The First Calendar?
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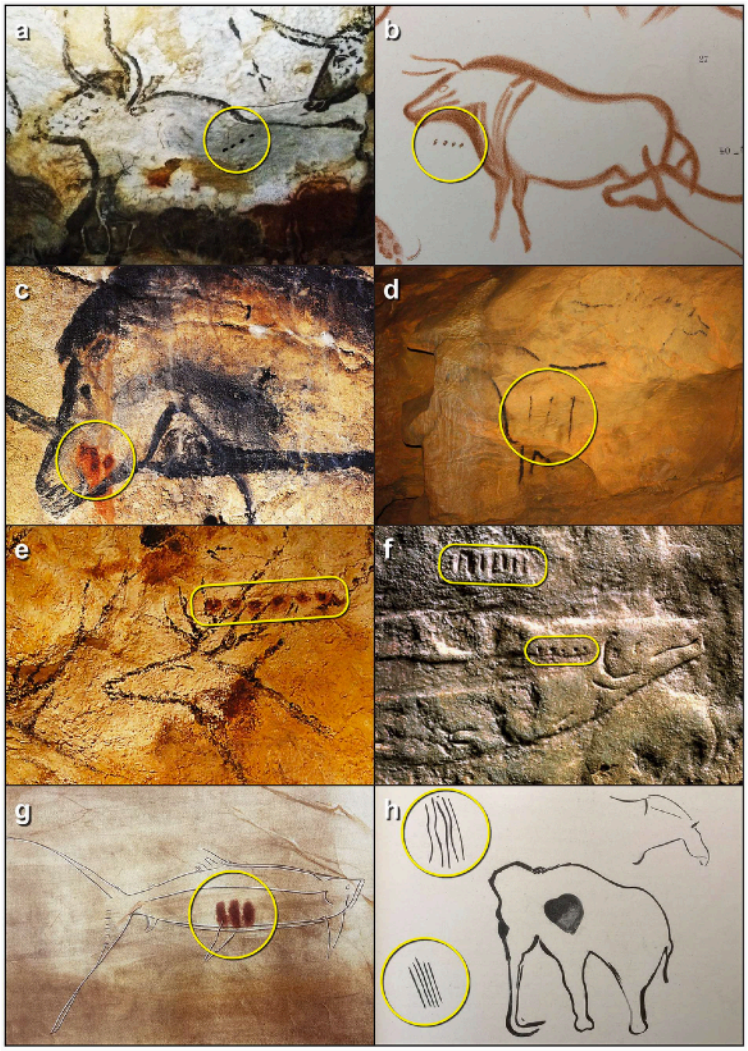
[Disclosure: Although I spent my professional life as an archaeologist, I am a Classical archaeologist and not an expert on the Paleolithic. I did excavate some Paleolithic tools on a dig in southern Spain, and now that I have retired to live in northern Spain, I have visited several of the caves with astonishing Paleolithic art that can be found on the Cantabrian coast.]



From Bacon, *et al*., 2023. "Figure. 1 (opposite). Examples of animal depictions associated with sequences of dots/lines. (a) Aurochs: Lascaux, late period; (b) Aurochs: La Pasiega, late; (c) Horse: Chauvet, late (we differ in opinion with the Chauvet team, for whom it would be early); (d) Horse: Mayenne-Sciences, early; (e) Red Deer: Lascaux, late; (f) Salmon: Abri du Poisson, early; (g) Salmon (?): Pindal, late; (h) Mammoth: Pindal, early."

Last week, several news items appeared discussing an article which recently was published in the *Cambridge Archaeological Journal* (Bacon, *et al.*, "An Upper Palaeolithic Proto-writing System and Phenological Calendar," 2023). On 5 Jan. 2023, Hannah Devlin, a science correspondent for *The Guardian*, published "Amateur archaeologist uncovers ice age 'writing' system ('Lunar calendar' found in caves may predate equivalent record-keeping systems by at least 10,000 years)."

On the same day, Becky Ferreira, a science correspondent for *Vice*, published her piece entitled "A Total Amateur May Have Just Rewritten Human History With Bombshell Discovery." As far as newspaper reporting on archaeological discoveries go, these two articles are only half bad.

One of the main half-good parts is that both Devlin and Ferreira eschew the normal, breathless, newspaper reporting about a "mystery" being solved. [*Why* do reporters *always* frame anything that has to do with archaeology as a "mystery"? I suspect that it reflects a general ignorance about how social sciences like archaeology actually function. Like all scientists, archaeologists seek data (artifacts), make hypotheses about that data, and then modify their theories on the basis of newly uncovered (literally!) data. As a method to understand past human cultures based on the surviving material record, there are things about which archaeologists *can* and *cannot* speculate. We know, for instance, a great deal about *when* and *how* the Egyptian pyramids or Stonehenge were constructed (although we are still learning some details about the latter). There is no "mystery" about *why* the Egyptian pyramids were built—we know from written records they were made by willing workers who were creating tombs for their god-pharaohs. And, similarly, there is no "mystery" about *why* Stonehenge was constructed. We can speculate that this monumental structure served as the locus of annual gatherings of small Neolithic farming communities in the Salisbury Plain, but we simply have no idea about *why* these Neolithic farmers built Stonehenge. There are no written or oral records that could tell us what was in the minds of the people who built (and rebuilt) it. No "mystery," just no evidence, or even the possibility of any evidence. There are, in this world, things that simply cannot be known. No "mystery." Deal with it!]

The other half-good part of Devlin's and Ferreira's articles is that both do a fine job in summarizing the argument that Bacon *et al*. make—that the sequences of dots and other marks associated with hundreds of Paleolithic painted images of animals are a notation system by lunar months of the animals' mating cycles. Devlin's piece includes comments by Paul Pettitt, a Professor of Archaeology at Durham University and one of the authors of the article: "'The results show that ice age hunter-gatherers were the first to use a systemic calendar and marks to record information about major ecological events within that calendar,' he said." Devlin is

also careful to note that “Since the marks are thought to be recording information numerically rather than recording speech, they are not considered to be “writing” in the sense of the pictographic and cuneiform systems that emerged in Sumer from 3,400 BC onwards but are classed as a proto-writing system.” Ferreira is a little less restrained, in part because she interviewed the amateur lead author Ben Bacon, quoting him as saying that he discovered “the first known writing in the history of *Homo sapiens*,” that Paleolithic “society achieved great art, use of numbers, and writing” and “that reading more of their writing system may allow us to gain an insight into their beliefs and cultural values.”

Now the half-bad part of Devlin’s and Ferreira’s articles: [To be fair, most of my cavils are about the Bacon, *et al*., article itself, on which more anon.]

Both Devlin’s and Ferreira’s leads focus on the fact that an *amateur* researcher started this line of research:

> A primitive writing system used by ice age hunter-gatherers appears to have been uncovered by an amateur archaeologist, who concluded that the 20,000-year-old markings were a form of lunar calendar (Devlin)

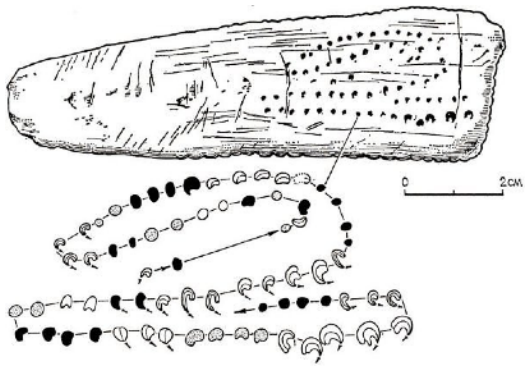
And

> In what may be a major archaeological breakthrough, an independent researcher has suggested that the earliest writing in human history has been hiding in plain sight in prehistoric cave paintings in Europe, a discovery that would push the timeline of written language back by tens of thousands of years, reports a new study. (Ferreira)

While there is nothing wrong in highlighting the fact that an amateur contributed to this discovery, it does tend to minimize the training and time it takes to do real archaeology. Ben Bacon is a furniture repairman who spent “countless hours” in the British Library looking at pictures of Paleolithic cave art in an attempt to find patterns in the auxiliary marks added to the cave paintings; one can only admire Bacon’s perseverance. Still, we don’t read about amateur nuclear physicists making breakthroughs in quantum mechanics, and I doubt that anyone would want to be operated on by an amateur neurosurgeon. To be sure, amateur astronomers have, by wading through masses of publicly available evidence, made equivalent contributions to astrophysics and cosmology; but, in the end, it is the real astrophysicists and cosmologists who make sense of what they have found. And here, in the case of a possible, previously unnoticed, Paleolithic notational system, it

is the job of Prof. Pettitt—who has made important contributions in the field of Middle and Late Paleolithic archaeology—to put Bacon's discovery to the test and to put it in the broader context of what we know about our Paleolithic ancestors.

It is curious that both Devlin and Ferreira missed the opportunity to compare the amateur Ben Bacon's achievement with the work of a previous amateur, Alexander Marshack, who made equally important breakthroughs in our understanding of Paleolithic notational systems. Marshack was a journalist who became interested in the history of mathematics and astronomy after working on a project with NASA. In the 1960's Marshack began to examine engraved Paleolithic artifacts, such as the ca. 30,000 BCE Upper Paleolithic Blanchard bone, and concluded that that the markings on the Blanchard bone and others like it record phases of the lunar cycle.



The Blanchard bone and Alexander Marshack proposed interpretation of a notational system recording lunar cycles.

The Bacon *et al*. article itself does give credit to Marshack:

> While the lunar calendar notion failed to convince the scholarly community, Marshack's work paved the way for the recognition that these sets of markings were artificial/external memory systems, whatever the reason for this recording.

And now, what really gets my goat (chamois?) about the Bacon *et al*. article itself: [I am grateful that Cambridge University Press has made this article freely available online through a Creative Commons Open Access license.]

I have no problems with a number of reasonable assumptions Bacon *et al*. make (I have removed the in-text citations from these quotations):

> Our interest is in the sequences of dots/lines associated with depictions of prey animals in Upper Palaeolithic art, and in the <Y> sign that appears in some of these sequences. As we have noted above, it seems justifiable to assume that such sequences were saying *something* about the specific taxa with which they were

> associated, rather than forming a part of the depiction. If they depicted blood or breath, for example, why would several taxa including aurochs, fish and a cicada be consistently marked with four dots/lines in various anatomical locations. Hunting magic, shamanism, other 'umbrella theories' and, for that matter, random chance, do not provide an explanation for the redundancy of the number four in many images . Instead, we believe that it is likely that this information was numerical in nature, of either a cardinal or ordinal nature.

And:

> We have seen above that the quantification of things using mental number lines and the additive/plus one principle, wherein one mark equates/represents one thing, was a characteristic of Upper Palaeolithic mark sequences. In our hypothesis, when associated with an animal they should mark units of calendrical time. Given that the number of these is always relatively few, it is unlikely these represent days. We think it likely that the total number of marks in a sequence is one way of denoting *a number of months*. The most obvious units of time for non-agricultural groups are lunar months. The recurrent cycle of the moon's four individual phases provides a readily visible framework for quantifying time, particularly when assisted by material scaffolding and, if necessary, the cycle of ~29 days could be subdivided into four subphases of ~7 days. As none of the sequences in our database (see below) contains more than 13 marks, they are consistent with the 13 lunar months of a year. Hence, we hypothesize that sequences are conveying information about their associated animal taxa in *units of months*. In other words, they present ethological information as a seasonal calendar.

Bacon *et al*. reasonably assume that any seasonal reckoning used by Paleolithic peoples would have been based on meteorological and not astronomical phenomena—phenomena that "are directly relevant to the cycles of flora and fauna that were crucial for survival in the Pleistocene." They, perhaps a little less reasonably, assume that the first month in a Paleolithic year would have started in May with the "so-called '*bonne saison*', a French zooarchaeological term for the time at the end of winter when rivers unfreeze, the snow melts, and the landscape begins to green." (Although the rivers near the Paleolithic caves in southern France and northern Spain do not freeze in the winter.)

With these assumptions in hand—including the assumption that the <Y> sign represents "giving birth", Bacon *et al*. undertake a rigorous statistical test of their hypothesis

> . . . that the number of lines/dots, or the ordinal position of <Y> symbols, in sequences associated with depictions of prey taxa in Upper Palaeolithic art, convey information about events in those

> animals' annual lives important to hunter-gatherers, expressed in lunar months RBS [relative to *bonne saison*], i.e. anchored to the start of the bonne saison. That information is likely to reflect birthing, and possibly mating and/or migration of the animals of concern in the region in which the images are found (or originated).

By comparing the sequences of line/dots and <Y> symbols associated with animals on Paleolithic parietal art to the life cycles of equivalent modern taxa, Bacon *et al*. demonstrate that there is a close correlation ("with fits of dual Gaussian mixture models") between their interpretation of the Paleolithic notational system and the mating and migrations of the animals depicted.

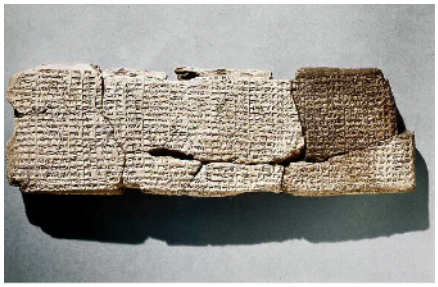
So far so good.

I think it's really cool that Bacon *et al*. have discovered that on some Paleolithic cave paintings of animals there are sequences of marks which denote a lunar month important to the Paleolithic hunters of those animals. This discovery goes a long way in helping us understand the cognitive evolution of our *homo* species.

Still, I have several issues with the Bacon *et al*. article, only some of which the authors address.

One of my minor gripes is the possible confusion of a calendrical notational system with a *calendar*. Of course, archaeologists are under pressure to claim whatever they have found is the first or oldest example of its kind. (Funding agencies are not impressed by statements like "We have discovered another Middle Helladic II tomb very similar to dozens of others already known.") But when Pettitt claims, as Devlin reports, that their research demonstrates "ice age hunter-gatherers were the first to use a systemic calendar" some may think that he is claiming that Paleolithic peoples had actual calendars. I don't know about you, but when I am looking at a calendar—mine hangs from a hook on the wall and has an interesting picture below which are the days of the month arranged in weekly rows—I am usually looking to see what day it is, or if I've forgotten something important like my wife's birthday. (And now that I am living in Spain, I look at the calendar daily to see what saint's day it is, and if it is national or regional holiday.)

[The history of the visual representations of different calendrical systems is a fascinating topic that we won't address today. Suffice it to say that the first *visual* calendars had nothing to do with any Paleolithic calendrical notational systems.]



Early calendars: Babylonian (ca. 500 BCE); Egyptian (ca. 180 BCE); Aztec (ca. 1500 AD)

So, let's take Bacon *et al*. at their word. All they are really claiming is that ice-age hunter-gatherers had a *mental* notion of a calendar and that they developed a notational system to represent lunar months within a calendrical year. That hunter-gatherers would have an appreciation for annual cycles affecting the prey animals upon which their lives depended is not surprising, and it is only to be expected that Paleolithic people would be acutely aware of lunar cycles. The remarkable claim that Bacon *et al*. are making is that the use of a numbering system by humans to denote calendrical events is tens of thousands of years older than we had previously thought. Really cool, as I've said.

But this raises the question of how, exactly, this Paleolithic calendrical notational system functioned in practice. Bacon *et al*.:

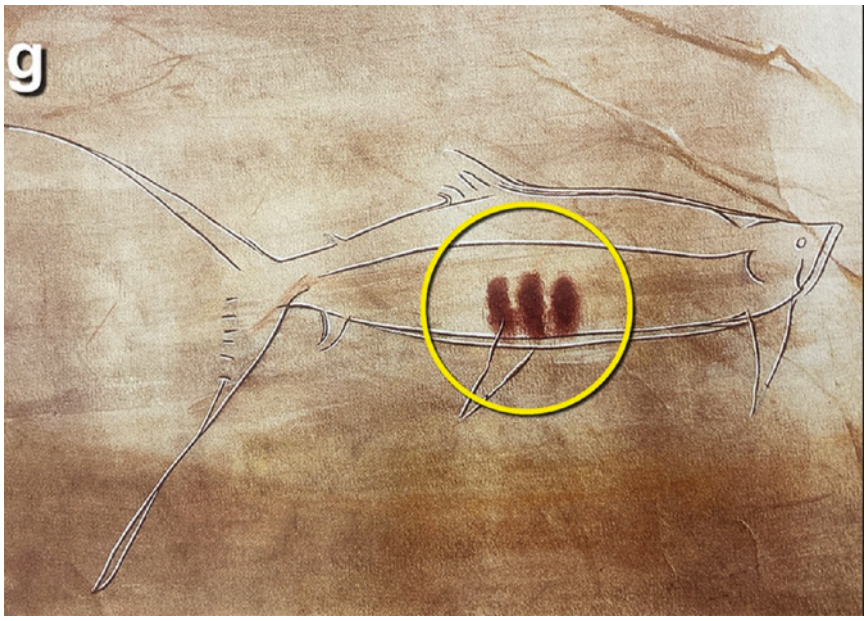
> We have proposed the existence of a notational system associated with an unambiguous animal subject, relating to biologically significant events informed by the ethological record, which allows us for the first time to understand a Palaeolithic notational system in its entirety. This utilized/allowed the function of ordinality (and, later, place value), which were revolutionary steps forward in information recording. The requirement, in ordinal representations of number, that the 'special' symbol at the ordinal position of the value being represented must be distinct from all other symbols in a sequence clearly invites a meaning to be associated with the special symbol. With such, there was no longer the need for a purely oral explanation of the system, as all of its components were self-contained to the point of being readable many thousands of years later. Thus, although a series of marks can of course be ambiguous, the Upper Palaeolithic written system was thus clear, unambiguous and permanent, and could have widespread meaning irrespective of any linguistic barriers (about which, of course, we know nothing),

Yes, this was a "revolutionary step forward in information recording." But was this notational system really "unambiguous and permanent" without a "need for a purely oral explanation"? As Bacon *et al*. note, "Prey animals overwhelmingly dominate Palaeolithic art and pelage, hair, antler growth, gregarious and aggressive behaviour

and other indications of rutting in particular are commonly depicted in some numbers by the Late Upper Palaeolithic." One can assume that any Paleolithic person viewing such indications of seasonality on a cave-painting depiction of a prey animal would understand what season was being depicted. But would every Paleolithic person really know without an oral explanation that four dots before a <Y> sign denotes that this type of animal gives birth four months into a *bonne saison* year?

And this brings us to my main gripe about the Bacon *et al*. article.

The evidence that Ben Bacon began investigating are paintings in *caves*, not illustrations in books in the British Library. But the way that the Bacon *et al*. article presents them makes them seem like they are pages from a calendar. [Someone should really make calendar with monthly illustrations based on Bacon's discovery!]



From Bacon, *et al*. (2023), "Fig. 1. (g) Salmon (?): Pindal, late. Source: Berenguer 1994, 92, fig. 63."

[A case in point: When I visited the El Pindal cave a few years ago, having read up beforehand all about that Paleolithic cave with its famous painting of a mammoth, the tour guide was just about to finish the tour when I asked her where was the image of the fish. As my brother and I were the only ones on the tour, the tour guide told us with a twinkle in her eye to step over the barrier and come right up to the cave wall where, with the aid of her flashlight, we could just barely make out the shallow engraving of the salmon. I don't remember seeing the three red dots that feature so prominently in the Bacon *et al*. illustration.]

To be sure, Bacon *et al*. do recognize the problems involved with viewing cave paintings that are often deep with caverns where Paleolithic people could have seen them only in the flickering glow of hand-held stone lamps fueled with animal fat:

> It is unclear to us how visible, accessible, or universally shared this information would have been. While we might assume that portable art found in domestic contexts was visible to many or all, this of course does not necessarily imply that everyone could 'read' its message. With parietal art, at least that created in deep caves, we simply do not know who its audience were; perhaps it was viewed by many, or perhaps shared only with a minority of 'literate' initiates 'in the know'. Likewise, we are not claiming that the function of the system was incompatible with other aesthetic, didactic or ritual aspects of Palaeolithic visual culture or that it explains *all* associations of lines/dots with animals, or that it was practised at all times and by all groups across Upper Palaeolithic Europe. We of course acknowledge that far more examples of animal depictions occur *without* associated signs, and of course do not imply that our interpretations include these.

It is nice that Bacon *et al*. recognize that the majority of Paleolithic cave paintings of animals are not accompanied by any calendrical notations. It is curious, however, that this team of researchers has not addressed the fact that the vast majority of dots and lines and other symbols such as segmented rectangular forms that appear in Paleolithic caves are not associated with any depictions of animals. Presumably these ambiguous markings must have meant *something* to the Paleolithic painters who put them up on the cave walls.

"Dot clouds" in El Castillo cave.

Dots and lines in El Pindal cave.

And this brings me to my final point.

For anyone who has had the pleasure of seeing Paleolithic cave art *in situ*, or even for anyone who has only seen a picture of Lascaux or Altamira on page one of

their college Art History 101 textbook, there is something fascinating about these ancient images of bison, aurochs, horses, mammoths, and other animals. Here is the earliest human *art*, drawn with such amazing skill by our earliest human ancestors millennia ago! But what do these pictures "mean"? When I was first studying archaeology the predominant "umbrella theory" (as Bacon *et al*. put it) explaining Paleolithic cave paintings was hunting magic—that drawing depictions of prey animals deep in caves would somehow lead to success in a future hunt. By the time that I was finishing my decades-long teaching career the hunting magic theory had been overtaken by shamanism—the idea that these depictions were visions created by shamans in dream-like states.

The impulse to try to find "meaning(s)" in Paleolithic cave art is understandable. We have a deep-seated desire to connect with these earliest *homo* artists. And now we know, thanks Bacon and crew, that at least some of their art have a "date stamp", much like a a date below a Picasso signature. But we must resist the natural urge draw a line between the marks made on cave walls by Paleolithic peoples and the beginnings of human civilizations 15,000 years later. Ben Bacon's dream that "that reading more of their writing system may allow us to gain an insight into their beliefs and cultural values" is just that, a pipe-dream. In the end, the beliefs and cultural values of our Paleolithic ancestors have been lost to the mists of time. Deal with it!

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