Lunar Notation on Upper Paleolithic Remains

Markings on bones and rock walls dating from the Upper Paleolithic period show accurate lunar observation.

Alexander Marshack

Recent computations of the Stonehenge alignments by Gerald S. Hawkins (*1*) have established the existence of an unexpectedly complex and sophisticated lunar-solar lore in England around 2000 B.C. This lore apparently included a precise knowledge of the solstices, equinoxes, and long-term lunar periodicities and irregularities, as well as ability to predict eclipses. The level of this astronomical skill, according to Hawkins' computations, was different from and seemingly more advanced than that being practiced about the same time in Egypt and Mesopotamia and in Shang China of about the middle 2nd millennium B.C.

The combined evidence of a lunar and an occasional lunar-solar lore in the early agricultural civilizations, which was spread across the land mass of Eurasia, branched into Africa, and was practiced by different peoples speaking different languages, raises the question as to whether an earlier, basic astronomical skill and tradition existed. The complexity of the Stonehenge tradition, for instance, indicates an evolution of some thousands of years.

Computations and analyses I have made have disclosed evidence of lunar observation in notational sequences and markings dating from the Upper Paleolithic period; these extend backward in an unbroken line from the Mesolithic Azilian to the Magdalenian and Aurignacian cultures, a span before history of some 30,000 to 35,000 years. The interpretation of these notations explains the calendric traditions of the first agricultural cultures.

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The evidence is neither sparse nor isolated; it consists of thousands of notational sequences found on the engraved "artistic" bones and stones of the Ice Age and the period following, as well as on the engraved and painted rock shelters and caves of Upper Paleolithic and Mesolithic Europe.

The interpretation of these notations ends one of the major mysteries concerning man's early cultural life, for these Upper Paleolithic sequences, marks, signs, symbols, and "forms" have perplexed prehistorians and archeologists since the antiquity of Ice Age art was first recognized, about 70 years ago. The attempts at interpretation have been persistent but inadequate, for, as Hallam L. Movius, Jr., summed up the dilemma (*2*),

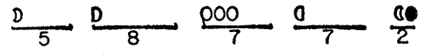
> It is patently obvious that the documents . . . whether paintings, engravings, or sculpture, must be deciphered. To allude to them as "probably for ceremonial purposes" . . . begs the issue and contributes nothing material and germane to our understanding of the purpose behind the artistic accomplishment.

I shall present examples from the three major periods of the prehistory of *Homo sapiens,* chosen because they are representative and relatively simple. The more complex styles, found in every period back to the earliest, require explanations of diverging and evolving notational techniques.

From the Azilian culture, which developed during the first two millennia after the ice had melted, but still before the beginning of agriculture in Europe, I present two painted notations from the rock walls of Spain (Fig. 1) (*3*).

In the notation found at Canchal de Mahoma (Fig. 1*a*) the large club or oval is the "count" or summation sign for a period. By a simple count there are 29 marks around it if the angle is counted as two. If we consider the crescent mark at bottom right as the first crescent, then the single mark below and outside is the day of invisibility. We can then proceed sequentially till we come to the last crescent mark, which faces in the opposite direction. Each crescent faces in the precise direction it would face to a man looking south, the first crescent curving right in the western dusk sky, the last curving left in the eastern dawn.

The line under the four marks, presumably made after them, represents the 7th day after the first crescent and therefore the quarter moon. Seven days later we find a group of three, the full moon period. The last quarter occurs 8 days later, being represented by the mark before the angle. There then are 5 days to the last crescent. This is a *precisely* observed lunar sequence:



The notation around the sign from Abri de las Viñas (Fig. 1*b*) gives a day count of 30, from invisibility to invisibility. An analysis of the phrasing is not difficult. More important is the fact that the sign for this period is the humanoid "god" or anthropomorph common in Magdalenian and Azilian art. This is the first clue towards an understanding of this "god."

If we now go backward several thousand years to the Magdalenian at the time of the last glacial maximum, we find thousands of engraved or painted notational sequences. They are scattered from Spain through Russia. One unusual example, a bit of engraved mammoth ivory from Gontzi, Ukraine, is presented in Fig. 2. It dates from the last stages of the Upper Paleolithic period, which correspond roughly to the Upper Magdalenian culture in Europe. It has been one of the more puzzling artifacts from the Ice Age, for it is clearly neither art nor decoration, but some sort of notation. Again we notice symbolic figures within the sequence and associated with it. In this paper I cannot present an analysis of all the markings, for the sequence contains some markings and phrases that are "nonlunar" within a strict lunar observation and long phrasing, a practice

common in Upper Paleolithic notation.

To present a graphic analysis I have placed the markings against a model of the lunar month. (Fig. 2*a*). The model is structured to a uniform 30-day month. Since the observational synodic month is 29.5 days, and two months are 59 days, it is necessary to insert one non-observational day (⌐) into the model each 2 months to make it match the observed phases and the resultant notation.

The first month, top right, contains a number of angle signs; some of these "swallow" the mark in their center; others do not. We assume that these angles represent points in the observation or narrative of this particular month and that each represents a single day.

The sequence begins with a small introductory angle three days before invisibility. Invisibility is the swallowed mark, and the next invisibility is again a swallowed mark, falling on precisely the right day. There is a prior angle of swallowing that comes after the last quarter and its mark of separation, as though to introduce the period that "kills" or swallows the moon. It recalls the somewhat similar angle found in the notation from Canchal de Mahoma.

Above the horizontal count-line, and following this month, are two marks (| |) that seem to be a summary, as if to say "we have just had two invisibilities." Similarly, after the next invisibility there are three marks (| | |). After this 2-month period we come to a "form" that seems to say, "we have just had 2 months (═|) with three invisibilities (· | |)." We then get the next 2 months. The notation for the 3rd month is lost because of damage to the bone but is apparent in the long marks remaining. After these marks

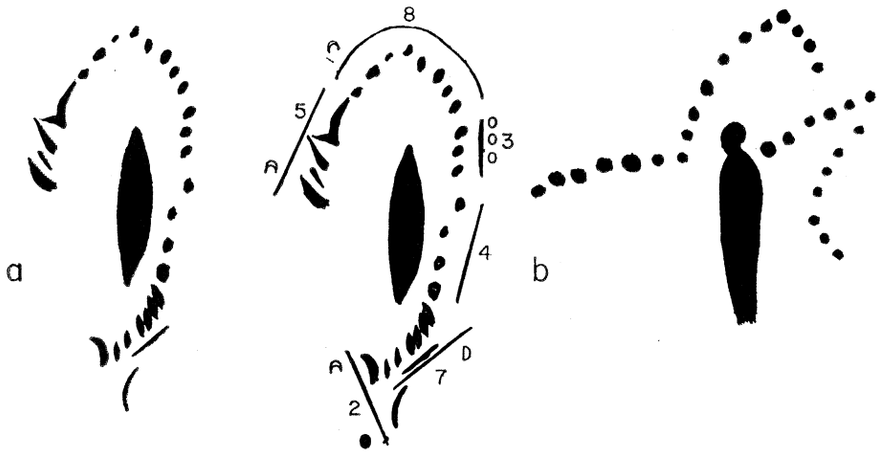


Fig. 1. Two painted notations from Azilian Spain. *a*, Sign from Canchal de Mahoma. *b*, Sign from Abri de las Viñas. [Artwork from H. Breuil, *Les Peintures Rupestres Schématiques de la Peninsule Iberique* (1933), vol. 1, plate 23, fig. 3; vol. 2, p. 125, fig. 40]

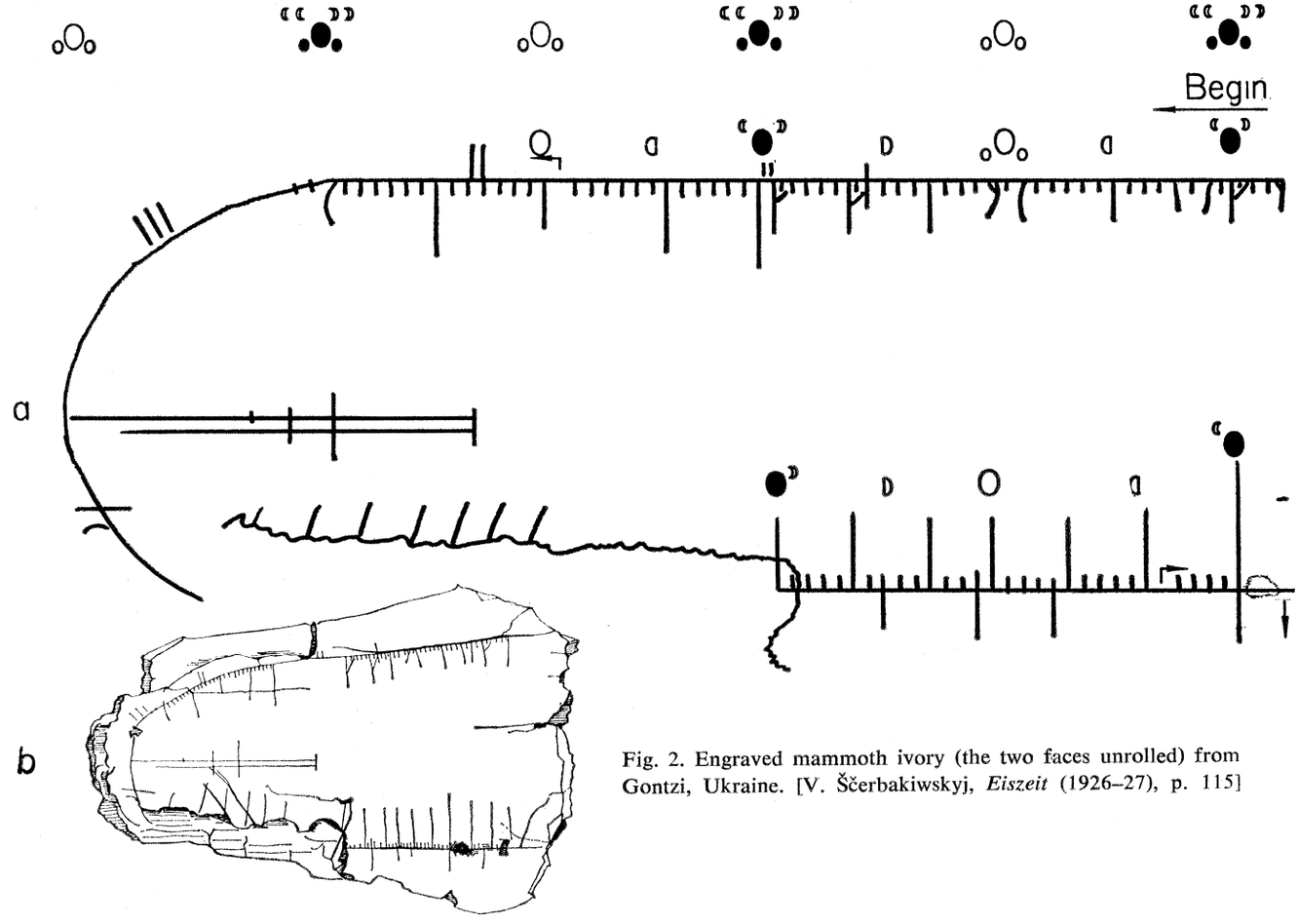


Fig. 2. Engraved mammoth ivory (the two faces unrolled) from Gontzi, Ukraine. [V. Ščerbakiwskyj, *Eiszeit* (1926–27), p. 115]

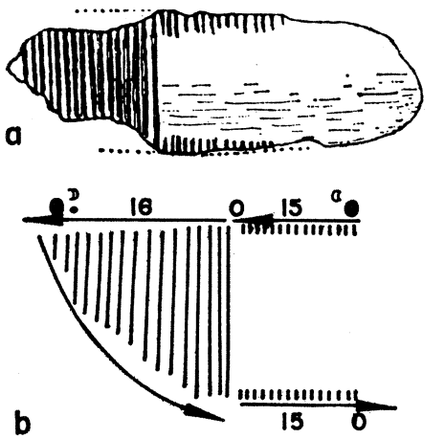


Fig. 3. Engraved reindeer bone from Kulna, Czechoslovakia. [H. Breuil, *Anthropologie* (1925), p. 286, fig. 11]

there is a space and the 4th month begins.

We assume that the mark for one day is lost in the damaged area and supply it. This month then ends on the day of invisibility, which is the longest vertical. The additional lines and "signs," which close the period, may summarize the four months or may be extra days.

The ramifications of the notation on this bone from the Magdalenian period will be presented elsewhere and will include a fuller analysis of the 1-, 2-, and 4-month notational periods, the rapidly evolving use of symbols and other notational techniques, a discussion of the purposes of the nonlunar phrases and of counts that are shorter or longer than a lunar phrase, as well as the reasons for the notational variations of different months.

If we now go backward again some 10,000 to 25,000 years, to the Aurignacian of Western Europe (about 33,500 to 16,500 B.C.) and to the Eastern Gravettian of Central Europe and Russia, we once again find hundreds of notational sequences, many of extraordinary complexity. Figure 3 shows a simple example from Kulna in Moravia, Czechoslovakia. This is a bit of engraved bone without symbols or art work; differentiation of the lunar periods is accomplished by the size of the marks and the direction of the count. The lunar phrasing of the Kulna bone is shown in Fig. 3*b*.

The questions raised by this evidence of lunar notation in the Upper Paleolithic period are many and important. They entail a reevaluation of the origins of human culture, including the origins of art, symbol, religion, rite, and astronomy, and of the intellectual skills that were available for the beginnings of agriculture.

For the first time it now becomes possible to begin the analysis and reconstruction of the culture of *Homo sapiens* in the Upper Paleolithic period. I have begun these tasks with an analysis of all the available published materials and artifacts of the Upper Paleolithic and a first-hand study of many of the artifacts and caves, including a "reading" of over a thousand notational sequences with their associated art and symbol. This is based on a few representative examples and is intended to open the way for a fuller presentation and analysis of the many documents in which the lunar tradition is apparent.

References and Notes

1. G. S. Hawkins, *Nature* **200**, 306 (1963); **202**, 1258 (1964).
2. H. L. Movius, Jr., in "Three regions of primitive art," *New York Museum of Primitive Art Lecture Series* **2** (1961), pp. 14–15.
3. Artwork of Henri Breuil redrawn with permission of Trianon Press, Paris, France.

The Compleat Botanist

Trained botanists with a broad background and a liberal education are urgently needed by society.

A. J. Sharp

My indebtedness, in this speculation about the "compleat" botanist, is clear (*1*). Izaak Walton was not a professional biologist, but he did realize that to be a thorough fisherman one had to understand every angle of angling. It is my thesis that to be a "compleat" botanist one must have a breadth of perspective that permits him to see beyond his own specialty and understand the importance of relationships which exist today not only between the fragments (and I use the word advisedly) of botany but also between plants and the everyday life of man. What I have to say about botany is equally true of zoology and biology in general. And I will be so bold as to substitute often in my discussion the word *biology* for *botany*.

It is wise and healthful in any discipline for the practitioners periodically to reexamine it and themselves. It is clear that the time has come for botanists to take a fresh look at themselves and their science. The current, bitter, internecine discussion concerning the relative validity of modern or molecular biology and classical or organismal biology indicates that we are confused. Worse yet, it is confusing our clients and benefactors, many of whom can see no reason why classical and modern approaches should not supplement each other.

As I understand it, botany is the study of plants in the broadest terms, and ranges from the chemistry of the DNA molecule in the nucleus of a plant cell to the spatial relationship of individuals in a desert community. It includes studies of the chemical and physical natures of the materials and processes in the cells, of the organization of the cells into tissues, of tissues into organs, of the movement of materials into, through, and out of plants. In addition, the botanist is concerned with the plants of the past, with phylogeny, with modern floras, with the relations of plants to all phases of their environment, not excluding man.

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