

# Tracing the roots of civilization

**A new book and a new technology present a new theory of time notation as a possible beginning of human culture. Archaeological opinion on the work varies.**

by Robert J. Trotter

*Time present and time past  
Are both perhaps present in time future,  
And time future contained in time past. . . .*

*Time past and time future  
What might have been and what has been  
Point to one end, which is always present.*

T. S. Eliot  
"Four Quartets"

The simple, subtle and somber words of Eliot opened a poetic meditation on man's sense of time and its relationship to communication. With less poetry, but in the same vein and with a substantial body of evidence, Alexander Marshack, in a book to be published this coming week, *The Roots of Civilization* (McGraw-Hill, \$17.50), uses man's sense of time as a cultural continuum to re-explain the roots of communication and therefore the roots of civilization.

A sense of time controls man's cognitive processes. For example, before he can have agriculture he must be able to understand sequences in time. His activities must be time-factored and time-factoring. Proto-man (Neanderthal) and early modern man (Cromagnon) 40,000 years ago had approximately the same brain capacity as a modern man. Therefore his cognitive processes were probably the same—time-factored and time-factoring. If so, contends Marshack, many prehistoric markings and scratches (previously dismissed as mere decoration) may, in fact be cognitive notations of time (probably lunar cycles).

If Marshack is correct, the markings he has described as lunar notations represent a system of notation that existed 25,000 years before the cuneiform of Mesopotamia and the hieroglyphs of Egypt. "I realized," he writes, "that if this solution was right or even approached some sort of validity, it would perhaps be necessary to rewrite much in the histories of science, art, religion and civilization and to reinterpret some of the meaning of man and his intelligence."

Marshack's reinterpretation began in 1963 when he was a science journalist writing a book about NASA's lunar program. Doing research on the origins of science he came across what seemed to be a small bone tool with a set of engraved marks and a chipped quartz point. It was pictured and described in *SCIENTIFIC AMERICAN*. The 8,500-year-old bone was found at Ishango, a Mesolithic site in the Congo. The markings were interpreted as possibly an arithmetical game. Believing man's brain was essentially a time-oriented organ, Marshack assumed the markings to be more than a mere game of numbers. He decided the marks could be somehow related to a time count and perhaps to a lunar count. He found that, when followed in a certain direction, the 168 marks on the bone could represent six months. The haphazard groupings and sizes of the marks could possibly represent the phases of the moon.

"The possibility is important," he says, "for if our hypothesis and conclusion are valid, civilization may have been built as much on such time-factoring or time-factored skills as on the handmade, hand-held tools that we find in the layers of the soil."

But one bone with a few marks or scratches could mean anything or nothing. Marshack turned to a study of European Ice Age artifacts. Many such Upper Paleolithic objects with regularly spaced parallel incisions have been unearthed during the past 100 years. The incisions had at first been ascribed to man's urge to fill or decorate an empty space. Later they were explained as hunting tallies. More recently they have been given sexual meanings. Believing that early man had a time-factored intellect, Marshack found these explanations inadequate. He began a search of the literature for evidence to support his theory of time notation.

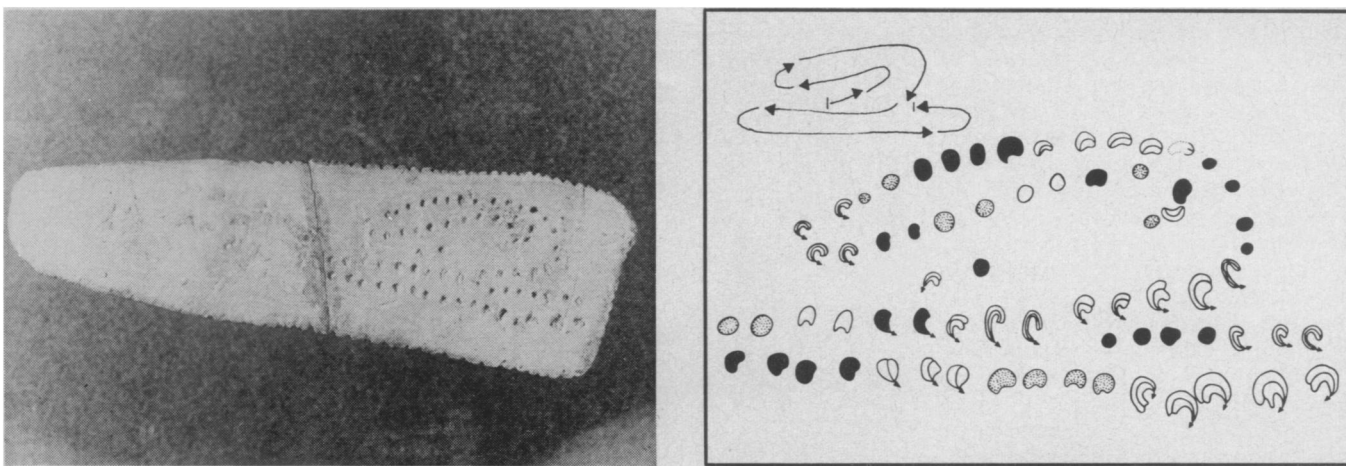
From drawings and photographs of hundreds of Ice Age artifacts he turned up two possibilities. One was a reindeer

bone from Czechoslovakia; the other, a mammoth tusk from the Ukraine. Both had sets of engravings that fit his lunar-phasing calendar. The findings were published in the Nov. 6, 1964, *SCIENCE*.

But drawings and photographs were not enough. With funding from the National Science Foundation and as a staff member of the Peabody Museum of Archaeology and Ethnology at Harvard University he went to the museums of Europe to inspect the artifacts firsthand. With a microscope Marshack began a minute analysis of ancient bones in the Musée des Antiquités Nationales outside of Paris. Five bones and a pebble had notations that could possibly be described as lunar.

One bone chip from early Cro-Magnon times (30,000 years B.C.) was pitted in a seemingly haphazard manner. Microscopic examination revealed that the 69 marks, in a serpentine form, contained more than 24 changes of point or stroke. "Obviously the pattern was not random," he says. "It had been made on purpose. It had been made sequentially." Marshack then describes other objects that were engraved not only with different strokes but with different objects. He explains that "with the microscope one can often determine how many tools or points or grips or styles of stroke were used to make a composition or a sequence of marks. This will often help in deciding whether a composition is decorative and ornamental or notational. For if it was made at one or two sittings with one or two tools, with one concept and one rhythm, it could be decorative. If it was made by many points over a long time, it was probably not decorative."

In all Marshack describes about 30 pieces and says the notations on them are probably lunar. "If I was right," he says, "not necessarily in all, but in one part, in one instance or one example, it was revolutionary." And, "the tradition seems so widespread that the question arises as to whether its beginnings may not go back to the period of Ne-



Photos: Courtesy McGraw-Hill © 1971 Alexander Marshack

*Microscopic analysis of engravings shows differences in point and stroke on bone shaped by man 30,000 B.C.*

anderthal." If it does, it could confirm the growing belief of many archaeologists that Cromagnon and possibly Neanderthal man were highly intelligent beings.

Burial grounds have been discovered suggesting a previously unsuspected type of humanity among these cave men. In the cave of Shanidar in Iraq, for example, the skeleton of a one-armed cripple was found. Careful examination of the remains indicated that the 40-year-old man had been cared for and fed by his fellow cave dwellers. It is therefore possible that ethical considerations (considered to be relatively modern) were operating in Neanderthal society. Marshack believes the similarities go farther.

With his lunar notation theory in mind, he reexamined Ice Age art (SN: 3/7/70, p. 242) that has been described in terms of magical rites or hunting and sexual symbolism. These are time-factored also, he believes. Obviously sexual images of rutting animals, spawning fish and pregnant women could represent mating seasons. Scratches and paintings previously described as phallic symbols or hunting spears could be reinterpreted as plants—representing sea-

sonal changes. Previous studies of some of this material (without the use of a microscope) had overlooked many details that Marshack uses as evidence to support his time-factoring intellect theory.

In conclusion Marshack argues, "If these broad time-and-space ecological concepts and my notational, symbolic findings are added to the new process-oriented archaeology, . . . we begin to see that a reconstruction of early man's life, which includes the dynamics of his real world, the real and symbolic relations he had to that world, as well as the cognitive processes by which that culture was created and maintained, is being made possible. At the end of almost one century of European archaeology, the mysterious maker of the chipped stone axes is beginning to seem not only human but a person we are able to study scientifically and in depth."

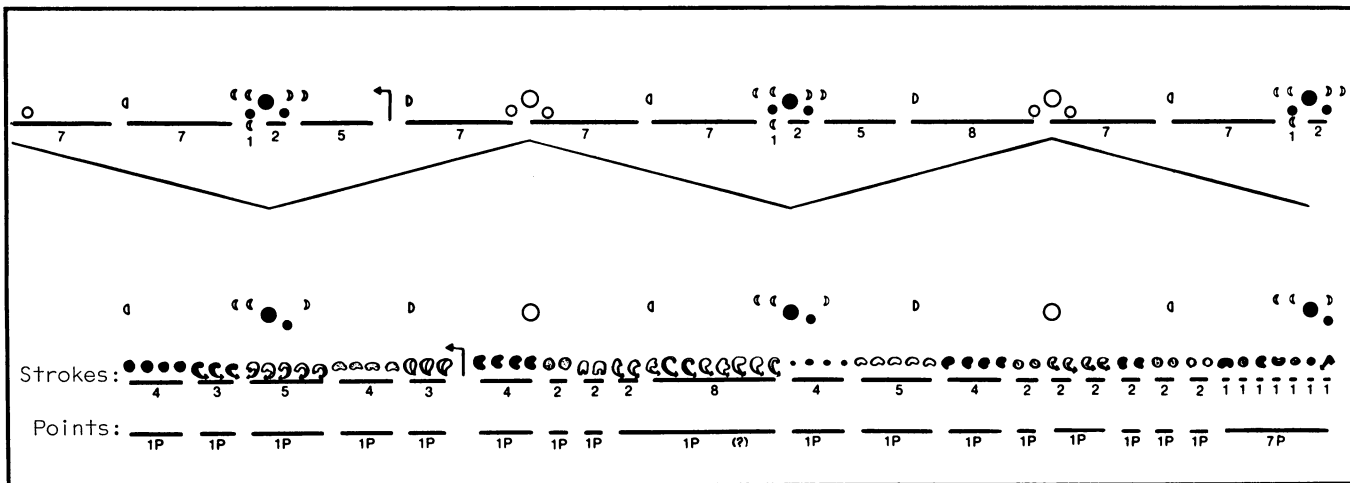
But the depth of Marshack's work may not be agreed upon by all scientists. As he admits, the work is innovative and controversial.

Archaeologist James Sackett of the University of California at Los Angeles warns of the need to be especially

skeptical in evaluating this type of research. One problem is the question of sampling. It is possible, from a statistical point of view, to get any relatively simple pattern by selecting data that fit. Interpretation also must be done carefully. "A 29-day cycle could well be lunar but it could well be menstrual," Sackett says. The fear of menstrual blood and knowing when to seclude a female could play a greater role in the hunter's mentality than attempting to predict animal movements or weather on a hand calendar.

The bulk of Marshack's work is just now being published, and it is not yet certain how archaeologists will receive it. It could be rejected outright. It could be accepted as interesting but not profound or important. Or it could, as his publishers suggest, cause a major revolution in present-day archaeological thinking.

The first possibility is well represented by Andrée Rosenfeld of the British Museum. Marshack's description of the artifacts in the Musée des Antiquités Nationales and his theory of a lunar calendar were published in France. Rosenfeld reviewed the work in the December ANTIQUITY (a British quar-



*Unraveled serpentine image against a lunar model indicates a possible two-and-a-quarter-month notation.*

terly review of archaeology). She begins by attacking Marshack's selectivity. "It is disappointing," she says, "to find that despite the imposing list of museums whose collections have been studied with a view to establish the significance of these decorative markings, the monograph is based solely on the analysis of six selected objects with only a brief reference to some seven or eight other comparative objects."

Next she finds fault with his methodology. Many of the marks described are made up of two or more overlapping lines. Perhaps the artist had to move his tool up and down a number of times to produce the required depth. "This problem of procedure," Rosenfeld complains, "is not discussed not even when the additional lines are so fine that they become visible only under magnification—and their intentional nature may thus reasonably be questioned!"

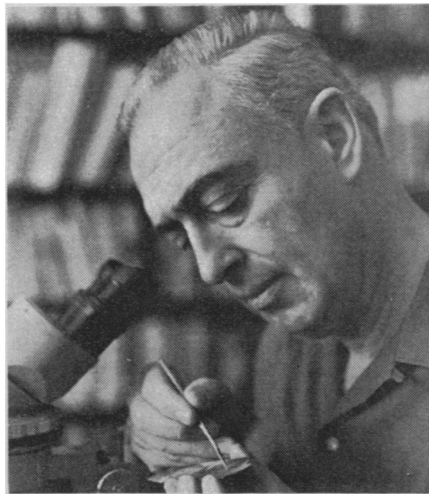
Marshack's reasons for the choice of a lunar model are not clear, she goes on, "except presumably that the author is satisfied with the fit . . . any irregular sequence of numbers could be read as a lunar calendar." She concludes: "That Upper Paleolithic man should have been interested in the seasons is a very reasonable supposition. That he should have been aware of the motions of certain astronomical bodies is not beyond the possible. However any Paleolithic interest in astronomy—let alone its use for calendric purposes—remains to be demonstrated."

"Rosenfeld is a very good archaeologist," says Michael D. Coe of Yale. "This is a really devastating review and I don't see how it can be answered." In his view, Marshack's findings—even if true—do not revolutionize but rather confirm that the Upper Paleolithic people were much more advanced than one usually thinks.

Irving Rouse, also of Yale, has not seen Marshack's complete work but he is impressed by the new idea and the new technique applied (microscopic analysis). But, he adds, "whether the interpretation is correct or not is something we will really never know because we just don't have the evidence. If true it is unexpected but not surprising."

"It is surprising and it sounds very interesting," says Anthony F. Aveni, an astronomer specializing in ancient astronomy at Colgate University in Hamilton, N.Y. "The astronomical alignments at Stonehenge surprised archaeologists," he points out, and it is only 4,000 years old. "These matters are very controversial and people generally are quite reluctant to believe ancient man's knowledge of astronomy."

There may be a whole level of such behaviors in the people at the end of the Pleistocene that has not been ex-



*Marshack: Marvelous or meaningless?*

amined, says F. Clark Howell of the University of California at Berkeley. "Archaeologists," he says, "were traditionally frightened away from dealing with these people because of the paucity of evidence and because we didn't know how to look at the evidence available. Marshack is looking at this evidence with a new set of glasses. He is trying to show that there is science at this range of time. This is a very major and lasting accomplishment that will have its effect more in the future. It may revolutionize the way people look at things they never coped with before."

Ralph Solecki of Columbia University was excavator of the cave at Shanidar. He also considers Marshack's work to be an outstanding contribution. "It is a breakthrough in the thinking of early man," he says, "and gives brand new insight into the mystery that has been surrounding these bones, stones and talismans." In fact, says Solecki, "this contribution ranks, not quite as revolutionary as carbon 14 dating, but in that category."

Hallam L. Movius Jr. of the Peabody Museum at Harvard is the American archaeologist most concerned with the Upper Paleolithic of Europe. He is the one who suggested to *ANTIQUITY* that Rosenfeld review Marshack's work. Now he says, "She is a silly little fool—perfectly inexcusable. She ought to have her pants taken down, be turned over and spanked for not doing her homework."

Movius has followed Marshack's work from the beginning. He considers it a magnificent accomplishment. As he puts it, "A system of notation spreading over such a wide area—repeating over and over again—implies something more than stone tools. This goes beyond archaeological evidence and implies a capability to communicate. It isn't absolutely absolute. It isn't completely objective. But the chances are so great. . . ." □

## Marshack discusses the discussion

In an interview with *SCIENCE NEWS* this week Alexander Marshack acknowledged that the ideas expressed in his book are "tremendously controversial" and said he welcomes all intelligent discussion on the relevance of his book.

But he said he believes the controversy should take into consideration three things: his methodology, his data and his interpretation. "This is not just a theory," he emphasized. "You are dealing with a methodology that has never been used in this period: careful, sequential microscopic analysis of the material. This methodology gives you a new set of data that has never before been presented to the scientific community." As a result of the methodology "one finds that 100 years of publication of this kind of material is almost totally in error."

"And if at any level you accept the methodology and the data, you are already in a new ball game." Then one has to consider its meaning. "And that is where I have made what I think is a very sound interpretation at a new level. Previous interpretations were based on a lack of adequate information and the only thing people could say was that it was either art or magic. Nobody in the whole field has ever talked about the cognitive content of these materials [Upper Paleolithic artifacts having possible notations of time]. They have always talked about magic and religion and the meaning of images. What I am talking about is the cognitive processes behind a whole body of symbols. That has never been done before. And that essentially is what I would like the discussion to be."

Marshack said he expected extremes of opinion about his work. "I think you will find people at one end saying it is absolutely impossible and at the other end saying it is the greatest thing that has ever happened. And in between you will find the sensible people." He said he prefers intelligent discussion at the middle, because the extreme viewpoints tend to stifle discussion.

"Without exception, what you are getting in the [critical] reaction has to be expected. Because, in a sense, if I am right, the archaeologists have to change everything they have thought. And it is not a question of saying that they are wrong. It is just saying that here is something additional that you have to put into the pot called man. Essentially it is the human element. The human element is that man is a cognitive animal, a symbol-making animal, a man who understands process. And toolmaking is only one part of that process." □