



The structure and evolution of symbol



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A B S T R A C T

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The received opinion is that symbol is an evolutionary prerequisite for syntax. This paper shows two things: 1) symbol is not a monolithic phenomenon, and 2) symbol and syntax must have co-evolved. I argue that full-blown syntax requires only three building blocks: signs, concatenation, grammar (constraints on concatenation). Functional dependencies between the blocks suggest the four-stage model of syntactic evolution, compatible with several earlier scenarios: (1) signs, (2) increased number of signs, (3) commutative concatenation of signs, (4) grammatical (noncommutative) concatenation of signs. The main claim of the paper is that symbolic reference comprises up to five distinct interpretative correlates: mental imagery, denotation, paradigmatic connotation, syntagmatic connotation, and definition. I show that the correlates form an evolutionary sequence, some stages of which can be aligned with certain stages of syntactic evolution.

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1. Introduction

There is a consensus that two features setting natural language apart from non-human animal communication are symbolic reference and semantically compositional syntax (Deacon, 1997; Hauser, Chomsky, & Fitch, 2002; Hurford, 2004; Nowak, Plotkin, & Jansen, 2000). Thus, minimally, evolutionary linguistics should be concerned with modeling specific stages¹ in the evolution of either one or the other. Elaborations of the evolution of syntax are numerous (e.g. Bickerton, 1998, 2000; Dessalles, 2006; Jackendoff, 1999; Johansson, 2006b; Nowak et al., 2000; Wray, 2000), the evolution of symbol, however, has received much less attention, as the defining characteristics of symbol as well as possible stages in its evolution remain

largely vague (but see Deacon, 1997). This paper presents a model of the evolution of symbol. Contrary to the common opinion, symbol is not a uniform monolithic phenomenon. I start from a synchronic viewpoint – from analyzing different cognitive correlates that emerge in interpreting symbols. The claim is that the correlates are mental imagery and different types of mental relations (denotation, connotation, etc.). I show that, among symbol's interpretative correlates, it is possible to separate and identify the more fundamental ones from the relative latecomers in the evolution. The evolution of symbolic reference is then aligned with a simple model of the evolution of syntactic compositionality. The latter is derived from the constraints on the evolution of syntax, outlined by Nowak and Komarova (2001), Jackendoff (1999), Johansson (2006b) and others.

2. Symbol: definition and timeline

As 'symbol' is a pretheoretic term, it has to be defined from the outset. Two features that are usually, if not implicitly, held to be characteristic of 'symbol' are the arbitrary nature of reference (a non-necessary link between a form and its meaning) and a used potential for

Abbreviations: mya, million years ago; NL, natural language; S, stimulus; R, reaction.

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¹ I define stages as sets of properties, totally ordered by implication. The definition is inductive – higher stages are defined by certain properties that imply other properties that pertain to lower (i.e. more elementary) stages. The lowest stage is defined by certain properties.

spatiotemporally displaced reference² (cf. Hockett, 1960). By contrast, ‘index’ and ‘icon’ are defined by a necessary and natural link between a form and its meaning (Peirce, 1998). In icons, the link is based on similarity. In indices, it is based on any other necessary relation (e.g. cause-effect or whole-part relation). In practice, various degrees of iconicity as possible, and symbols (e.g. the Christian cross, or onomatopoeic words like *knock*, *bump*, *crash*) may exhibit iconicity as well. Equipped with these definitions, one notices that the word ‘symbol’ gets colloquially used in very different senses. For example, status symbols (e.g. expensive clothes) have not much in common with linguistic symbols (e.g. words). By the above definitions, only the latter are symbols. The former are indices of wealth and, more generally, success. Although the difference might seem minor, it has fundamental implications on the archaeological evidence for symbolism. For example, one cannot infer symbolism (and by extension, language) from personal ornaments, as the most parsimonious interpretation of personal ornaments is that they are status symbols (Sterelny, 2008). As personal ornaments are costly, their are indices of success. This observation is archaeologically supported by the fact that the objects used in Pleistocene pendants (mainly predator teeth and suitable seashells) are hard to come by. As killing a predator is evolutionarily extremely costly, it is a bona fide indicator of success. Nevertheless, it is exceedingly common to interpret personal ornaments (and to a lesser extent pigment use) as manifestations of symbolism (e.g. Bednarik, 2008b; Chase, 1994; d’Errico et al., 2003). Observe also that personal ornaments do not imply displaced reference, as they bestow status only to their wearers. Thus, personal ornaments per se are not indicators of symbolism (and, by extension, language).

The same holds for pigment use and art (both representational and abstract). It is very difficult to rule out **all** potential utilitarian uses for Middle Paleolithic pigment pieces (medicine, hide preservative, protection from sun and insects, camouflage, startling of prey and conspecifics etc. – Barham, 2002; Sterelny, 2008; Wadley, 2001) but even where this could be done, there remains the possibility that pigment was used because definitive colors were preferred for esthetic or cognitive (salience) reasons. Even non-human species differentiate between esthetic and non-esthetic stimuli and utilize definitive colors as behavioral cues (Watanabe, 2010) and so do children in their first year (Baldwin, 2006). While coloring is probably uniquely human, there is nothing inherently symbolic about it. For color symbolism to be present, a non-natural, non-random and non-availability-specific link between color and object (or color and figure) has to be evidenced. For example,

a brown, black or white foot figure on a cave wall is probably color iconism (reference by similarity), one purple foot figure is probably a chance but ten purple foot figures suggest color symbolism (except if purple was one of the few pigments available to the artist and the others were equally non-iconic, e.g. crimson and green). Thus, extremely specific configurations of archeological and geological evidence are required to attest color symbolism.

Figurative symbolism is generally easier to establish. Importantly, as figurative paintings and sculptures are at least partly iconic, representational art per se does not entail symbolism. Thus, the vast majority of cave paintings and early sculptures (including the Berekhat Ram figurine from 0.25 mya – d’Errico et al., 2003) have to be excluded from possible indicators of symbolism. However, some early examples of figurative symbolism remain. For example, the two half-lion/half-man figurines from 0.031 mya (Conard, 2003) are symbolic, as they exhibit both spatiotemporally displaced and arbitrary reference (spatiotemporally displaced, because a half-lion/half-man has hardly any potential to refer to anything here and now, and arbitrary because the figurines are not representational **as wholes**). By extension, the figurines are reasonable proxies for language (or at least protolanguage).

As for abstract symbolism, one of the first examples of complex code appears on the La Marche antler from 0.016 mya (d’Errico, 1995). Simple codes are probably in evidence since at least the Ishango bone from c. 0.02 mya (Bogoshi, Naidoo, & Webb, 1987; Brooks & Smith, 1987). Both types of codes imply symbolism. Earlier examples tend to fall into a category of ‘abstract art’ for which doodling is a more parsimonious explanation than symbolism (Bednarik, 1995a; Halverson, 1995). For example, Bednarik’s (1995a) paper on concept-mediated marking in Lower Paleolithic makes no allegations as to the symbolism or even intentionality of the markings. The markings that Bednarik (1995a) analyzed were abstract, and some of them were very similar to those Middle Paleolithic markings found on bone and other pieces from Blombos Cave that are claimed to be “irrefutable evidence of symbolic behavior” (d’Errico et al., 2003, p. 4). The claim relies, of course, on a pretheoretic notion of symbol.

In general, cupules are better candidates for symbols than other forms of ‘abstract art’ because their manufacture is labor intensive, which rules out doodling as well as coincidental configurations of cut marks (Bednarik, 1995b, 2008a, 2008b). At the same time, it is plausible that some cupules (at least those on horizontal surfaces) were used as containers or were unintentional byproducts of other functional activities (e.g. grinding). Although a functional role does not preclude a symbolic use, it makes cupules’ status as an evidence of symbolism ambiguous. Nevertheless, cupules are seemingly a later addition to hominins’ behavioral repertoire than personal ornaments (at least 0.15 and 0.3 mya, respectively – Bednarik, 2008a, 2008b).

Although emotional attachment is a more parsimonious explanation for burials than symbolism (Sterelny, 2008), grave goods, structures and their configurations can point to symbolism as well. A Neanderthal burial site, La Ferrassie, dated to at least 0.04 mya, suggests a possible symbolic activity (Bednarik, 1995a, 2008a). The find that was

² The above definition of symbol opens the possibility that, in natural communication, symbolism is uniquely human. For example, while bottlenose dolphins’ signature whistles are arbitrary, the whistles’ natural potential for spatiotemporally displaced reference is not evident, as each dolphin uses its own distinctive signature whistle (Janik et al., 2006). Although dolphins frequently copy each other signature whistles in the wild, it is not clear whether this qualifies as a reference to third person individuals (which would indicate a used potential for spatiotemporally displaced reference).

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