

THE EVOLUTION OF LANGUAGE OR: HOW I LEARNED TO STOP WORRYING AND  
LOVE THE SIGN

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## ***Introduction***

One of the main goals of Anthropology is to understand the communication system characteristic of our species, and to elucidate how such a phenotypic feature occurs. In the following essay I discuss one synthesis of biological, linguistic and sociocultural anthropology as these pertain to and elucidate basic arguments surrounding language evolution. A primary challenge in understanding the evolution of language is to move beyond explanations rooted in the form of communication we know and utilize today. Accordingly, this essay emphasizes the potential mechanisms and forces crucial to the *evolution* of language: the ancestral aspects of signaling behavior navigating the requisite, biologically relevant terrain that ultimately gave rise to contemporary language. This discussion is rooted in an appreciation for the utility and evolutionary depth of signs, their potential impact upon behavior, and the continuous gradations in complexity that arise from the relationships among social behavior, communication and developing neurobiology. The proposed thesis is that language evolves from behaviors common to multiple organisms, emerging from the complementary relationship between social and biological ontogeny.

### ***Part 1: Signs are mechanisms of evolutionary change.***

In this essay I employ “behavior” to indicate the complex, iterative suite of physiological processes that occur as a result of sensory input and output among modalities (olfactory, visual, auditory etc.). I employ “language” when referring to a system of differentially related signs that influence behavior when arranged in particular sequences accompanied by contextual clues (Culler, 1986). Taken together, language refers to a particular kind of sensory datum, and takes part in natural selection via the differential reproductive success resulting from alterations to an organism’s behavior (Mayr, 2001; see also Kenneally, 2007).

Linguistic research shows that the signs that make up the linguistic system are not wholly arbitrary, but indeed are curiously subject to biological constraints (Jakobson, 1960; Kenneally, 2007). Specifically, Jakobson (1960) argues that the pattern of linguistic datum is constrained by anatomy, citing the cross-cultural similarity of names for “mother” and “father.” This cross-cultural similarity consists in the optimal “consonant plus vowel” sequence, in which a bilabial consonant is paired with an open vowel. He argues that /m/ and /p/ (or similar) sounds are easily distinguishable from /a/, forming what he calls the “principle of maximal contrast” (Jakobson, 1960:24), and are produced by the least difficult anatomical arrangement of the mouth – open and close. In addition, studies of the developing brain indicate that the number of connections increase beyond adult levels, and are then selectively pruned (Bourgeois et al., 1989; 1993; Zecevic et al., 1989). This observation fits well with behavioral studies indicating that infants can hear all the phonemes early in development, and then lose the ability to distinguish sounds irrelevant to their primary language (Deacon, 1998; Lieberman, 1984). In short, a child’s capacity to distinguish and produce sounds depends upon the interaction between sensorimotor development and external stimulation (Deacon, 1998; Kuhl, 1994). These observations indicate that linguistic or signaling behavior is dependent upon particular sensory data (e.g. auditory or visual), identifies language as an aspect of behavior critically dependent upon evolving biological features (e.g. tongue, ears, brain), and suggests that evolutionary rules may govern language behavior in general. It follows that signs are at least in a broad sense biologically determined, and may play an integral part in the *evolution* of language.

The capacity of the linguistic system to alter behavior constitutes a mechanism capable of producing differential reproductive success; in other words, an anatomically or biologically salient sign system harnesses evolutionary forces by altering behavior (Mayr, 2001). This is

evident when considering dramatic behaviors (e.g. effects of infanticide on the mother's hormone levels), but even subtle behaviors (e.g. vying for social dominance) have significant long-term effects upon reproductive success (Kummer, 1997). It follows that if language (or an ancestral signaling system) facilitates even subtle behavior, it can produce profound social changes via evolutionary mechanisms.

Consider that an individual has distinct behavioral responses when confronted with appropriate compared to inappropriate linguistic performance (Schieffelin, 2005). For example, the linguist Richard Bauman (1986:37-42) notes that jokes play on “information asymmetries” and “violations of behavioral norms,” and that a good, or effective practical joke appears to breach an individual's expectations. Specifically, the jester sets up a sequence of behaviors that introduces the victim to a false belief, and the joke is the effect this fabrication has upon the victim's behavior (i.e. does he act according to the false belief) (Bauman, 1986). The appropriate linguistic performance of a practical joke, according to Bauman, includes a resolution of the informational asymmetry that induced the victim's false belief, demonstrating to the victim that the previously assumed norm violation was, in fact, within the rules for practical jokes. Finally, consider that the consequence of an inappropriate joke – one in which the information asymmetry is never resolved, or in which the norm violation remains outside the accepted bounds of “joking” – is that the victim does not laugh (or otherwise appreciate the execution of an acceptable joke), and may indeed seek retaliation. Accordingly, appropriate or inappropriate signaling behavior effectively alters the recipient's behavior.

Transparent examples of what are fundamentally signaling systems that alter reproductive behavior abound (e.g. sex taboos), and interactions between individuals in a host of social species (e.g. baboons, dolphins, humans) are subject to a variety of behavioral norms (Kummer,

1997). Consider the mundane observation that an adult (e.g. female) behaves in one way with another adult (e.g. male; copulation), and in a distinct manner with an infant (e.g. play) (Schieffelin, 2005). These behavioral patterns result from the interaction between the physiological processes determined by genes and the cultural norms learned during development, and this observation applies to a variety of behaviors in numerous species (Kummer, 1997). Plainly speaking, there are rules for behavior, linguistic and otherwise, dependent upon specific characteristics of the organism and its environment (e.g. sex; social relationship).

The cultural anthropologist Schieffelin (2005) notes, for instance, that Kaluli mothers teach numerous rules to their children, ranging from how to ask or demand, to how to address an elder in ritual settings. Similar examples of rule-guided behavior occur in baboons, for instance, when males or females compete for social dominance (Kummer, 1997). Schieffelin (2005) also describes a complex web of social hierarchy navigated at critical ontogenetic stages (e.g. puberty) by elaborate linguistic and motor performance(s). In similar vein, Kuipers (1998) demonstrates that linguistic performance is crucial to social status, occurs at specific and biologically interesting ontogenetic stages (e.g. puberty), and is vital to the community's sense of identity and well-being – real or imagined. Primatologists see analogous processes in our relatives, and have well-documented examples indicating the consistent effect upon reproductive success of particular social decisions at crucial junctures during life history (Goodall, 1971; Kummer, 1997). Together these observations indicate that sign systems in general, and language in particular, constitute viable mechanisms for evolutionary forces. Accordingly, language is legitimately viewed as an adaptation for signal dispersion building upon previous sign or communication systems.

Our previous discussion identified sign-related behavior as a mechanism by which individuals can modify another's behavior. Evidence that this scenario is capable of translating into differential reproductive success was introduced, and it is argued to be a non-trivial contribution to the evolutionary process that produced language. The proposed thesis maintains that language is a process fundamentally continuous with previous, ancestral sensory signaling systems, and in the following section our discussion turns to the inter-individual aspects of linguistic behavior.

***Part 2: Multiple clues birth complex minds.***

The following section focuses on two major aspects of inter-individual linguistic or signaling behavior that hold relevance for our discussion of the evolutionary roots of the human linguistic phenotype (HLP). The first aspect concerns what is called "theory of mind" (TOM) or "metacognition," here employed to indicate the ability of one individual to infer the mental state of another (Tomasello, 2008). The second aspect that I would like to discuss is "joint attention," or the ability for two individuals to attend to a single object or sequence of events. The following discussion argues that the HLP evolved from a signaling system engaging multiple individuals in continuous social interaction making extensive use of contextualizing clues.

The observation that we interpret each other's signs is mundane; it is less obvious that interpretation resolves signaling behavior. This observation is important because as signs alter behavior and may induce evolutionary forces, interpretation is adaptive as it facilitates the modification of behavior. Consider, for instance, that if a chimpanzee finds a pile of bananas, the most effective way of bringing his group to indulge involves loud, excited calls (Goodall, 1971). However, when that chimpanzee wants to eat the bananas himself, he tries to inhibit this behavior (Goodall, 1971). It stands to reason that our "selfish" chimpanzee distorts the effective

“come hither” signal precisely because no signal or a distorted signal is less effective at inducing the “come hither” behavior. In other words, an individual can influence another’s behavior through signs (e.g. calls), but altering or distorting that call decreases its efficacy. However, if an individual nearby has access to enough of the context, she may interpret the distorted call and investigate. Specifically, if she knows that our “selfish” chimpanzee just wandered off alone and that piles of bananas sometimes magically appear in this neck of the forest (perhaps due to those odd humans), she may investigate any call, even if incomplete or distorted. In short, her ability to connect various aspects of the environment (e.g. magic bananas, solitary friend) to a sign (e.g. distorted call) constitutes an interpretation that resolved the modification of behavior initiated by that particular sign. It follows then, that interpretation depends upon an individual’s ability to attend to the contextualizing clues relevant to the sign(s) in a given situation.

Consider then, that contextualizing clues include inferences and assumptions not only about the sign(s) itself, but the *signaler*. Furthermore, developing assumptions or inferences concerning the signaler utilizes the same basic mechanism(s) necessary to determine the relevant context of an interaction, extrapolating from previous and present clues. This process applied to some agent (e.g. conspecific) is indeed TOM, or the ability to infer the mental state of another individual – a sophisticated way of saying that one is proficient in the process of evaluating the intent of an individual’s behavior based upon clues relevant to the signaling behavior. For example, in Bauman’s (1986) treatment of practical jokes, it is critical to acknowledge a context stocked with subtle nuance, and the numerous assumptions regarding the individuals involved. Specifically, the jester’s audience frequently and consistently compares the observed behavior to a variety of cultural and social norms, and the jester needs to know well his victim’s personality and history (Bauman, 1986). The audience – and particularly the victim – scrutinizes the jester’s

behavior for norm violations, and these are crucial in considering the behavior elicited by said practical joke (e.g. laughter or anger). That is, the audience considers the jester's behavior in light of his previous behavior (e.g. he likes to pull tricks), the immediate general context (e.g. male camping trip) and the behavioral norms surrounding practical jokes (e.g. setup, trick event, informational symmetry etc.) (Bauman, 1986). In addition, the jester also needs to evaluate his performance and the reactions from his audience in order to elicit the desired behavior (e.g. laughter). In line with our previous observations, distorted or misinterpreted features of the contextualizing clues result in distinct behaviors (e.g. anger vs. laughter), placing certain costs on effective communication that draw heavily upon TOM. It is important to note that as we are investigating the *evolution* of the HLP, the requisite faculties of effective signaling so prominent in human interaction are continuous across a number of taxa (Tomasello, 2008), producing a spectrum that renders the HLP tractable as an evolving behavioral system (Mayr, 2001). In sum, the proposal indicates that TOM is vital to altering behavior and builds upon previous faculties in a graded manner, indicating its importance to the *evolution* of the HLP as a signaling system.

The second aspect of social behavior crucial to our understanding of how the HLP evolved is "joint attention," because linguistic dialogue requires two or more individuals attending to the same sequence of signs. The need for joint attention in the HLP may be obvious, but its role in evolution is not. Consider that, in line with observations concerning TOM, joint attention is not specific to humans, but exists to some degree in other species (Tomasello, 2008). That is, humans actively teach each other, and this instruction often takes the form of directed attention (Schieffelin, 2005; Zentella, 1997). Chimpanzees have also been observed actively teaching, typically when adult females teach subadult females to crack nuts (Boesch & Boesch, 1981). Next, consider the intimate relationship among contextualizing clues in signaling



behavior, TOM and joint attention, such that contextualizing clues are informative of the sign, TOM is informative of the signed message via assigning intention to the agent, and joint attention is informative of the agent herself. In other words, these terms are merely labels for continuous, graded aspects of signaling that facilitate the efficacy of a sign to produce behavior in another individual. For example, Kaluli mothers teach their children how to behave (e.g. ask, demand etc.) by repeatedly capturing and drawing the child's attention to a specific behavior (Schieffelin, 2005). This process depends upon the ability for the mother to use her attention as an instructional device, that is, the child pays attention to what mother is attending, and that constitutes the lesson (Schieffelin, 2005). In other words, joint attention facilitates behavioral modification, and in humans is deeply entwined with language. The current thesis argues that joint attention emerges from the salience of the contextualizing clues concerning the *signaler* (i.e. TOM) that facilitate behavioral modification through effective signing.

### ***Part 3: Social and Biological Ontogeny***

In his book, *The Symbolic Species*, Terrence Deacon (1998) makes the insightful observation that language evolution may depend, in important ways, upon the temporal relationship between the brain and social behavior. The following discussion examines the potential application and utility of this observation for the proposed thesis that language is an evolving sign system. Specifically, I argue that the interaction between neural architecture and social behavior during early post-natal life is crucial to understanding how the HLP evolved.

Research in comparative neuroanatomy indicates that asymmetry in the size of the temporal parietal transition area (area Tpt), part of the more widely known "Wernicke's area" involved in the processing of word sounds and meaningful gestures, probably arose sometime in the last 25 million years (MA) (Rilling et al., 2008; Spocter et al, 2010). The other commonly

known language-related area, “Broca’s area,” which processes speech production, syntax and hierarchical rules of recursion (Rilling et al., 2008), is asymmetrical in humans, but not in chimpanzees (Schenker et al., 2010), indicating that it probably arose in the last 6-8 MA. Taken together, signaling systems involved in the ordered processing of sensory data (e.g. auditory or visual signs) are behaviorally ancient, and show a graded evolutionary trajectory in a few key neuroanatomical regions. It follows that as signaling systems evolved as adaptations to modify behavior, the neural regions involved in processing these signs became larger and lateralized to reduce processing time, setting up a feedback loop among neural space, sign systems and social behavior.

Research from developmental biology and comparative neuroanatomy also reveal that the neural space involved in the hypothesized feedback loop is sensitive to temporal development. Specifically, studies demonstrate that axons (LaMantia & Rakic, 1994) and synapses between neurons (Bourgeois et al., 1989; 1993; Huttenlocher & Dabholkar, 1997; Zecevic et al., 1989) increase exuberantly early in life, being pruned as development proceeds, incorporating to some extent experience and learning. Deacon (1998) argues that *when* you expose an ape to language influences how well syntactical information is learned and subsequently how the ape performs linguistic operations because of the way the brain processes information in early post-natal life. In other words, the brain receives input from the signaling system (e.g. language), and because it has not already formed many of the connections between brain regions involved in processing these stimuli (i.e. still an infant), they are more readily learned. Furthermore, it is not simply that these experiences get a head start in the competition for neural space, but that the infant brain is more apt to learning associations about the world utilizing the strategy employed in language (specifically the HLP) (Deacon, 1998). Linguistic researchers provide evidence that the primary

language sets certain, subtle constraints upon the acquisition of additional languages, most obvious in the performance of analogous linguistic feats in operationally distinct linguistic structures (Kuipers, 1998; Zentella, 1997). In similar vein, despite the broad similarities in the structure of vocal sign systems (read language), variation is rampant – for example, African-American children are taught to “ask” or “demand” using distinct body posture and words (Rickford & Rickford, 2000), yet this is distinct from the emphasis placed upon analogous linguistic operations in Kaluli (Schieffelin, 2005). However, in accord with the use of sign systems throughout a large portion of primate evolutionary history, we should expect that general specializations making optimal use of effective signaling strategies exist (e.g. vocal, visual, acquisition etc.). In short, many developmental processes are temporally constrained by biology (e.g. LaMantia & Rakic, 1994), placing selective pressure on processing and acquisition strategies for phenotypic features (e.g. HLP) crucial to the organism’s reproductive success, although the exact paths to achieving proficiency exhibit variation.

The sign system ubiquitous throughout social structure in *Homo sapiens*, or language (Jakobson, 1980), mediates numerous, important aspects of life. For instance, language constitutes the medium through which many aspects of cultural *identity* are conveyed and reinforced in many communities (Allen, 2002; Kuipers, 1998; Zentella, 1997), further involving less encompassing but important ideas and expressive avenues like jokes, narratives (Bauman, 1986), poetry, songs, social change (Rickford & Rickford, 2000), food, rituals (Allen, 2002), and gossip (Zentella, 1997) – to name a few. In other words, language permeates human society, and drawing upon analogous research in our relatives (indeed all social animals), it is clear that language places significant selective pressure upon human populations. Indeed, as the cultural anthropologist Schieffelin (2005) notes, Kaluli children learn how to *be* Kaluli via the iterative

process of learning Kaluli customs, culture and language, and this certainly involves reproductive opportunities. Expanding upon this theme, the anthropological linguist Kuipers (1998) describes a type of ritual that is learned and lived early in life, mastered only well into adulthood, serves as a wellspring of historical knowledge, an outlet for linguistic prowess, a mechanism of social and economic status and identifies an entire suite of cultural heritage. Furthermore, Rickford & Rickford (2000) also depict the linguistic sign system as an integral part of social change and class conflict. In similar vein, Dean Saitta (2007) gives an excellent example demonstrating the power and salience of linguistic signs mediating class conflict – from beyond the grave no less – through the memorials and literary references created to remember the coal strikes in the American southwest. This last example brings up an aspect of language and sign systems deemed pivotal by a number of researchers (Allen, 2002; Bauman, 1986; Deacon, 1998; Kuipers, 1998; Schieffelin, 2005), namely the role of symbols. Research suggests that symbols mediate meaning and these oft-cited contextualizing clues in an incredibly powerful way (e.g. see Deacon, 1998). In accord with previous observations, symbols might be understood as objects whose context has become intertwined with the mechanisms of cultural transmission over generations. The current thesis argues that symbols are primarily relevant to the HLP, and outside the scope of the current essay, except insofar as they derive from an increase in the rich contextual milieu surrounding a given sign. As such, symbols are a profound result of the previously discussed evolutionary trajectory of signaling behavior, but are relatively uninformative of that trajectory and its causal roots.

Stepping back, it is apparent that when language is considered as a holistic communicative and signaling phenotype (Aboitiz & Garcia, 1997), not only are many features shared among numerous organisms, but that departures from this trend constitute potentially

interesting aspects of human behavior and society. It follows that quantitative increases in the attention paid to contextualizing clues had pleiotropic effects throughout much of our ancestor's social structure, elucidating mechanisms facilitating the extensive propagation of linguistic signaling behavior throughout human society, potentially informing us of the selective pressures currently active in *Homo sapiens*. These considerations fit well with the observation that humans have an extensive period of dependency (Leigh, 2004) that may prove crucial to learning all the sociocultural norms (Schieffelin, 2005), socio-sexual behaviors (Jaeggi et al., 2010), and manipulative skills that a given community has accumulated (Malinowski, 1922; van Schaik & Burkhardt, 2011). Similarly, selection on a few key mental faculties supporting these processes (e.g. working memory, learning etc.) underwent extensive selection, purportedly guiding the evolution of what is the anatomically modern human phenotype. Furthermore, extensive cultural pressure on the biological and social developmental trajectory of *Homo sapiens* is a pivotal aspect of our recent history, mediating evolutionary selective forces placing a high demand upon the rapid acquisition and proficient use of the linguistic system (Deacon, 1998). Taken together, these observations suggest that language is fundamentally a sign system harnessing social behaviors and developmental biology, illuminating mechanisms critical to the HLP.

### ***Conclusion:***

The current essay proposed that the evolution of the human linguistic phenotype is productively examined with the hypothesis that language evolved as a sign system. We described the gradations in selective pressures that result from quantitative increases in the cognitive load surrounding signaling systems in our relatives, and how this demonstrates that language might have evolved as an optimal solution to facilitate communication and behavioral modification in a social organism. Subsequent analysis centered on the cognitive and mental faculties that support

and maximize reproductive fitness in a complex social and signal-rich environment. Finally, we evaluated the aspects of modern human ontogeny that shed light on the apparently pleiotropic effects that result from the efficacy of the proposed evolutionary trend. In summary, the efficacy of language in *Homo sapiens* derives from the fundamentally salient system of signs that has ancient evolutionary roots and has recently been generalized throughout social life, leading to its ubiquitous presence in mental activity and elaborate complexity.

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