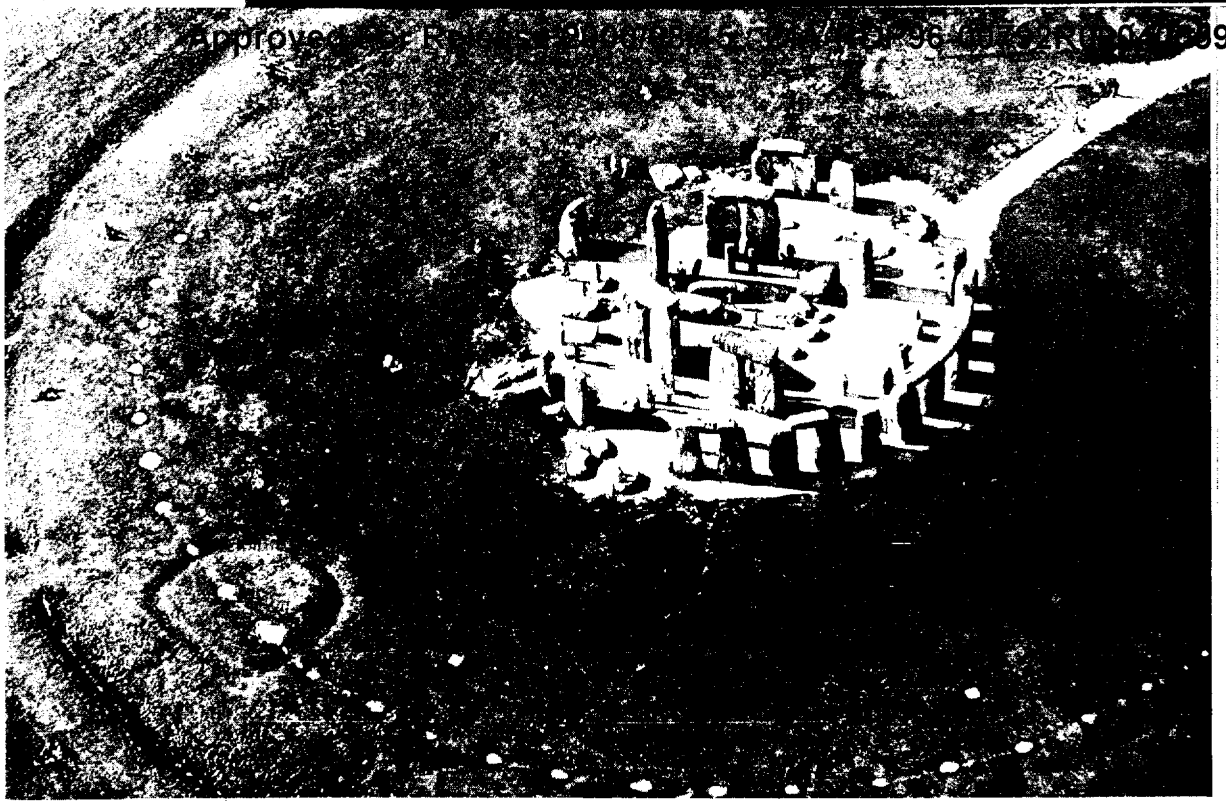


Stonehenge, the ruins of an ancient religious center and astronomical observatory. Sightings from different positions and along the various stones were used to predict astronomical events with remarkable accuracy.

STONEHENGE, stōn'henj, is the ruins of a Stone Age monument situated on Salisbury Plain in southern England. It is one of the most imposing and complex of the 40 to 50 prehistoric circular enclosures or "henge" monuments known in the British Isles.

The most striking features of Stonehenge are the remains of a great circle of lintel-capped rectangular stone columns surrounding a still taller "horseshoe" of trilithons, each trilithon consisting of two columns supporting the ends of a horizontal top piece, or lintel. The tallest trilithon rises 24 feet (7.3 meters) above ground, and each of the uprights weighs up to 50 tons. Other conspicuous features of the monument include the Slaughter Stone, the Heel Stone, the bluestones, and ditches.

Many of the elements have changed through time as the result of natural forces or human activity. Standing stones have toppled, ditches have silted, and additions and changes have been made by the prehistoric peoples to whom this site was an important religious center during the Neolithic Period and the Early Bronze Age, roughly from 1900 to 1400 B.C.

Speculation on and study of Stonehenge have continued unabated from the time that it was first mentioned in the literature shortly after the Norman Conquest of 1066. Its construction has been attributed to many of the various peoples who have inhabited the British Isles. The most widely held belief was that Stonehenge was built by the Britons, a Celtic people, for druidical rites. It is now known, however, that the Celts and their druid priests did not come to Britain until 1,000 years after Stonehenge was abandoned.

The first architectural study of the site was made in the 17th century by the English architect Inigo Jones at the command of King James I. More accurate surveys and observations were conducted subsequently by such British antiquaries as John Aubrey, Sir Richard Colt Hoare, and William M. Flinders Petrie. The numbers assigned by Petrie to the various holes and stones are still employed in identifying them.

Archaeological research has provided the most trustworthy evidence concerning not only the several phases of construction and their dates, but also the cultures to which they belong. Interpreting the original function of Stonehenge is partly an archaeological matter and partly an astronomical problem. Scientific excavation and restoration began in the 20th century, especially with the work of William Hawley from 1919 to 1926. The most meticulous investigations were conducted jointly by Richard J. C. Atkinson, Stuart Piggott, and John F. S. Stone from 1950 to 1954. The result of these excavations was an extremely complicated picture of successive periods of construction.

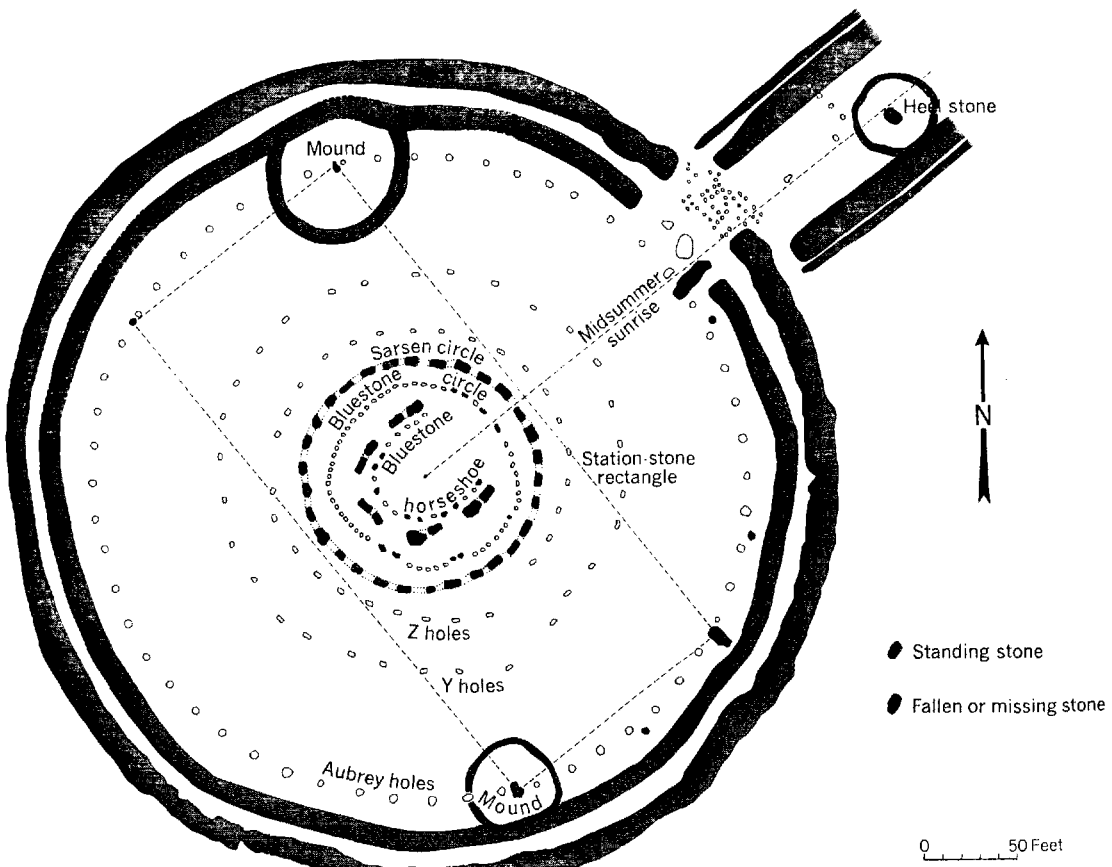
Construction. The history of Stonehenge may be divided into three main periods. The first major construction, or Period 1, took place between 1900 and 1700 B.C. It was accomplished by people belonging to the secondary Neolithic culture, a blend of earlier hunting and gathering peoples and the first groups with an agricultural economy to appear in the British Isles. This construction consisted of a circular ditch and bank about 320 feet (97 meters) in diameter, broken by an entrance causeway from the northeast. Just inside the bank and concentric with it was dug a circle of 56 equally spaced holes—called the Aubrey holes for their 17th century discoverer John Aubrey. The holes were filled with chalk rubble and, in some instances, with cremated human bones. Charcoal from one hole yielded a radiocarbon date of 1848 B.C. ±275 years. The 16-foot (4.9-meter) tall Heel Stone was erected at this time or earlier, a short dis-

tance outside the ditch to the northeast. The Heel Stone is a block of sarsen stone, a type of sandstone used for many of the larger stone elements in the monument.

The structure of Period II (about 1700–1500 B. C.) does not now exist but can be inferred from the existence within the ditch and the Aubrey hole circle of the "Q" and "R" holes. These holes form a double circle, 86 feet (26.2 meters) and 74 feet (22.5 meters) in diameter, each circle originally containing about 38 bluestones. Many of these stones were removed and used for later constructions. Two parallel ditches were dug outward from the main entrance, forming an avenue running northeast toward the point on the horizon at which the sun rises on midsummer day, or the summer solstice. Because of the absence of holes in the western part of the double circle, it would appear that Stonehenge II was never completed. The architects must have belonged to the Beaker culture, colonizers who came from the European continent at the end of the Neolithic Period, for shards of Beaker pottery have been found in association with the traces of this structure.

Period III (about 1500–1400 B. C.) witnessed the final and most spectacular phases of construction. One of the principal features is the 100-foot (30.5-meter) circle of 30 sarsen stone columns. Each column weighs about 25 tons; measures about 3 to 4 feet (0.9–1.2 meters) thick, 7 feet (2.1 meters) wide, and 13 feet (4 meters) high; and is capped by a continuous circle of horizontal lintels held in position by mortise and tenon joints. Within this circle is the central horseshoe of five sarsen trilithons referred to previously. Other features, such as the circles of "Y" and "Z" holes outside the sarsen circle and a small horseshoe of bluestones within the trilithon area, appear to represent later modifications of the plan. The largest of the bluestones, called the Altar-Stone, now lies under two fallen trilithon stones. Its original location and function are unknown. The builders of Stonehenge III were almost certainly members of the Early Bronze Age Wessex culture, at the time one of the most advanced European cultures outside of the Mediterranean area. Other sites of this culture, largely graves, have produced bronze ax blades and other artifacts resembling strikingly in details many objects from central Europe and Mycenaean Greece. In 1953 a carving of a bronze dagger similar in form to those used at Mycenae during the period of the shaft graves was found on one of the sarsen stones.

As for the construction techniques of Stonehenge, much practical experimentation has been done with simple equipment to determine possible methods of transport and the size of the labor force needed to move and erect the large sarsens. Geological studies have shown that the sarsens came from Marlborough Downs, some 20 miles (32 km) north of Stonehenge. The bluestones were brought from the Prescelly Mountains of southwestern Wales, probably by sea and then overland by sledges running on rollers. It has been estimated that it might require upwards of 500 men to pull a 50-ton stone up the steepest



slope along the route. Timber cribwork, levers, and ropes were considered adequate for raising stones to vertical positions and placing lintels on their tops.

Function. The original function of this extraordinary monument has been the subject of much speculation. It has been thought of as a monument, funeral or otherwise, to various legendary or historic personages. It has also been considered to be the center of a religious cult. Because of its orientation toward the rising sun, scientists have seen it as an astronomical observatory of some kind. Archaeologists are in general agreement that the site had both a religious and an astronomical function. It is likely that the monument at Stonehenge, hallowed by its early use as a purely religious structure, became modified gradually in its early phases to perform astronomical functions as well—first to record the advent of the summer solstice, then to predict sunrise, moonrise, and probably eclipses, all as part of a religious and agricultural ritual.

In 1963, Gerald Hawkins, an astronomer, used a computer to work out all observations that could be made by sighting along and through the various markers, stone posts, and openings between uprights, including four "station" stone locations that form a rectangle on the line of the Aubrey holes. His calculations indicated with almost perfect probability that Stonehenge can be used as an astronomical instrument to predict accurately, with adjustment of movable marking stones once a year, the movements of both sun and moon as well as eclipses. Various objections to the theory and its implications have been raised by archaeologists. One of the important ones is the unlikelihood of the existence of such a sophisticated device, requiring the passing on of accumulated observational data over a long period of time, in a culture that was otherwise on a considerably lower level of development than the heart of Bronze Age culture in the eastern Mediterranean.

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Further Reading: Atkinson, Richard J. C., *Stonehenge* (Macmillan 1956); Hawkins, Gerald S., and White, John B., *Stonehenge Decoded* (Doubleday 1965); Petrie, William Flinders, *Stonehenge* (1881); Stone John F. S., *Wessex Before the Celts* (Praeger 1958).

STONE'S RIVER, Battle of, in the American Civil War, fought Dec. 31, 1862–Jan. 2, 1863, about 30 miles (48 km) southeast of Nashville, Tenn. It is often called the Battle of Murfreesboro. A hard-fought but indecisive conflict, it had no apparent influence on the strategic situation, but President Abraham Lincoln observed that if the Union Army had been defeated, "the nation could scarcely have lived over it."

After Gen. Braxton Bragg led an unsuccessful invasion of Kentucky in the autumn of 1862, he retired to Murfreesboro, in southeastern Tennessee. Maj. Gen. William S. Rosecrans, the new commander of the Union Army of the Cumberland, was based at Nashville. Eastern Tennessee was favorably inclined to the Union, and the high command in Washington was determined to drive the Confederates from the region.

Under strong pressure for action, Rosecrans led his army out of Nashville on Dec. 26, 1862. Rain, fog, and Confederate cavalry patrols hindered his advance, and his leading elements did not approach Murfreesboro until the evening of the 29th. The next day, the two armies confronted each other in strength. Rosecrans had about 45,000 men; Bragg a little less than 40,000.

Bragg deployed his forces astride the west fork of Stone's River, a few miles northwest of the town. The bulk of them were on the west bank, but one division, about 5,000 men, was on the east. Rosecrans concentrated entirely on the west side of the river.

The battle plans of the opposing commanders were identical in principle. Each planned to hold with his right wing and attack with his left wing, seeking an envelopment of the enemy.

Bragg struck first, about 6 A. M. on Dec. 31. He surprised the Union troops at the right end of the line; many were cooking breakfast. His assault gathered momentum as reinforcements arrived. The Union right was bent back at right angles to the left, and by midafternoon the Union army was compressed into a tight horseshoe with its back to the river.

But stout resistance and minor counterattacks had jolted the Confederates. Bragg called for the division on the east bank of the river to strengthen a last blow, but its commander did not move, fearing a Union attack. At a council that night, some Union generals wished to retreat to Nashville, but Rosecrans decided to hold.

On Jan. 1, there was little fighting. Both armies were exhausted and had suffered heavy losses. The next day, the only important action was east of the river, where a Union force that had crossed there repulsed a Confederate attack.

Bragg realized that Rosecrans had received ammunition and supplies, and on Jan. 3 he withdrew through Murfreesboro and proceeded south. Rosecrans occupied the town but did not pursue his foe. The situation in Tennessee remained static for six months, but by holding fast Rosecrans had averted what would have been a serious defeat for the Union at that stage of the war.

The Union losses were about 12,800 men killed, wounded, and missing. The Confederate casualties totaled about 11,600. The Stones River National Battlefield now occupies part of the battle site. In the Stones River (or Murfreesboro) National Cemetery are graves of soldiers of both armies.

STONEWARE is a hard, nonporous ceramic. It is made of a highly siliceous paste, either a special clay or clay mixed with other materials, such as ground flint, feldspar, or marble. The paste is fired at a high temperature until it vitrifies (fuses) to form a nonporous, glassy substance that gives a ringing sound when struck. Stoneware thus differs from soft, low-fired porous earthenware. It closely resembles hard, high-fired, nonporous porcelain and is often called porcelaneous ware. However, because stoneware is usually heavy and opaque, with a bluish gray or reddish brown color, Western authorities have tended to distinguish it from porcelain, which they characterize as thin, translucent, and white.

Stoneware may have incised, impressed, or applied relief decorations. It may be unglazed, or it may be glazed to resist acidic liquids or for decoration. A thin, slightly pitted salt glaze is common. Thicker, colored lead glazes are also found.

Stonewares were made in Shang China before 1000 B. C. Heavy, porcelaneous stonewares of the Han, T'ang, Sung, and Yuan dynasties had black or brown painted decoration or relief decoration with celadon green glaze. In the Ming period,