WHAT MEAN THESE AFRICAN STONES?


Frank

The ancient Cushites of the upper Nile had a complicated calendar. The stones called Namoratunga may have been a calculator for it.

By DIETRICK E. THOMSEN

Megaliths, arrangements of large stones set up by humans apparently for some purpose, are found in various parts of the world. The most famous, and quite colossal, examples are those in southern Britain and the French Brittany peninsula, particularly Stonehenge and Avebury. Much paper has been piled up in the debate over the purpose of Stonehenge. Was it a temple? An astronomical observatory? An eclipse computer? Or a bit of all three? Perhaps one of its purposes was calendric.

Now researchers report that an East African megalith, called Namoratunga II, though not as spectacular as Stonehenge, seems to have had a calendric purpose. That is the conclusion of the recent Namoratunga Expedition sponsored by the organization Adventure Study Africa and led by the organization's president, Eddie Frank.

It was also the conclusion of the first scientists to examine Namoratunga II, the late B. M. Lynch and L. H. Robbins, anthropologists of Michigan State University in East Lansing. However, at least one observer, Robert Soper of the National Museum of Kenya, disagreed. If the proponents are correct—and Soper is described as softening his negative opinion as a result of the latest work—then, in the words of Laurance Doyle of the NASA Ames Research Center in Moffett Field, Calif., who reported on the expedition's findings at the recent meeting in Santa Cruz, Calif., of the Astronomical Society of the Pacific, this is the first subject of archaeoastronomical research in sub-Saharan Africa. (Doyle, Frank and the nine other members of the expedition have also submitted a paper to the journal ARCHAEOASTRONOMY.)

"Namoratunga" means "stone people" in the language of the local Turkana people. It expresses a belief that the basalt pillars weighing between 45 and 250 kilograms that characterize the two sites so named are people who were turned to stone by a malevolent spirit. Lynch was excavating Namoratunga I, which is basically a large cemetery and rock art site on the Kerio River near Lokori, Kenya, when local people told him of a similar site 160 kilometers north on the shore of Lake Turkana (formerly Lake Rudolf).

Lynch and Robbins investigated this Namoratunga II and determined that the pillars there lined up in ways that would make them useful for observations that might have been involved in keeping the complicated calendar devised by the ancient Cushite people and still used by the Borana of southern Ethiopia, who speak a Cushitic language. No such alignments were found at Namoratunga I. A bone found at Namoratunga II has been dated to 300 B.C., and observers are taking that as the date of its construction.

The Cushites were a people who lived in the region of the fifth cataract of the Nile. Traditional rivals of the ancient Egyptians, they conquered Egypt in 800 B.C. Their writing has never been deciphered. If the calendric and astronomical connections of the Namoratunga II site could somehow help decipher the glyphs on the stones, Doyle suggests, that might be a lead to understanding the script. Namoratunga could be the Rosetta stone for Cushitic, he says.

The calendar in question is a lunar one of 354 days or 12 synodic months. (The synodic period is the time it takes the moon to return to the same point in its orbit with respect to the earth, 29.5 days.) The calendar has resemblances to the Hindu, Chinese and Maya calendars, Doyle says, but it is unique in completely ignoring the position of the sun (except indirectly as the sun determines the phases of the moon). It also makes no attempt to adjust to the solar cycle or the seasons determined by it as, for example, the Hebrew and Islamic calendars do. But, as Doyle says, near the equator the seasons don't matter much. The beginnings of the months are determined by conjunctions of the moon with certain stars. The moon moves across the background of the fixed

Facing page: Members of the Namoratunga Expedition measure distances between stones and their alignments and enter them on a plan of the site.

stars in a cyclic way. Astronomers define conjunction as the nearest approach of the moon's position to that of one star or another in the course of this passage. As will be seen, in this story it is defined in a somewhat looser way.

The Cushitic-Borana year begins with the new moon's conjunction with — or as they put it, the new moon's "rising with" — the constellation Triangulum, which the Borana call Lami, particularly the star Beta Trianguli. This is the start of the month Bittottessa. If they started the next month when the moon came around to Triangulum again, they would have a sidereal month of 27.3 days, rather than the synodic period that they want. They want a month of 29 or 30 days (half days not being counted) and so they wait for the next new moon, and that "rises with" the Pleiades (Busan in Borana), starting the second month. The next four months start at the new moon's conjunctions with Aldebaran (Bakkalcha), Bellatrix (Algajima), the central region in the sword of Orion (Arb Gaddu), Saiph (Urji Walla) and Sirius (Basa). Twenty-nine days later, the seventh month automatically begins, but it can be identified 14 or 15 days after it begins by a full moon in conjunction with Beta Trianguli. The last five months are identified by various phases of the crescent moon in conjunction with Beta Trianguli until the new moon appears there again, and a new year starts.

The months of the Borana Year are in order Bittottessa, Camsa, Bufa, Wacabajii, Obora Gudda, Obora Dikka, Birra, Cikawa, Sadasaa, Abrasa, Ammaji and Gurrandala. There are no weeks, and the days are not numbered but named. There are 27 day names, so that there is still some month at the end of the days. The cycle, however, resumes on the 28th day so that each succeeding month begins with a different day name. The year begins with the day Bito Kara in the month Bittottessa. The most recent such new year's day was July 28, 1984.

What Lynch and Robbins reported in 1978 was that various alignments of the stones at Namoratunga II pointed to the rising positions of these reference stars as they would have been in 300 B.C. (Precession of the earth's orbit has changed the positions since.) Soper's objections were basically three. First the pillars are magnetic, and their magnetism contributed a compass error to the determinations of Lynch and Robbins. (They also lean, and there is a question how to take that into account.) Second, if the calendar depends on the new moon and the reference star rising together, what need is there for markers? The observer needs only to look for the conjunction. Third, given enough pillars — there are 19 — one can find almost any alignments one wants.

Lynch's reply, as quoted by Doyle, was that, using Soper's data and correcting for magnetic error, alignments with the Cushitic stars could still be found. As for the argument about enough pillars, the site is definitely a human construction; if its purpose is uncertain, astronomy may be the least unlikely of the possible purposes.

This is where the argument stood when the Namoratunga Expedition set out. They remeasured the alignments, taking account of magnetic problems and using the centers of the tops of the pillars as reference points — as Lynch had suggested. The leaning of the pillars may be natural subsidence. However, they lean in the direction of the precession of the stellar positions. Doyle suggests it may be the result of human effort at correction. A priority for the future, he says, is to get a geologist to examine them. Using the tops, they find good alignments. But for what were the alignments needed?

Here Doyle and collaborators make a new suggestion regarding the interpretation of the Cushite-Borana calendar. The key phrase is the description by the people

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THE BORANA-CUSHITIC CALENDAR

Gregorian Date	Cushitic Day/Month	Time	Lunar Declination	Phase	Comments
Aug. 7, 1983	Bito Kara/Bittottessa	6 a.m.	+24°1′	28^d	New Year! New moon at Beta Triangulum horizon position (rising)
Sept. 6, 1983	Algajima/Camsa	9 a.m.	+14°55′	29^d	New moon at Pleiades horizon position (rising)
Oct. 5, 1983	Walla/Bufa	midnight	+8°14′	28^d	New moon at Aldebaran horizon position (rising)
Nov. 2, 1983	Basa Dura/Wacabajii	10 a.m.	+1°58′	27^d	New moon at Bellatrix horizon position (rising)
Dec. 2, 1983	Maganatti Jarra/ Obora Gudda	5 a.m.	−12°15′	28^d	New moon at Central-Orion/Saiph horizon position (rising)
Dec. 30, 1983	Salban Dura/Obora Dikka	6 a.m.	−16°1′	27^d	New moon at Sirius horizon position (rising)
Jan. 29, 1984	Gardaduma/Birra	Feb. 15/4 a.m.	+23°51′	14^d	Full moon at Beta Tri horizon position (setting)
Feb. 28, 1984	Rurruma/Cikawa	Mar. 14/3 a.m.	+22°35′	12^d	Waxing gibbous moon at Beta Tri horizon position (setting)
Mar. 28, 1984	Gidada/Sadasaa	Apr. 10/1 a.m.	+23°56′	9^d	Waxing quarter moon at Beta Tri horizon positon (setting)
Apr. 26, 1984	Areri Dura/Abrasa	May 7/11 p.m.	+22°8′	6^d	Waxing crescent moon at Beta Tri horizon position (setting)
May 25, 1984	Adula Dura/Ammaji	Jun. 3/9 p.m.	+23°8′	4^d	Waxing smaller crescent moon at Beta Tri horizon position (setting)
Jun. 23, 1984	Garba Dura/Gurrandala	Jun. 30/7 p.m.	+24°5′	1^d	Waxing smallest crescent moon at Beta Tri horizon position (setting)
Jul. 28, 1984	Bito Kara/Bittottessa	6 a.m.	+23°52′	29^d	New Year! New moon at Beta Tri horizon position (rising), 354 days after last New Year

Doyle

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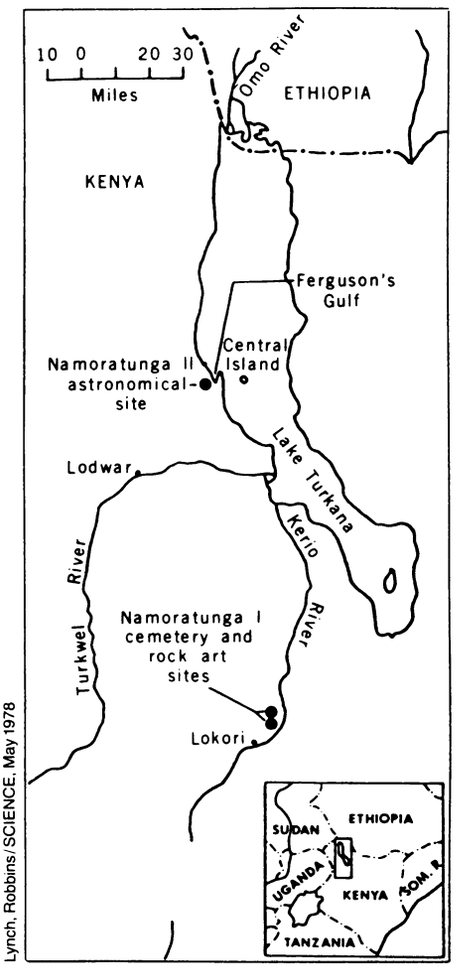
who use the calendar of the new moon as "rising with" the reference star, taken by researchers generally to mean "in conjunction with." But precisely how "in conjunction with"? Others who have described the Borana calendar, particularly Asmarom Legesse of Swarthmore College in Swarthmore, Pa., have taken "rising with" to mean that the reference star and the new moon are on the eastern horizon at the same time. This interpretation would support Soper's objection to the need for markers. If one knew the star, one would only have to look east for it.



Lynch, Robbins/SCIENCE, May 1978

Namoratunga II may be the first scientifically investigated archaeoastronomical site in sub-Saharan Africa. Its existence was reported by local people to scientists investigating Namoratunga I, which does not seem to have astronomical significance.

Doyle points out, however, that such a conjunction is likely to be invisible. What these explicators seem to have forgotten, he says, is that the new moon is always close to the sun and therefore difficult to see at night. It will appear near the horizon after sunset or before sunrise. Beta Trianguli, which is a third-magnitude star, rising at the same time would be washed out by the twilight. Doyle suggests that "rising with" means instead rising at the same point on the horizon (or setting, in the latter part of the year) but not necessarily at the same time.

To put it another way, in Legesse's view the coordinate of the reference star that matters is its right ascension, its relative east or west position. Doyle proposes that the important coordinate is the star's declination, its north or south position. If one imagines the sky as a sphere and projects the earth's poles and equator onto it, one defines a system of coordinates in which the projection of terrestrial latitude is called declination and the projection of longitude is right ascension. The coordinates of the "fixed" stars vary slowly over centuries mostly because of the precession of the earth's orbit, but in small part because of their own proper motion. The moon, sun and planets move against the background of "fixed" stars in complicated cycles of months and years determined by their own and the earth's orbital motion.

The Namoratunga II site is about three degrees of latitude from the terrestrial equator. Therefore, to all intents and purposes, the celestial equator at that point is an arc across the sky rising vertically from due east and running overhead to due west. Other circles of constant declination are also vertical arcs, displaced north or south of the east-west line by the appropriate number of degrees. Or, to put it shortly, at the earth's equator the stars rise vertically. Therein lies the key to Doyle's analysis of the Borana calendar.

Legesse had taken "rising with" to mean at the same time. At the equator objects located on the same meridian of right ascension come above the horizon at the same time. On that interpretation, the new moon would have to appear at the right ascension of each reference star sequentially in the order given by the Borana calendar. Doyle gives an argument to show that the new moon does not move in right ascension month by month in the proper sequence. What does work is the sequence of declinations of the reference stars, and so he interprets "rising with" as rising from the same point on the horizon but not necessarily at the same time. "It's a declination calendar," he says.

If that is so, then markers to give lines of sight to the proper horizon points become not merely convenient but necessary. Furthermore, even if the reference star is not visible due to twilight effects until an hour or two after it has risen, the marker still works as, thanks to the location of Namoratunga II so near the terrestrial equator, the star has risen vertically and so is still directly over the marked point. If all this is true, it strengthens the case for Namoratunga II as such an observing station. Doyle says his latest effort is a statistical analysis of the stone alignments on a Cray computer at Ames, which yields 99.45 percent probability that that is what they were for. If Namoratunga II is that, then it becomes, Doyle says, the first archaeoastronomical site to come under study in sub-Saharan Africa. □