

Symbolism Without Symbols?

The Unsoundness of the Artifact to Symbol Inference in Paleolithic Archaeology

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ABSTRACT

Behavior mediated by symbols—commonly termed ‘symbolic behavior’—is widely recognized as a defining feature of human cognition. In deep history, its emergence is frequently inferred from artifacts or features that appear to lack utilitarian function and are thus interpreted as ornamental or representational artifacts potentially carrying symbolic meaning. However, such interpretations have been contested and have become a topic of increasing scrutiny due to the inherent ambiguity of both the archaeological data and the conceptual frameworks used to analyze them. This paper reviews the ambiguities inherent in the conceptual framework used to define and identify ‘symbols’ in Paleolithic contexts and explicitly outlines and interrogates its logic and applicability while attempting to suggest alternatives.

We confirm that the dominant theoretical frameworks fail to establish a coherent inference chain from ‘artifact’ to ‘symbol.’ These approaches are often either ad hoc or grounded in Peircean semiotics, which relies heavily on the role of the interpretant, a process that poses significant challenges in prehistoric contexts given its dependence on knowledge of prehistoric social conventions. We argue that archaeologists often fail to reconstruct symbols, but rather construct them. Moreover, if the criteria for identifying symbolic behavior were consistently applied across species, many non-human animals would qualify. This undermines the analytical utility of symbolism when used as a marker of humanness, as it often has been done over the past two decades. We contend that the prevailing symbolic framework is symptomatic of a deeper issue, namely a longstanding research tradition marked by a problematic nature/culture dualism. To move beyond these limitations, we advocate a *longue durée* perspective that integrates recent developments in evolutionary theory, particularly the Extended Evolutionary Synthesis, with insights from the philosophy of technology, especially the work of Simondon and Boëda. In doing so, we aim to move away from a fixation on discrete symbolic objects and toward a more processual and theoretically robust understanding of early human behavior.

INTRODUCTION

Throughout the history of research on human evolution, the use of symbols has played a central role in defining what it means to be human. Theoretical concerns about symbolism in archaeology emerged as early as 1954 (Hawkes 1954: 164) and have remained a topic of debate (e.g., Binford 1962; Chase and Dibble 1987; Coolidge et al. 2024; Friedrich 1970; Hodder 1982; Kissel and Fuentes

2017; Lindly et al. 1990; Robb 1998; Wadley 2003). Within the framework of human evolution, symbolic capacity was championed by proponents of the ‘Human Revolution’ model, which identified it as a core component of the so-called ‘modern package’ (Klein 1995; Marean et al. 2007; Mcbrearty and Brooks 2000; Mellars 1989; Nowell 2010). Despite critiques of the essentialist and exceptionalist thinking long embedded in paleoanthropology (Cartmill

1990; King 1994), particularly the notion of ‘policing the human/animal boundary’ (Cartmill 1990: 178), the Human Revolution paradigm gained dominance in the late 1980s and 1990s. This model drew a sharp distinction between ‘archaic’ behavior and the symbolic behaviors attributed to behaviorally modern humans, and became synonymous with Culture, with a capital ‘C,’ indicating essential, exceptional human forms of behavior. For example, Noble and Davidson (1991: 224) cite Geertz’s (1964: 39) definition of culture as “the imposition [of an arbitrary framework] of symbolic meaning upon reality”, reinforcing the binary opposition between ‘nature’ and ‘culture.’ Symbolic behavior thus became conceptualized as an epistemic boundary marking entry into the human domain.

In this period, the empirical and theoretical underpinnings of recognizing symbols in the archaeological record has also started to become a topic of debate within the field of archaeology (e.g., Byers 1994; Chase 1991; Davidson and Noble 1992; D’Errico and Villa 1997; Hays 1993; Hodder 1982; Nowell 2006; Wadley 2003; Wynn 1991). Theoretical discussions emerged focusing on how symbolic behavior (defined by Byers (1994: 369) as: “intentional behaviour subsumed under or governed by rule.”) could be inferred from artifacts (Byers 1994; Chase 1991, 1999; Donald 1991; Duff et al. 1992a; Wynn 1991, 1996). While there was a general consensus that symbols are of an arbitrary nature, the theoretical discussion of how arbitrariness could be inferred from the archaeological record has been a matter of debate (Chase 1991). While for some scholars recognition of style (the imposition of arbitrary standardized forms) were enough as an indication for symbolic behavior as their forms were conventional (Sinclair 1995; Wynn 1991, 1996), other scholars (Chase 1991, 1999; Duff et al. 1992a) claimed that stylistic standardization and symbolic arbitrariness are categorical different meanings of ‘arbitrariness;’ ‘style’ could be a result of functional, social, or cognitive restraints. Due to conceptual tensions surrounding ‘arbitrariness’ and ‘symbols,’ this period also saw a renewed interest in the work of the 19th century semiotician Charles Sanders Peirce (Chase 1991; Deacon 1998; Duff et al. 1992a). Chase (1991: 195) extends the notion of the ‘symbol’ beyond its Saussurian linguistic sense to Peirce’s broader theory of signs, which includes, but is not limited to, linguistic sign.

Although it was generally accepted that Upper Paleolithic figurative art and many decorative artifacts constituted clear evidence of symbolic behavior (however, see Conkey 1987 for a critique of how ‘art’ has been conceptualized in Paleolithic contexts), this did little to explain how such behavior emerged (Clark (1994, CA comment on Byers 1994); Duff et al. 1992b). In tandem with theoretical developments, empirical methods began to focus on determining intentionality in, for example, the perforation of beads (Bednarik 2005; d’Errico et al. 2005; Kuhn et al. 2001), engravings (d’Errico and Villa 1997; Marshack 1991), intentional burials (cf. Gargett et al. 1989; Riel-Salvatore and Clark 2001), and the material representation of art in general (White 1992). This methodological turn reflected a broader attempt to ground claims about cognition and sym-

bolism in observable criteria—intentional production was taken as a more secure inferential bridge between material traces and behavioral interpretations. Techniques such as microscopic use-wear analysis, experimental replication, and contextual association were employed to distinguish deliberate modification or placement from natural or incidental processes. However, while this empirical emphasis provided a more rigorous framework for interpreting the archaeological record, it also exposed a deeper tension—establishing intentional manufacture is not equivalent to demonstrating symbolic intent (Duff et al. 1992), and in many cases the symbolic dimension remained a theoretical problem.

By the early 2000s, the concept of Modern Behavior was criticized for its Eurocentrism, essentialism, and reliance on Western assumptions of human nature (Corbey 2005; Corbey and Roebroeks 2001; Garofoli 2016; McBrearty and Brooks 2000; Porr 2010). Scholars such as Nowell (2010) and Marean et al. (2007) noted that symbolic capacity had become central to definitions of modern behavior, effectively reducing the concept to a single marker—symbolic activity. This shift reified the symbolic as the defining feature of humanness. This view, initially restricted to *Homo sapiens*, has since been expanded to include Neanderthals, largely based on claims of symbolic artifacts (e.g., Finlayson et al. 2023; Hoffmann et al. 2018; Pitarch Martí et al. 2021) and burials (Dibble et al. 2015; Pomeroy et al. 2020; Rendu et al. 2016). Critics argue that such interpretations reflect shifting goalposts in an ongoing exceptionalist discourse (e.g., Cartmill 1990; Sterelny and Hiscock 2025; Stoczkowski 2002).

Despite the conceptual, empirical and theoretical challenges, symbolic behavior remained firmly embedded in debates over behavioral modernity. As archaeologist and anthropological theorist John E. Robb noted, “archaeologists probably disagree about symbols more than anything else they dig up” (Robb 1998: 329). This discussion has been ongoing due to new excavation results, theoretical developments, and improved methodologies (Camarós et al. 2017; Clark 2006; Coolidge et al. 2024; Currie et al. 2024; d’Errico et al. 2009; Gontier et al. 2024; Hoffmann et al. 2018; Meneganzin and Currie 2022; Nowell 2006, 2010; Rodríguez-Vidal et al. 2014; Shea 2011; Sterelny and Hiscock 2014; van Mazijk 2024; Wadley 2003; Wisher et al. 2023; Zilhão 2006). A notable contribution comes from the framework of cognitive archaeology, which has sought to explain the origins of symbolic behavior through models of cognitive evolution and neuropsychology (Coolidge and Wynn 2016; Currie et al. 2024; Dehaene et al. 2022; Kerkoerle et al. 2023; Renfrew 1994; Wynn et al. 2024). Coolidge et al. (2024), for example, recognize the conceptual issues that surround the terms symbolism, and symbolism and symboling and reject the “archaeologists’ rudimentary commonsense and dictionary definitions of symboling” (Coolidge et al. 2024: 310). They argue for a program that is more rooted in cognitive principles such as learning, theory of mind, and working memory, arguing instead for an approach grounded in cognitive principles. They also caution against collapsing highly diverse artifacts such as engraved

ochre, incised bones, and figurative art into a single symbolic category, since this obscures the different cognitive demands involved in their production.

Other scholars have moved to a *longue durée* approach grounded in robust data (Baker et al. 2024; Culley 2016; d’Errico et al. 2023; 2025; Hovers and Belfer-Cohen 2024; Man-Estier and Paillet 2019; Miller and Wang 2022), focusing more on social networks, transmission, and continuity of behaviors. While the alleged symbolic content in these studies takes a back seat (i.e., there is less focus on meaning), it is still assumed that a symbolic content is present in these artifacts.

Despite shifts and diversification in theoretical framing (from style and arbitrariness, to Peircean semiotics, cognitive models, and *longue durée* perspectives), the central concern of the debate has remained remarkably stable—determining when (and in which species) symbolic capacity evolved. Whether framed as uniquely modern, gradually emerging, or shared across multiple hominin taxa, ‘the symbolic’ has often been treated more as a marker for classification than as a phenomenon to be examined in its own right. This has kept the debate focused on who gets counted as part of the ‘symbolic’ in-group, while leaving largely unexamined the inferential logic by which artifacts are classified as symbolic in the first place.

In this paper, we critically examine the epistemic limitations inherent in the framing of symbolic behavior. Our primary focus is on inferences grounded in semiotics, the study of signs and meaning-making. The semiotic reasoning that underpins the classification of certain behaviors or artifacts as ‘symbolic’ remains under-examined and epistemically problematic. This paper adopts a trans-species perspective. Ornamental artifacts have been attributed to several species of *Homo*, and we do not assume that ornamentation is the exclusive domain of any single taxon.

We begin by reviewing the historical development and underlying logic of the framing of symbolic behavior, and we critically assess the validity of what we call the ‘artifact-to-symbol’ inference. Instead of attempting to refine or expand this inference logic, we argue for its suspension in archaeological contexts where no clear interpretive continuity with historically attested symbols can be established. This position is motivated not only by the epistemic weaknesses of the inference itself, but also by our contention that symbolic behavior, when framed as an essential or uniquely human trait, does not withstand critical scrutiny. With this, we side with a growing number of scholars who are critical of inferences based on Peircean semiotics, on the grounds that such approaches rest on abductive reasoning that cannot be independently verified within the archaeological record (e.g., Coolidge et al. 2024; Iliopoulos 2016; Iliopoulos and Malafouris 2021; van Mazijk 2024). Subsequently, we explore alternative theoretical frameworks for interpreting ornamental artifacts and consider the broader implications of essentialist narratives in archaeological discourse. Finally, we situate our conceptual analysis within a wider theoretical landscape by integrating insights from evolutionary theory and the philosophy of technology. We

advocate for a shift toward a *longue durée* or deep history approach to the interpretation and reporting of ornamental artifacts.

SEMIOTICS AND SYMBOLISM IN ARCHAEOLOGICAL INTERPRETATION

In the 1990s and early 2000s, symbols in archaeological contexts were conceptualized to be especially recognizable when they were functioning as external devices storing symbolic meaning outside the human body (Donald 1991; Wadley 2003). These included items such as jewelry and engravings. This theoretical framework was used, for example, by d’Errico et al. (2005) in their influential publication on shell beads from Blombos Cave in South Africa. Another marker of symbolic behavior is the exhibition of a specific ‘style’, defined by Wynn (1996, cited by Wadley 2003) as “*repeated patterning that is geographically and chronologically restricted*”. Wadley’s definition of a symbol is based on the work of Terrence Deacon (1998), who argued “*that symbols are higher-order concepts than icons or indexes and that symbols point arbitrarily to their referents*” (Wadley 2003: 248). Deacon’s theory is itself grounded in the semiotics of Charles Sanders Peirce (1839–1914) (de Villiers 2007) and Peirce’s philosophy has had a broad influence on archaeological theory (e.g., Baron 2021; Guibert et al. 2023; Heusden 2009; Iliopoulos 2019; Preucel 2010). In this paper, we limit our discussion to how Peircean sign theory has been applied to interpret ornamental artifacts, such as engravings, collected bird feathers, beads, hand stencils, and pigment use in caves, as evidence for symbolic behavior. Burials are also included within this scope, since their interpretation as symbolic likewise relies on reading material traces such as grave goods, body positioning, and ochre use as signs of meanings or intentions. Following Peirce, Deacon (1998) classifies symbols as one of three types of semiotic signs, alongside indexes and icons. He uses the triadic terms Object, Representamen, and Interpretant, which we adopt here as well (for an overview of Peirce’s technical terminology, see Nöth (2011). Fundamentally, the Peircean sign consists of three components, configured in a triadic relationship (Deacon 1998; Eco 1986; Peirce 1974):

- The Object: the element of the sign that is referred to
- The Representamen: the component that refers to the object
- The Interpretant: the means by which the sign is interpreted.

If any of these elements is missing, the sign cannot exist. The key distinction between icons, indexes, and symbols lies in how the Representamen refers to the Object (Deacon 1998; Eco 1986; Peirce 1974). An icon refers through resemblance (a drawing of a house refers to a house); an index, through physical or causal connection (smoke refers to fire); and a symbol, through arbitrary or socially constructed convention (the dove as a sign of peace in Christian ontology). To illustrate this with some archaeological examples, an icon could be a carving of a human face representing a human face, a statue of a bull representing a bull, a wooden duck toy representing a duck.

There might be more meaning to these objects, but their iconic representation by means of resemblance is clear. Examples of indexes are ash layers for fire pits, use-wear for the use of tools, and cut marks as signs of butchering animals. These signs represent a direct result of something else, or another physical or causal connection. Examples of symbols are hieroglyphics representing words, a mason's mark on a cathedral stone identifying a particular mason, or a cross symbolizing Christianity. These signs represent in an arbitrary and/or conventional manner, and as such, are the only type of sign whose relation to their object is not grounded directly in physical reality, but in shared habits and agreements. Importantly, signs can be interpreted on multiple levels. A sign, for example, can both be an icon and a symbol; an image of a lion iconically refers to a lion, but the lion also symbolizes courage in multiple cultures.

Returning to the symbol in archaeological contexts, what is physically excavated is the Representamen part of the sign, specifically the representamen of a symbol stored outside the human body (Donald 1991; Wadley 2003). For example, in the case of beads, the Object (e.g., "status or group identity is symbolized in artifact X") and the Interpretant (e.g., "ethnographic parallels suggest social meaning") are allegedly reconstructed by the archaeologist. This completes the Peircean triadic structure, effectively interpreting the material artifact as a symbolic sign. Consequently, archaeologists working within this semiotic model tend to focus on the relationship between the Representamen and the Object. If that relationship is considered arbitrary or socially conventional, the artifact is identified as a symbol. Thus, to claim that an artifact is a symbol in the Peircean sense is to assert that the connection between the object and its representamen is not inherent, but conventional—an assertion that presumes the existence of a social agreement or shared interpretive framework in deep prehistory.

A notable contribution to this issue comes from Kissel and Fuentes (2017: 387), who explicitly address what they term 'the meaning problem': "*archaeologists and palaeoanthropologists have struggled to find ways to identify symbols without knowing what they stand for (their meaning)*". To address this issue, they suggest focusing on how the sign refers rather than what it refers to. By analyzing the class of the representamen—with *qualisign* (a quality of a sign that cannot exist on its own: bright red), *sinsign* (an instance of a sign: the flashing light at the end of the tunnel), and *legisign* (the sign as a convention: red lights indicate a warning), they attempt to circumvent the meaning problem by interrogating *how* a sign represents. However, this strategy still assumes that a sign exists in the first place. If no sign is present, then there is no representamen to analyze, bringing us back to the original problem of how meaning is inferred from archaeological evidence. A recurring difficulty here is that the status of artifacts as *signs* is often taken for granted rather than critically examined. Much recent work, particularly drawing on Peircean semiotics, devotes extensive effort to classifying putative signs into categories (icon, index, symbol; qualisign, sinsign, legisign) or to debating the arbitrariness

of their forms (e.g., Culley 2016; Iliopoulos and Malafouris 2021; Kissel and Fuentes 2017). Yet such analyses presuppose signhood from the outset, thereby bypassing the more fundamental question of whether it is methodologically or empirically warranted to treat these artifacts as signs at all. This results in what might be described as a displacement of the central problem—elaborate theoretical discussion about the kinds of signs we might be dealing with obscures the fact that the initial inference to 'signhood' is itself underdetermined. While such approaches often present themselves as pragmatist in orientation, they risk drifting into abstraction, producing frameworks that appear theoretically sophisticated but remain unanchored to the empirical constraints of the archaeological record. They start with the *result* of archaeological work, rather than taking the whole *process* from unearthing to classification into account and all the decisions that are explicitly or implicitly made in the course of this process.

In a later study, Kissel and Fuentes (2021) reframed the discussion of 'modern humans,' symbolic behavior, and ornamentation, within the framework of the Extended Evolutionary Synthesis. Rather than focusing solely on the presence or absence of symbols, they emphasize investigating how, when, and where meaning-making emerges in the archaeological record. Their approach incorporates concepts like niche construction, multiple inheritance systems, and dynamic causal relationships between body, environment, and meaning-making. This shift moves the emphasis away from artifacts as binary markers of symbolic status and toward broader evolutionary and developmental processes.

Other recent studies (d'Errico et al. 2023, 2025; Miller and Wang 2022) adopt a *longue durée* approach, focusing less on individual objects or assemblages and more on macro-scale processes that generate and sustain particular artifact forms. For instance, d'Errico et al. (2023) trace the emergence of body-related technologies over 500,000 years. While they still use the term 'symbolic' for many artifacts, they insist on grounding interpretations in well-dated, robust datasets¹. Their focus is on identifying behavioral continuities rather than isolating symbolic thresholds. In a similar *longue durée* perspective, Miller and Wang (2022) use ostrich eggshell beads to reconstruct ancient social networks over 50,000 years. While they still attribute symbolic significance to the beads, their primary interest lies in how bead morphology correlates with environmental conditions and social structures. They show that stylistic changes often coincide with environmental shifts, suggesting links between ecology, group dynamics, and ornamentation. Other time-oriented approaches similarly treat ornamentation as reflecting group identity and social boundaries, without assuming that such artifacts necessarily function as symbols in the strict Peircean sense (e.g., Baker et al. 2024; Hodder 1982; Rigaud et al. 2018; Robb 1998).

THE EPISTEMICALLY FRAGILITY OF THE 'ARTIFACT-TO-SYMBOL' INFERENCE

Inferences about cognitive capabilities based on artifactual evidence have long been the subject of critical scrutiny

(e.g., Botha 2010; Hawkes 1954; Hodder 1982; Porr 2010; Robb 1998; Stibbard-Hawkes 2024). Of particular relevance here is the work of Botha (2010), who analyzed claims by Henshilwood et al. (2004) and Henshilwood and Benoit (2009) regarding the presence of ‘modern’ or ‘fully syntactical’ language, claims based on the discovery of pierced shell beads dated to approximately 75,000 years ago at Blombos Cave, South Africa. Botha examined the inferential structure underlying these claims, identifying a critical step in the argument—the assumption that “the beads are symbols.” We refer to this step as the ‘artifact-to-symbol’ inference. Although Botha, writing as a linguist, provisionally accepted this inference for the sake of argument, he acknowledged that it merited further critical evaluation (Botha 2010: 353). In this section, we adopt a similar strategy.

Two broad inferential strategies can be identified in literature where artifacts are classified as symbolic. The first is an ad hoc theoretical approach, in which the label ‘symbol’ is applied without definition. In these cases, authors refer to previous studies involving similar artifacts that had already been interpreted as symbolic (e.g., Álvarez-Alonso et al. 2025; Hoffmann et al. 2018; Leder et al. 2021; Pitarch Martí et al. 2021; Rodríguez-Vidal et al. 2014; Romandini et al. 2016; Zilhão et al. 2010). These works typically lack any bridging theory or formal framework, relying instead on analogical reasoning and assumed consensus.

This first category of inference often points to a second, more structured category, in which researchers construct explicit arguments based on semiotic theory, especially Peircean semiotics (e.g., Chase and Dibble 1987; d’Errico et al. 2005; Henshilwood 2014; Kissel and Fuentes 2017; Mithen 2014; Prévost et al. 2022). These studies often cite foundational works by Deacon (1998), Donald (1991) or Wadley (2003). Within this semiotic discourse, it is frequently claimed that “a key characteristic of all symbols is that their meaning is assigned by arbitrary, socially constructed conventions” (d’Errico et al. 2005: 4).

Because the first type of inference relies heavily on the authority of the second, our critical analysis will focus on this more theoretically grounded category, where semiotics is employed to justify symbolic interpretation. Botha (2010: 348) argued that each inferential step requires support from a bridge theory—an intermediate framework that connects data to interpretation. To be epistemically valid, such a theory must satisfy three conditions:

1. It must be testable.
2. It must be supported by empirical evidence.
3. It must not be ad hoc.

The inferential chains used by many of the authors cited above can be summarized in the following schematic form:

- a. The artifact lacks an apparent utilitarian function; Conclusion 1: Therefore, it must be ornamental.
- b. Ornaments are symbols.
- c. Symbols are evidence of symbolic behavior; Conclusion 2: The artifact is evidence of symbolic behavior.

Of these steps, inference (b) is particularly problematic and requires a robust bridge theory, one that is often lacking. In many cases, there is no explanation of what a symbol actually is, why a given artifact should be interpreted as such, or how such artifacts directly imply symbolic behavior.

Another problematic inference concerns the cognitive capacities of hominin species. Once an artifact is classified as a symbol, a generalization frequently follows:

- a. Archaeological artifact Y is a symbol.
- b. Archaeological artifact Y was made by individual X.
- c. Individual X belongs to species Z; Conclusion 3: Therefore, all individuals of species Z were capable of symbolic behavior.

This move represents a leap from singular evidence to species-wide capability. It is a sweeping generalization not adequately supported by the data, and it exemplifies the overstretching of symbolic inferences in paleoanthropology.

FROM SHARED SOCIAL PRACTICES TO SYMBOLS? INDEXICALITY AND THE CONFLATION OF SIGNALING WITH SYMBOLIC COMMUNICATION

Ornamental artifacts that resemble historical or contemporary ones are frequently treated as privileged evidence for symbolic interpretation. Perhaps the most explicit articulation of the ornaments-to-symbol inference can be found in d’Errico et al. (d’Errico et al. 2005: 4), who state: “(...) *personal ornaments and art are unquestioned expressions of symbolism that equate with modern behaviour*”. In support of this position, they cite Wadley (2003: 248) who writes: “*artefacts are not automatically imbued with symbolism; this happens only when they become important within human social life. Stone spearheads or bone points plainly become symbolic when they are metaphors for an aspect of social behaviour or when they begin to define individual or group identity*”. We agree with Wadley’s assertion that artifacts are not inherently symbolic. However, the relationship she proposes between material culture and social identity warrants closer scrutiny. In our view, this relationship is more accurately described as indexical rather than symbolic. That is, artifacts do not necessarily refer arbitrarily to abstract concepts; rather, they point to social identities or practices through their embeddedness in repeated behavioral contexts.

Indexical signs function via causal or contextual association rather than through arbitrary conventions. Thus, whether ornamental or not, the artifact does not function as a symbol in the strict Peircean sense, but as an index, an indicator of shared social practice. This distinction is clearly demonstrated in the work of Miller and Wang (2022), who infer aspects of social dynamics from patterns of shared practice and ornament use, with minimal reference to symbolic behavior. Other forms of collective or ritualized behavior can also be understood through indexical frameworks (cf. Barzilai et al. 2024; Donald 1991: 174–176). For example, the association between ostrich eggshell beads and social interaction is not necessarily symbolic, but

rather indexical, grounded in recurrent use within specific social contexts. The repeated deployment of such artifacts in socially meaningful activities produces an indexical link between the object and group identity.

The failure to distinguish between semiotic categories—iconic, indexical, and symbolic—risks conflating distinct interpretive possibilities. When all ornaments are interpreted as symbols by default, analytical nuance is lost, and the broader range of possible meanings or functions is obscured. In modern sociology, non-bodily ornamentation, such as lipstick, jewelry, or piercings, is not automatically imbued with symbolic content. Most of these artifacts are not arbitrary signs referring to a conventional meaning. Rather, they serve aesthetic, signaling or indexical purposes that are enhancing perceived attractiveness, signaling status, or group affiliation  ornaments, such as wedding rings, can have a clear symbolic meaning and may also have other layered semiotic meanings, but this does not automatically imbue every ornament with symbolic content (Mithen 2014). There is no reason to assume that the same necessarily held in the Paleolithic. Animal signaling behaviors show similar patterns. For instance, Schaedelin and Taborsky (2009) describe non-bodily signals in various species that do not rely on arbitrary conventions, yet still convey information effectively within social contexts.

SUMMARY: CLASSIFYING PALEOLITHIC ARTIFACTS AS SYMBOLIC IS TENUOUS

Because symbols rely on arbitrary meaning and culturally specific conventions, their identification in the archaeological record is inherently problematic, especially when the contextual information required to infer such meaning is absent. One cannot meaningfully argue that an artifact is symbolic if the Object and the Interpretant are unknown. The reconstructed sign does not necessarily correspond to the original sign, if one existed at all. The inference from artifact to symbol becomes an act of interpretation, not of empirical reconstruction (cf. Camarós et al. 2017; Rodríguez-Vidal et al. 2014). As a result, the artifact-to-symbol claim typically remains an abductive hypothesis, a proposed explanation for an observation (Peirce 1974: 171), rather than a conclusion that can be tested and independently supported through induction. Many artifacts cited as evidence of symbolic behavior, such as engravings and personal ornaments (e.g., Henshilwood et al. 2009; Leder et al. 2021; Rodríguez-Vidal et al. 2014), are treated as decisive despite lacking the empirical scaffolding needed for evaluation. They may be a testimony of symbolic behavior, but this cannot currently be confirmed or falsified. Consequently, conclusions about symbolic behavior are often stronger than the available evidence warrants, even though they are used to support far-reaching claims about humanness, modernity, and species distinctions.

SYMBOLIC BEHAVIOR IS NOT AN ESSENTIAL/UNIQUELY HUMAN TRAIT

Wadley (2003) regards the emergence of geographically and chronologically varied ‘styles’ as a marker of symbolic

behavior using a more flexible definition of ‘symbolic behavior,’ one that encompasses non-utilitarian or apparently arbitrary actions. Yet many animals are now known to exhibit behaviors that fit this definition and in many animal species, culture appears to influence gene selection (Lala and O’Brien 2023). Madden (2007), in her study of bowerbird culture, documents significant variation in vocalizations across populations that cannot be attributed to genetic differences and suggests that this geographically structured behavioral variation is likely transmitted culturally. It is sometimes argued that such behaviors are genetically hardwired, i.e., that birds are ‘cultural one-trick ponies’ (Aplin 2019: 180). However, many bird species exhibit a wide range of socially transmitted behaviors across multiple domains (Aplin 2019; Gordinho et al. 2015; Piersma 2011; Tello-Ramos et al. 2024).

The spontaneous emergence, transmission, and retention of a socially learned, arbitrary trait has been observed in a wild chimpanzee group (van Leeuwen et al. 2014). A female chimpanzee named Julie began placing grass straws in her ears (Figure 1), a behavior with no obvious utilitarian purpose. Remarkably, other group members copied this behavior, and it persisted even after Julie’s death.

Perhaps an even more striking example of arbitrary behavior in animals is found in the recent study by Hersh et al. (2022) on sperm whale clans showing that whale clans use arbitrary vocal patterns as ‘cultural’ identifiers of ‘clan’ membership. These strongly resemble the cultural signaling practices seen in human ethnic groups (Hersh et al. 2022: 6). While one might argue that such practices are more indexical than symbolic, many archaeologists accept similar forms of group signaling as evidence for symbolic cognition.

The examples above meet the definitional criteria commonly invoked in archaeology, style, arbitrariness, ornamentation, non-utilitarianism, yet they are typically dismissed as non-symbolic solely because their agents are classified as animals rather than humans. This reveals a deeper essentialist bias, as described by Corbey and Roebroeks (2001), and reflects a longstanding tendency in paleoanthropology to enforce species boundaries through interpretive double standards. Like the Paleolithic record, the semiotic worlds of animals are largely opaque to us. We lack the interpretant necessary to reconstruct the Peircean triad as discussed above for the Paleolithic record. Hersh et al. (2022) constructed a partial ‘dictionary’ of whale vocalizations, but we have no such interpretive guide for the Paleolithic. The symbolic ‘language’ is dead, and we possess no Rosetta Stone. This critical difference undercuts the application of Peircean semiotics to deep time archaeology.

To be clear, our critique is epistemological. It applies across taxa and does not deny the possibility of complex cognition among ancient hominins or among animals. In short, symbolic behavior—as currently conceptualized—is not archaeologically assessable. It cannot be conclusively demonstrated or refuted. Its identification rests on interpretive leaps that conflate signs, meanings, and social roles without sufficient empirical grounding. In the following



Figure 1. Julie the chimpanzee displaying the ‘grass-in-ear’ behavior that fits Wadley’s (2003) definition of style via Wynn (1996) (Image from van Leeuwen et al. (2014; reprinted with permission © 2014 Springer Nature).

section, we turn to alternative evolutionary perspectives that might offer a different entry point into these questions, and which allow us to reframe the relationship between material culture, behavior, and meaning without relying on symbolic inference.

AN ALTERNATIVE EVOLUTIONARY APPROACH: TRACING BEHAVIORS THROUGHOUT HUMAN EVOLUTION

The Extended Evolutionary Synthesis (EES) has recently gained traction among scholars studying human evolution (e.g., Kissel and Fuentes 2021; Lala and O’Brien 2023; Liu and Stout 2023; Stock et al. 2023). Within the framework of the EES, evolution is shaped not only by genes and natural selection, but also by developmental, ecological, and cultural processes that can actively influence evolutionary change (Lala et al. 2024; Laland et al. 2015; but see Baedke et al. 2020; dos Reis and Araújo 2020; Scott-Phillips et al. 2014). Many of the core concepts of the EES (for example, niche construction, culture-gene coevolution, phenotypic plasticity) are already present in archaeological theory (Corbey 2020; d’Errico and Colagè 2018; Zeder 2018). d’Errico and Colagè (2018: 222) argue that writing “is too recent to be an outcome of genetic evolution (...)” and the neural infrastructure that was a prerequisite for reading and writing was already present to a certain extent when writing appeared. d’Errico and Colagè (2018) suggest that that these neural pathways were then ‘exapted’ (i.e., evolved a secondary function) to better suit reading and writing and refer to this as ‘cultural neural reuse.’ This proposed mechanism exemplifies how developmental plasticity and cultural practices (both key components of the Extended Evolutionary Synthesis) can be seen as agent reorganizing behavior without genetic change while simultaneously reshaping the selective environment, potentially guiding genetic evolution in subsequent generations. Recent studies have approached human ornamentation from a biological standpoint (Borau and Bonnefon 2020; Dixon 2019; Luoto 2019a, 2019b; Lynn et al. 2019), interpreting ornaments as

extended phenotypes, i.e., “the part of the phenotype expressed beyond the body [including] any feature in the environment resulting from a manipulative action or construction behaviour of an individual” (Bailey (2012: 84) (cf. Bailey 2012; Dawkins 2016; Hunter 2018; Laland 2004; Schaedelin and Taborsky 2009).

For Luoto (2019a: 53; Luoto 2019b) and Dixon (Dixon 2019), shelter construction directly contributed to fitness of Paleolithic hunter-gatherers. These shelters later developed an exapted signaling function, as structures that indicate access to resources or social standing (Dunn and Hill 2014). Luoto however, influence sexual selection even in absence of the phenotype proper. The theoretical framework of human sexual selection is updated in this article by unifying four theoretical approaches and conceptualizing non-bodily traits as extended phenotypic traits.

Methods Existing research is synthesized with extended phenotype theory, life history theory, and behavioral ecology. To test population-level hypotheses arising from the review, ecological and demographic data on 122 countries are analyzed with multiple linear regression modelling.

Results A four-factor model of intelligence, adolescent fertility, population density, and atmospheric cold demands predicts 64% of global variation in economic complexity in 1995 and 72% of the variation in 2016.

Conclusions The evolutionary pathways of extended phenotypes frequently undergo a categorical broadening from providing functional benefits to carrying signalling value. Extended phenotypes require investments in skills and bioenergetic resources, but they can improve survival in high latitudes, facilitate the extraction of resources from the environment, and substantially influence sexual selection outcomes. Bioenergetic investments in extended phenotypes create individual- and population-level tradeoffs with competing life history processes, exemplified here as a global tradeoff between adolescent fertility and economic complexity. The merits of the present model include a more systematic classification of sexual traits, a clearer articulation of their evolutionary-developmental hierarchy, and an analysis of ecological,

TABLE 1. KEY DIFFERENCES BETWEEN THE SEMIOTIC AND BIOLOGICAL APPROACHES.

Semiotic framework	Extended Evolutionary Synthesis framework
Requires reconstruction of arbitrary meanings and conventions	Depends on observable evolutionary and technological processes
Based on idealized binaries (symbolic/non-symbolic; human/non-human)	Based on gradual, testable mechanisms (e.g., signaling, niche construction)
Focuses primarily on <i>Homo sapiens</i>	Applicable across species
Difficult to test or falsify	Open to empirical validation

genetic, and psychological mechanisms that modulate the flow of energy into extended phenotypes and cultural innovations.”,”container-title”:”Adaptive Human Behavior and Physiology”,”DOI”:”10.1007/s40750-018-0103-6”,”ISSN”:”2198-7335”,”issue”:”1”,”journalAbbreviation”:”Adaptive Human Behavior and Physiology”,”language”:”en”,”page”:”48-102”,”source”:”DOI.org (Crossref(2019a))” also discusses clothing as a flexible, non-bodily ornament and vehicles as signals of wealth or identity. All of these represent extended phenotypes that have acquired exapted signaling functions. Similar behaviors have also been documented in animals (e.g., Blamires et al. 2018; Schaedelin and Taborsky 2009).

This same perspective can be applied to the Paleolithic. Signaling traits and adaptive functions of symbolic behavior in general have been already proposed by Byers (1994) and Clark’s commentary on Byers (1994: 382), and Mithen (1991). As such, it is not a stretch to regard ornamental artifacts in the Paleolithic as exapted. The cross-cultural universality of non-bodily ornamentation and art-like behaviors among humans strengthens the case for an evolutionary origin. The labor investment and consistency of forms suggest these artifacts held fitness-related significance. The investment of time and energy in bead manufacture suggests they served a significant function rather than being trivial. While not direct evidence of natural selection, such behaviors are consistent with evolutionary explanations and can be tested against findings on ornament use in modern humans (Chais in Byers 1994; Carmen et al. 2012; Luoto 2019a; Lynn et al. 2019; Mithen 1991). Schaedelin and Taborsky (2009: 84, quoting Bolhuis and Giraldeau (2005) define a signal as: “something evolved to transmit information”. They argue that extended phenotypes are often used as signals, especially among animals. Humans, particularly those in the genus *Homo*, have long relied on extended phenotypes. It is therefore reasonable to suppose that some ornamentation behaviors gradually evolved signaling functions. The ‘sexy handaxe’ theory (Burris 2009; Chang and Nowell 2009; Hayden and Villeneuve 2009; Hodgson 2009; Kohn and Mithen 1999), and later interpretations of the handaxe as a ‘bird’s nest’ (Corbey et al. 2016; Wynn and Gowlett 2018), already hinted at this possibility. Likewise, the Baldwin Effect has been invoked to explain how extended phe-

notypic traits might become genetically or culturally canalized over time (Corbey 2020).

By foregrounding the signaling dimension of ornamental artifacts and suspending semiotic assumptions, archaeological interpretation can become more empirically grounded. This approach helps avoid projecting culturally specific meanings onto material remains, especially in deep-time contexts. Table 1 lists some of the major advantages of using a framework supported by the Extended Evolutionary Synthesis versus a framework supported by semiotic.

FROM ARTIFACTS TO ARTIFACTS LINEAGES AND TECHNO-LOGIC

If we move beyond semiotic interpretations and use an evolutionary perspective, the question can become not whether an artifact “is” a symbol, but rather, how did it evolve, what is its functional or communicative trajectory, and what kinds of behaviors led to its proliferation?

To that end, lineage-based and processual frameworks derived from the philosophy of technology may be useful to analyze ornamental artifacts not as isolated symbols, but as evolving technical objects with a developmental history. A particularly fruitful source of inspiration here is the work of Gilbert Simondon, as adapted by archaeologists such as Boëda (2023; Simondon et al. 2017). In Simondon’s philosophy, artifacts are not static or ideal types; they are components of technical lineages that is a concept analogous to biological phylogenies. Each lineage expresses a trajectory of development, from abstract multifunctional forms to more integrated and specialized objects. Concretization is the key mechanism—as artifacts evolve, they shed functional redundancies and become optimized for specific uses. For example, in the case of ornamental artifacts, one might trace the development from:

- Multipurpose tools with incidental aesthetic qualities (e.g., handaxes with symmetry), to
- Modified tools occasionally used for display or personal marking, to
- Specialized artifacts (beads, pendants, engravings) explicitly designed for bodily adornment or signaling.

This reflects a shift from exapted function to dedicated function that is a form of technological speciation. Boëda’s

approach, though primarily applied to lithics, provides an analytical structure for understanding this progression. Simondon's notion of lineage also entails that:

- standardization emerges not from imposed norms, but from the internal evolution of the object.
- Artifacts respond to environmental, social, and functional constraints, becoming more stable over time.
- The resulting “techno-logic” reveals the logic of human behavior embedded in material form, without needing symbolic inference.

What this alternative framework also offers is a developmental perspective. Rather than relying on the binary logic of ‘the symbol,’ which tends to group all ornamental artifacts into a single, undifferentiated “semiotic pile,” this approach may allow tracking gradual changes in the form, use, and distribution of ornaments throughout the archaeological record. Take beads, for instance. Despite their wide temporal and geographic range, they are still often uniformly labelled as ‘symbols.’ This practice limits interpretive nuance. If the first hominin places a “symbol” on their body, then—according to this binary logic—the body is already considered fully “acculturated.” Such reasoning halts further investigation, leaving no room for understanding how ornamentation practices might have evolved incrementally. There is little doubt that ornamental artifacts increased in number and diversity over the course of the Paleolithic, especially in the case of beads (d’Errico et al. 2023; Miller and Wang 2022). The technological development and long-term patterning of ornaments remain relatively underexplored. While their symbolic meaning is inaccessible, large and well-structured datasets—like that of d’Errico et al. (2023)—could be used to further explore changes in manufacturing techniques, material sourcing, standardization, or regional transmission. At a broader scale, one might explore the potential transition from multipurpose artifacts with incidental aesthetic features (e.g., symmetrical handaxes) to artifacts explicitly created for display or social signaling (e.g., pendants, beads). This transformation could then be viewed as a technical and behavioral shift, rather than as evidence of an immediate symbolic revolution. While a full elaboration of this method lies beyond the scope of this paper, we hope to have raised awareness about its potential. Rather than speculating about meaning, such a framework could offer a robust structural and epistemological basis for understanding change, continuity, and innovation in ornamental practices.

CONCLUSIONS

Contemporary *Homo sapiens* live in a world saturated with symbols. Language, art, institutions, and rituals form complex systems of meaning-making that shape our behavior and cognition at every level. Given this reality, it is tempting for archaeologists to search for the origins of this symbolic condition in deep time. However, as we have shown, this search can be hampered by problematic assumptions and epistemologically fragile inferences. Binary distinctions (symbolic/non-symbolic, human/animal, modern/archaic) may hinder our understanding of complex and evolving

phenomena such as symbolic behavior. When symbolic behavior is treated as a threshold marker for “humanness,” it invites circular reasoning—we first assume that only humans have symbols, and then define symbolic artifacts as being made by humans. This notably applies to Paleolithic contexts where, as we have argued, semiotic frameworks become questionable because of our limited capacity to reconstruct the cultural context in which these symbols once functioned. The triadic relationship between object, representamen, and interpretant—so central to Peircean theory—becomes a hypothetical one. We would argue that, rather than reconstructing the original meaning of signs, archaeological research often creates parallel signs, projecting modern interpretations onto ancient materials without the ability to verify whether our interpretations are compatible with the meaning these symbols once had. This results in a troubling asymmetry; if the same criteria used to identify symbolic behavior in the Paleolithic were applied to non-human animals, then many species—from whales to birds to chimpanzees—would qualify as symbolic. This challenges the idea that symbolic behavior is uniquely human and calls into question the use of symbolic behavior as a defining trait. Or, to put it differently, if we use the term ‘human’ in such a way (defining human beings as *symbolic beings* to an exceptional degree) it becomes a metaphysical category rather than a biological one. That is not necessarily objectionable, as long as we are aware of it. We recommend suspending the concept of symbolic behavior in contexts where no interpretive continuity with historically attested symbolism can be established. We encourage a shift toward processual, evolutionary, and techno-logical frameworks that allow for gradual, testable, and comparative analysis of ornamental artifacts, dovetailing with current debates in contemporary archaeology.

Instead of asking whether an artifact “is” a symbol, we suggest focusing on exploring how it came into being—what technological, social, or ecological processes shaped its production and distribution, and what behaviors or constraints it reflects. This perspective shifts the focus from semiotic interpretation toward evolutionary and technological analysis, which offers different kinds of empirical and theoretical traction. The approach resonates with the Extended Evolutionary Synthesis and with work in the philosophy of technology, both of which view artifacts as components of evolving material systems rather than as static symbols. From this angle, artifacts can be studied in terms of their lineages, functional specialization, and signaling roles without requiring recourse to speculative symbolic meanings.

We have argued that symbolic behavior is a problematic concept because, due to the incompleteness of the archaeological record, it cannot be conclusively demonstrated or refuted whether particular artifacts were symbols, nor can we determine with certainty what they once meant in Paleolithic contexts. More specifically, we have pointed to the problematic nature of a *binary use* of the concept of symbolic behavior in contexts where no interpretive continuity with historically attested symbolism can be established. In-

stead, we encourage a shift toward processual, evolutionary, and techno-logical frameworks that allow for gradual, testable, and comparative analysis of ornamental artifacts, dovetailing with current debates in contemporary archaeology. In doing so, we will free ourselves from essentialist legacies appearing in the binary distinctions (symbolic/non-symbolic, human/animal, modern/archaic) often used in the current discourse on symbolic behavior. Instead, we will begin to construct a more pluralistic, grounded, and dynamic understanding of human evolution, one that honors both the complexities of past behavior and the limits of our interpretive reach.

ENDNOTE

¹The call for robust data sets is not new. This has been an ongoing discussion and has been addressed explicitly by Hodder (1982) and Robb (1998).

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DATA AVAILABILITY AND PERMITS

No new data were generated or analyzed in this study.

AUTHOR CONTRIBUTIONS: CREDIT TAXONOMY

K.J. Kuipers: conceptualization, funding acquisition, methodology, project administration, visualization, writing original draft, writing review. **H. Zwart:** funding acquisition, project administration, supervision, writing review and editing, validation. **M.A. Soressi:** conceptualization, funding acquisition, supervision, validation, writing review and editing.



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