

KNO-001 · A Mark on a Stone

KNO · Ways of Knowing

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1. A Scratch Is Not Yet a Symbol

The Question

A groove can be measured, photographed and dated. Its meaning cannot be lifted from the surface in the same way. What chain of evidence allows archaeology to move from a physical trace to an intentional mark, and then—more cautiously—to a possible sign? A line on a durable object begins as an observable modification, not as a decoded message. Archaeologists can establish material, geometry, superposition and manufacture before they address purpose. That order matters because an intentional cut may have been practical, decorative, imitative, playful or communicative; survival alone does not choose among those possibilities.[1,3] At Trinil in Java, a freshwater shell from the Homo erectus assemblage bears a geometric engraving made before fossilisation. The associated shell context is hundreds of thousands of years old. The study establishes deliberate manufacture more strongly than it establishes function: its authors explicitly state that the engraving's purpose or meaning cannot be assessed.[1] Middle Stone Age ochres from Blombos Cave and Klein Kliphuis carry deliberately incised patterns. Detailed studies distinguish patterned engraving from grinding or scraping used to process pigment. Yet even a repeated cross-hatched design does not contain its own dictionary. Calling it symbolic is an interpretation supported by pattern and context, not a translation of recovered semantic content. [2,3,5] A silcrete flake from the approximately 73,000-year-old levels at Blombos preserves intersecting red lines. Microscopy and chemical analysis support deliberate application with an ochre crayon, and the lines continued beyond the surviving edge. This identifies a drawing action and part of a larger design; it still does not recover what the design meant to its maker.[4] The inference therefore has layers. Surface analysis can show that a mark is ancient; fracture and sequence can show when it was made; experiments can identify a tool and gesture; recurrence can support deliberate patterning. Intention, notation and shared meaning sit progressively farther from direct observation and require progressively more contextual evidence.[1,3,4]

Where That Leaves Us

The oldest durable marks enlarge the history of deliberate pattern-making, but they do not come with captions. Archaeology is strongest when it reports the sequence of inferences rather than collapsing them: object, modification, deliberate gesture, recurrent form, possible convention. The mark is evidence; the recovered meaning is usually the open question.

2. Marks, Tallies and Numbers Are Different Claims

The Question

Several parallel notches look countable to a modern eye. But countable is not the same as counted, and counted is not the same as numerical notation. Which observable features can distinguish decoration, grip, ownership, sequential action and a record of discrete events? Incisions can result from cutting, scraping, sharpening, gripping, butchery or deliberate marking. Microscopic profiles,

stroke direction, superposition and tool changes can exclude some alternatives. They identify how a sequence was produced more securely than why. A regular row is therefore evidence of organised action before it is evidence of counting.[3,9] Experiments on the Zaskalnaya raven bone indicate that two notches may have been added to make an existing sequence look more regular. That result supports attention to visual spacing. It does not demonstrate that each notch stood for one animal, day or quantity, and it offers no recovered rule for reading the sequence.[8,9] A notched bone from Border Cave, about 44,000 years old, contains groups made at different times and has been interpreted as notational. Sequential production makes an external record plausible. The recorded category is unknown, however, and the object does not by itself reveal whether the units were numerical, calendrical, social or practical.[7,9] Archaeological proposals for the emergence of number symbols use testable stages: perceptual grouping, one-to-one marks, accumulation across sessions, conventional forms and eventually operations on signs. This is a model for organising evidence, not an excavated universal sequence. Different communities could externalise quantity through different materials and routes.[9] The Ishango bone concentrates the temptation to overread. It is a small object with a quartz point and grouped notches, found near Lake Edward and usually dated to roughly twenty thousand years ago. Many arithmetic and calendrical interpretations have been proposed. The notches are real; a uniquely demonstrated decoding is not.[10]

Where That Leaves Us

A row of notches can be intentional without being a tally, and a tally can track items without constituting writing. The strongest analyses test manufacture, sequence and grouping before proposing content. Number enters the argument only when evidence supports a mapping between marks and units, not when modern observers can simply count the marks.

3. How Archaeology Tests Intention

Microscopy turns a mark into a sequence of physical events. Investigators examine groove cross-sections, shoulders, internal striations, pigment particles, entry and exit points, and crossings between lines. Those features can distinguish a dragged point from deposited pigment and can reconstruct which stroke preceded another without assigning a message to either.[3,4] Experimental replication supplies comparison rather than reenactment. Researchers use candidate tools and gestures on similar materials, then compare resulting traces with archaeological ones. A close match can support a manufacturing hypothesis and estimate skill or effort. It cannot establish that the experimenter's motive was the ancient maker's motive.[3,8] Context asks whether the marked object belongs where investigators think it does. Stratigraphy, refitting, dating, surface alteration and association with other artefacts constrain age and behaviour. A striking object without secure provenance carries less historical information than a modest one excavated within a documented sequence.[1,2,5] Confidence grows when independent observations converge: the mark predates burial, its strokes were deliberately sequenced, experiments reproduce its morphology, and comparable patterns recur in related contexts. These signals are not fully independent if they derive from the same misidentified object, so identity and provenance checks must precede interpretation.[3,4,9] Good analysis also preserves uncertain cases. The Blombos ochre study separated definite engravings, ambiguous incisions and traces better explained by processing. More generally, Pleistocene behavioural evidence accumulates unevenly rather than arriving as one sudden package. Classification with explicit uncertainty is more informative than forcing every mark into a story of cognitive revolution.[3,6]

Where That Leaves Us

Archaeology cannot interview the maker, but it can discipline the questions asked of the object. Microscopy reconstructs gestures, experiments compare causes, and context secures time and association. Meaning remains the most distant inference. Uncertainty is not failure here; it is the recorded distance between a surviving trace and a vanished act.

4. External Memory Changes the Task

The Question

Remembering internally and consulting a stable mark can produce the same answer, but they are not the same cognitive operation. What changes when part of a task is held outside the nervous system, where it can be inspected, rearranged and shared? External representations change a task by making some states perceptually available. A written intermediate result, arranged token or marked position need not be maintained entirely in working memory. The environment does not solve the problem alone; it redistributes storage, search and comparison between a person and a structured surface.[15,18] In Hutchins's cockpit study, remembered speeds were distributed across people, spoken procedures, instruments and movable markers. No single component contained the whole memory in isolation. The case demonstrates how a coordinated system can preserve task-relevant state, while providing an analogy—not direct evidence—for much older practices of marking and checking.[16] Some actions are epistemic: they are performed to reveal, simplify or stabilise information rather than to advance directly toward a physical goal. Rotating a piece to recognise it or arranging counters to compare groups can reduce mental search. A mark can serve this role even if it is temporary and understood by only one person.[17,18] The extended-mind thesis goes further, arguing that a reliably integrated external resource may count as part of a cognitive process. That is a philosophical position about where cognition ends, not an archaeological measurement. KNO-001 needs only the narrower empirical point: external records can alter how remembering and reasoning are performed.[19] For prehistory, the safe inference is conditional. If marks were revisited, matched one-to-one with events or accumulated across sessions, they could have reduced demands on unaided recall. Microscopic sequence may support repeated production, but the cognitive role remains a model until contextual evidence links the object to a recurrent task.[9,15,18]

Where That Leaves Us

An external mark does not think, but it can transform what a thinker must keep active. Stable states can be revisited, compared and corrected; arrangements can make relations visible. Modern cognitive studies establish those mechanisms. Applying them to prehistory requires a separate archaeological argument that the marks were actually used in a recurrent task.

5. From Private Trace to Shared Convention

A person can use a mark without anyone else knowing its rule. Such a private trace already extends persistence across a delay, but it dies as a usable record when the rule is forgotten. Public notation requires more: a community must stabilise how forms are produced, distinguished and connected to things or actions.[15,18] Recurrence can support convention, but resemblance alone is not enough. Simple grids, parallel lines and crosses can arise independently because human hands and available surfaces constrain design. Stronger evidence would combine repeated form with shared manufacture, placement, chronology and context, while still acknowledging that similar signs can carry different meanings.[3,4,5] Cumulative cultural evolution involves modifications that are retained and build on earlier ones, although scholars distinguish several

forms and mechanisms. Durable records can assist accumulation by preserving outcomes for later learners. They are neither necessary in every case nor sufficient: copying a persistent error can accumulate just as effectively as copying an improvement.[25] External symbolic storage has been proposed as a major transition in human cognitive-cultural history because records can outlast individual memory and support instruction, retrieval and revision. The broad mechanism is plausible. Any fixed stage sequence, however, compresses diverse histories and should be tested against archaeological chronologies rather than treated as a universal ladder.[20,25] There was probably no instant at which one scratch converted an isolated mind into a cumulative culture. Patterning, teaching, material aids, convention and institutions leave different traces and need not emerge together. A better history tracks capacities and practices separately, then asks when particular combinations became stable enough to change transmission.[6,20,25]

Where That Leaves Us

Persistence becomes socially powerful when a rule survives along with the trace. Then another person can retrieve, compare or correct what the maker recorded. Convention is therefore not decoration added to memory; it is the coordination that makes an external state portable across minds. Archaeology must demonstrate that coordination rather than assume it from geometry.

6. Counting Objects, Accounts and Writing

The Question

A token can stand for a sheep, a notch for a delivery and a written sign for a spoken word. These systems can interact historically, but they solve different representational problems. What evidence justifies moving from quantity to account and from account to language? Humans and other animals can discriminate approximate numerosities, while small exact sets and learned symbolic numbers involve partly different systems. Neural studies identify populations tuned to quantity, but a sense of more or less is not an inscription. Exact, indefinitely extensible number systems require learned practices that connect forms, words or gestures to ordered values.[11,14] Experiments with Pirahã participants found accurate performance for some exact matching tasks but increasing error when quantities had to be retained or transformed without exact number words. The result supports number language as a cognitive technology for stable exact representation. It does not show that speakers lack numerical thought or general intelligence.[12] Indigenous Australian children speaking languages with restricted number vocabularies nevertheless performed well on nonverbal numerical tasks. Read with the Pirahã results, this blocks a simple claim that number words create all numerical capacity. Language and material signs can stabilise exact operations without being the source of every quantitative discrimination. [13] In the ancient Near East, clay tokens, sealings and numerical tablets form an influential reconstruction of administrative recording before and alongside early writing. Proto-cuneiform documents from the late fourth millennium BCE are heavily numerical and administrative. The proposed token-to-sign continuity is powerful for this regional case, but details and wider universality remain debated.[21,22] Writing is not identical to every durable sign system. It conventionally represents language across a sufficiently broad range, whereas tallies, ownership marks and numerical notations may encode restricted domains. Comparative histories identify several independent inventions of writing. There is no need to force all of them through one chain beginning with tally marks.[21,23]

Where That Leaves Us

Quantity can be perceived without symbols, exact values can be stabilised by words or marks, accounts can organise restricted domains, and writing can represent language. These capacities overlap but are not interchangeable. Their histories should be reconstructed locally, from documented transitions, rather than arranged in a universal staircase from notch to number to text.

7. What Survives Is Not What Existed

Bone and shell enter the archaeological record through selective pathways. Weathering cracks, abrasion, trampling, chemical alteration, transport and breakage remove objects and modify surfaces. Taphonomic analysis can identify some of these processes. It also shows why the surviving sample is not a neutral census of what people made or marked.[24] Organic records are especially vulnerable. Wood, bark, fibre, skin and soft plant materials can carry marks or arrangements but usually decay outside exceptional conditions. Border Cave's organic artefacts are informative partly because such preservation is unusual. Stone and bone may dominate our evidence without having dominated ancient representational practice.[7,24] A durable engraved object is more likely to survive, be recognised and be published than an unmarked or perishable aid. Frequency in museum collections therefore combines ancient behaviour, preservation, excavation, identification and research attention. Apparent bursts of marking may reflect some mixture of real change and improved visibility.[1,2,3,24] Absence of marks in a layer is strongest when excavation, preservation and sample size make absence detectable. Otherwise it may indicate no practice, a different material, a different context of use or simple loss. Archaeological silence is evidence only after the conditions that could produce silence have been modelled.[6,24] Archaeology, cognitive science and neuroscience answer different questions. Traces constrain what happened to objects; experiments reveal capacities and task mechanisms; neural data describe living systems. They can inform one another, but a modern capacity does not date its origin, and an ancient mark does not disclose the complete cognition that produced it.[9,11,15,24]

Where That Leaves Us

The archive is filtered before excavation begins. Durable materials, stable contexts and recognisable patterns are overrepresented; perishable aids and failed experiments mostly disappear. Any history of external memory must therefore explain both the marks that survived and the processes that selected them. A gap in the record is not automatically a gap in capacity.

8. A Mark Changes What Can Persist

Once a state is materially stabilised, it can persist while attention moves elsewhere. The maker can return to it; another person may inspect it; later action can begin from an earlier result. This is the minimal transformation external memory offers, independent of whether the mark is artistic, numerical or linguistic.[15,18] A persistent record also permits operations unavailable to a vanishing thought: side-by-side comparison, reordering, annotation and correction. Those affordances can make discrepancies visible and distribute complex work across time. They do not guarantee truth. A durable false entry can coordinate later action just as effectively as an accurate one.[15,17,18] When records acquire shared rules, copying practices and institutions, they can connect people who never meet. Accounts coordinate stores and obligations; texts preserve procedures and arguments; archives allow later comparison. These are historically documented expansions of persistence. They should not be projected backward onto every Palaeolithic line.[20,21,23,25] No known object deserves to be called the single first external memory. Earlier traces may be lost, and surviving candidates instantiate different behaviours. The historical question is

therefore plural: when did particular communities begin revisiting marks, mapping them to units, sharing their rules and building later records from them?[1,6,9,20] The deepest change is not that stone began to contain thought. It is that a human action could leave a structured state available after the action ended. From that modest capacity, under particular conventions and institutions, came many forms of tallying, diagramming, accounting and writing—related technologies with distinct histories rather than one inevitable ladder.[9,15,23,25]

Where That Leaves Us

A mark matters because it can remain available after the gesture and perhaps after the maker. That persistence creates opportunities for checking, sharing and accumulation, but each requires additional evidence and social practice. The scientifically honest story is not a leap from scratch to civilisation; it is a branching history of external supports for thought.

What We Know, and How

Microscopy, chemistry, experiments and context can establish that many ancient marks were deliberately produced and can often reconstruct tools, gestures and sequence. Cognitive experiments show that external states can redistribute memory and comparison. Documented administrative and writing systems demonstrate later conventional uses. These conclusions rest on different evidence and should remain distinct.

What We Still Don't Know

For most early objects, we do not know what a mark meant, whether anyone revisited it, whether its rule was shared, or whether its units were numerical. We also cannot measure the vanished record on wood, fibre, skin or temporary surfaces. The earliest surviving example is therefore not necessarily the origin of the practice.

What Could Change Our Minds

Repeated marked objects from secure contexts, with demonstrable production sequences and stable associations to independently known tasks, could strengthen claims of notation or convention. Direct refits, new dating or trace analyses could also weaken existing interpretations. Exceptional preservation of organic records may reveal routes to external memory that durable collections currently hide.

If You Remember Only One Thing

A deliberate mark can preserve a state beyond one brain, but symbol, tally, number and writing each require additional evidence.

Related Articles

None assigned in Master Index v2.50.

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