

The Evolution of Language: From Signals to Symbols to System

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Introduction

Human natural languages are communicative systems, and the primary use of language is to communicate. The precise nature of the relationship between the communicative functions, and the systemic properties, of natural languages may be disputed, but what cannot be disputed is that language is a vehicle for human communication. How different are natural languages, and their users, from other natural communication systems, and other species?

Studies of non-human communication systems have revealed not only the ubiquity of communication in the animal world, but also unsuspected complexity in some naturally-occurring systems of non-human communication. A now-classic example is the communication system of the vervet monkeys studied by Cheney and Seyfarth (1981). These monkeys employ a system of warning calls in which each of three call-types codes for the presence of a particular predator (snake, eagle, leopard). Animals hearing a call respond with behaviour that is appropriate to the danger posed by the predator: hearing an eagle call, they descend from a tree, hearing a snake call they stand and scan the ground.

The capacity to use elements of, or corresponding to, the lexicons of human natural languages communicatively is certainly not unique to humans. People have communicated with domestic animals for countless generations. However, non-human animals can do more with human natural languages than respond to simple instructions. When raised in an environment broadly resembling the cultural and communicative settings in which human infants acquire language, bonobos (*Pan paniscus*) can apparently acquire extensive receptive and productive lexicons, use them combinatorially in ways which involve quite complex event characterization, and apparently spontaneously teach such uses to their offspring (Savage-Rumbaugh and Fields, 2000). African grey parrots, when participating in structured communication settings, can also learn extensive vocabularies and employ them for

cross-classification of objects according to different object attributes (Pepperberg, 1999, and chapter 10 in this volume).

Human natural languages, and their human users, are the product of both biological and cultural evolution. If language really *is* unique, however, it is difficult to ascribe this uniqueness to dramatic differences between humans and other species in their genetic makeup. Humans share (on the most recent estimate) about 95% of their genetic material with their closest primate relatives, chimpanzees (Britten, 2002). Taken together with initial results of the human genome project, this suggests that the linguistic gulf separating the human species from other closely related species is not correlated with a difference of orders of magnitude in the available quantity of genetic material for directly coding the language capacity. This does not mean that there is no genetic foundation for the human language capacity. It does mean that we should be cautious in ascribing differences between human languages and other natural communication systems to interspecies genetic differences alone.

Language is the foundation of human societies as symbolically mediated orders, and of human cultural transmission. It could, and has, been argued that the uniqueness of language goes hand in hand with the uniqueness of culture. Culture is not, however, a uniquely human achievement. Culture can minimally be defined as the existence of intra-species group differences in behavioural patterns and repertoires, which are not directly determined by ecological circumstances (such as the availability of particular resources employed in the differing behavioural repertoires), and which are learned and transmitted across generations. On this definition, there is ample evidence of culture and cultural differences in foraging strategies, tool use and social behaviours in chimpanzees (Whiten *et al.* 1999; de Waal, 2001). Such a definition will also qualify, for example, epigenetically learned intra-species dialect differences between songbird communities as cultural and culturally transmitted behaviour (Marler and Peters, 1982).

Given these findings, would it be correct to conclude, as some have, that the human language capacity is, after all, not species unique? Such an argument would hold that the evident continuities we can observe between humans and non-humans in genetic makeup, capacity for culture, and capacity to use language-like signs communicatively, justifies the “gradualist” conclusion that the difference in

complexity between human natural languages, and the communication systems and abilities of non-human animals, is non-qualitative. I will present some arguments why this is not the case. My argument will not focus solely or primarily upon the unique grammatical properties of human natural languages, although it is clear that these exist. My argument is rather that, in contrast to non-human *signal systems* of communication, human natural languages are *symbol systems*. The evolutionary transition from signal to symbol usage, and the exo-somatic, culturally-driven elaboration of symbol usage into language, accounts for the unique complexity of human language (including grammar). This emergent complexity, I suggest, has, in the course of evolution co-opted or captured a suite of cognitive capacities that are uniquely developed (but not unique) in humans.

The account I offer below of the evolution of the human language capacity is neither nativist nor empiricist, but one based upon *the epigenetic emergence and elaboration of symbolization*. Each of these terms is technical, and all of them are disputed. Hence, I conclude this Introduction by providing definitions of how I shall use the terms *epigenesis* (and epigenetic), *emergence*, *elaboration* and *symbolization*.

Epigenesis

Contemporary theories of epigenesis in biological and psychological development build upon the pioneering accounts of Waddington (1975) and Piaget (1979). Epigenetic naturalism (Sinha, 1988) proposes a constructivist account of the interaction between genotype and somatic and extra-somatic environment in organismic development. The claim that such an interaction exists is, as such, trivial and undisputed, since everyone agrees that phenotype is co-determined by genes and environment. There are two particularly important characteristics of epigenesis that I wish to highlight here.

The first is that the role of the environmental factors is *constructive* rather than, or in addition to, being *selective*. Nativist approaches to the developmental interaction between genotype and environment stress the role of specific input either in permitting a developmental process to unfold, or in parametrically selecting a particular variant of development. An example of the former would be phenomena such as “imprinting”, where an innate and fully endogenous process of development is “triggered” by an environmental event during a critical developmental window. An

example of the latter would be the role hypothesized by generative linguists to be played by typological characteristics of target languages in setting parameters and thereby permitting the child non-inductively to acquire the grammar of the target language (Chomsky, 2000). In neither of these cases does the environmental information add any higher *level of organization* to the genetically coded information. That is to say, the pathway along which the behaviour develops, and its terminal structural complexity, are assumed already to be directly encoded in genes.

By contrast, in epigenesis the developmental pathway and final structure of the behaviour that develops are a consequence as much of the environmental information as of the genetically encoded information. For example, the development of birdsong seems to involve reproduction by imitative epigenetic learning, rather than selection from amongst pre-established alternatives (Marler and Peters, 1982). Fledglings not exposed to a model do develop birdsong, but it is impoverished or unelaborated relative to that of those individuals developing in a normal environment in which models are available.

The second key characteristic of epigenesis is, accordingly, that a genetically specified developmental envelope or window specifies an initial behavioural (or perceptual) repertoire that is subsequently *elaborated* through experience of a relevant environment. This process of elaboration is directional (see below), and once it has taken place the initial plasticity of the embryonic, or unelaborated, repertoire is largely (though not necessarily wholly) lost. A typical example is the development in human infancy of speech sound perception (Bohn, 2000; Kuhl, 2000; Oller, 2000), in which the “universal” initial processor is transformed into a “language-specific” processor in a process that is probably analogous with that of the development of birdsong.

We can note here that an epigenetic account of this process differs from a nativist, parameter-setting process inasmuch as no assumption is made that the infant brain is innately equipped with an inventory of all possible natural language phonemes (Characteristic 1, above). Equally, however, it differs from a classical learning account, inasmuch as epigenesis depends upon the elaboration of an initial repertoire which itself is not learned, in a process which cannot be re-run—the initial, unelaborated capacity cannot be re-accessed after the epigenetic developmental

process has taken place, as all second language learners come rapidly to realise. In other words, the process of developmental elaboration implies in epigenetic development a transition from relative plasticity and informational openness to relative rigidity and informational closure.

There are two other characteristics of epigenesis that are particularly relevant to *human* development. One is its neurobiological basis in “Neural Darwinism”, the selective stabilization of synaptic connections during ontogenesis (Changeux, 1985). The other is the role of ontogenesis itself in canalizing phylogenesis, through “Baldwin effects” and genetic assimilation. Baldwin (1902) hypothesized that behavioural adaptations in individuals could track environmental changes, or increase the range and complexities of behavioural repertoires, before becoming genetically fixed (assimilated) by natural selection. The relevance of such a process to the elaboration of communication systems is obvious, and it should be noted that Baldwin supposed that such “organic selection” played an increasingly important role in the evolution of species with high degrees of neural and behavioural plasticity.

Emergence

The “emergentist” hypothesis has received considerable attention recently as an alternative (closely allied with epigenetic theories) to nativism (MacWhinney, 1999). I will use *emergence* to mean, quite widely, the development of new properties and/or levels of organization of behavioural and cognitive systems as a consequence of the operation or cooperation of simpler processes. Epigenesis is thus a special case of emergence. In this paper, I focus on *symbolization* as a phylogenetically emergent property of communication, as well as upon its epigenetic development in infancy.

Elaboration

By elaboration I mean the process whereby development gives rise to increased complexity of organism, behaviour and cognition. Increase in complexity usually involves both form and function. A crucial distinction between Darwinian natural selection and epigenetic development is that the latter, but not the former, *implies* elaboration. In ontogenesis, some instances of elaboration are under more or less direct genetic control, others may be epigenetically driven, and still others may be emergent consequences of the elaboration of subsystems. I will not make a strong distinction between emergence (new properties) and elaboration (greater complexity),

which I see as two aspects of the underlying directionality of developmental change (Valsiner, 2000). Although it is appropriate to reject teleological explanations for Darwinian evolution, and teleology is not inherent in emergence, teleology *is* inherent in elaboration as a directional process whose “aim” is the increase in the spatio-temporal extent of the lived and cognized environment.

Symbolization

This is the central topic of this chapter, and I shall restrict myself here to some brief remarks which I shall expand below. There is a large literature in linguistics, psychology and semiotics on the defining characteristics of the concept of “symbol”, which I do not have the space to review in depth. Many treatments postulate *arbitrariness* and *productivity* as criterial for symbolicity. In line with much recent discussion of the importance of *motivation* in language structure (Lakoff, 1987), I consider the extent of arbitrariness in natural languages to have been overstated, although it is certainly characteristic of morphemes in spoken languages (Hurford, 1989). Arbitrariness is a bivalent relationship between symbol and symbolized, which does not adequately capture the *communicative logic* of symbolization. I prefer to focus on the notions of *intentionality* and *conventionality*, which directly implicate the *users* of symbols, their psychological capacities and social relations; and *reference*, which similarly implicates the *uses* to which symbols lend themselves. Productivity is indeed criterial for natural languages and symbol *systems*, but not necessarily for symbolicity as such. If it were so, we should be forced to conclude that children in the early stages of language acquisition are using one-word utterances non-symbolically, which is counter-intuitive, since what they have not yet learned is the structural properties of the system, not the signifying properties of words.

Symbols are contrasted, in Peirce’s semiology (Peirce, 1955), with both icons and indices. I have followed instead the binary distinction employed by Bühler (1990) between *signals* (which equate in most respects to Peirce’s indices) and symbols. My core hypothesis is that the epigenetic development of symbolization involves the emergence of symbol usage from communicative signal usage. Whereas a communicative signal can be viewed as an instruction (perhaps coded) to *behave*, the use of symbols involves two emergent properties, *reference* and *construal*. Reference and construal are the basic functional components of the representational function of

language, and the development of symbolization is essentially the process of the elaboration of the representational function.

Signals and Symbols

Signals and Signal Sensitivity

Sensitivity to signals is as basic a property of life as the ability to reproduce. All organisms are able to detect signals indicating (indexing) the presence of conditions hospitable to survival (including metabolism) and reproduction. The more complex the organism, the greater the range of signals to which it is sensitive, and the more complex its behaviours both in response to, and in the active search for, life-relevant signals. In the most general terms life might be defined as the possession by self-organizing systems of the dynamic and mutually influencing emergent properties of reproduction and signal sensitivity, which together provide the basic conditions for the organismic “value system”. The functional characterization of simple, non-communicative signals is essentially identical to that of the S-R link of classical learning theory, although the responsivity of the organism may be either innately determined or learned. It is diagrammed in Figure. 1.

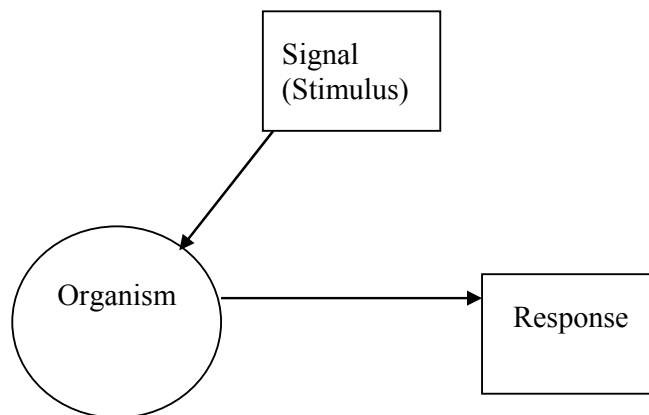


Figure 12.1 A non-communicative signal.

Signals, in social animals, may also be used to communicate. The basic structure of the communicative signal is shown in Figure. 2. The communicative signal mediates between a non-communicative signal picked up by one organism, and the response produced by a second organism. The social exchange of communicative signals does not require intentionality. The sender does not have to emit the

communicative signal purposively, since the signal may simply be an innate or learned response to a stimulus. The receiver does not have to direct its attention either to the sender, or to the original stimulus (signal₁) that causes the sender to emit the communicative signal, but only to the communicative signal emitted by the sender. The sender is not signifying or representing a “referent” for the receiver, and no mutual awareness of the cognitive viewpoint of sender and receiver is implied in the exchange.

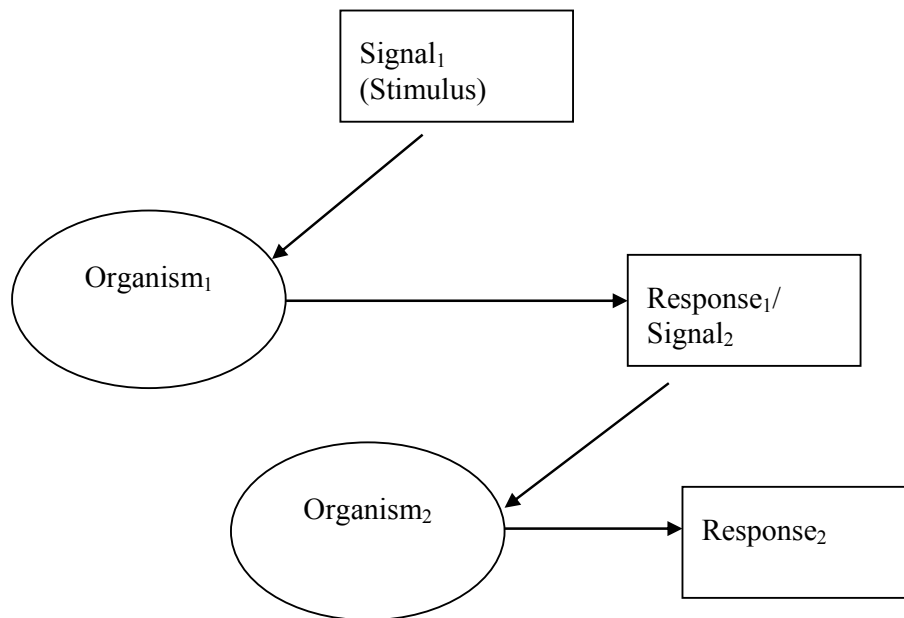


Figure 12.2 A communicative signal.

The communicative signal (as in the vervet monkey call) may, however, bear an arbitrary relationship to the non-communicative signal (object, event) which triggers it. Does this mean that vervet monkey calls are symbolic in nature (as maintained, for example, by Hurford, p.c.)? Certainly, if learned, they display an embryonic conventionality as well as a primitive systematicity. Social, communicative signals may thus be in some degree *systematic* and *coded*, that is, the same communicative modality may support a variety of coded instructions, and it is even possible for them to support a simple “code-syntax”. But are they intentionally produced in order to refer to the dangers they signal? Or are they merely behavioural

cues, instructions to behave in a certain way? Before exploring this issue further, let us introduce an analysis of fully developed symbolic communication based upon Karl Bühler's (1990 [1934]) Organon model of language.

Symbols and symbolization

The conventionality of a true symbol rests upon the shared understanding by the communicating participants that the symbol is a token *representing* some referential class, and that the *particular* token represents a *particular* (aspect of) a shared situational context, and, ultimately, a shared universe of discourse. Conventional symbol systems are therefore *grounded* in an *intersubjective* meaning-field in which speakers *represent*, through symbolic action, some segment or aspect of reality for hearers. This representational function is unique to symbolization, and is precisely what distinguishes a symbol from a signal. A signal can be regarded as a (possibly coded) *instruction to behave* in a certain way. A symbol, on the other hand directs and guides, not the *behaviour* of the organism(s) receiving the signal, but their *understanding (construal)* or (minimally) their *attention*, with respect to a shared referential situation.

In this way, we can unpack and understand the concept of *intentionality*, widely understood to be intrinsic to symbol usage, but used in several different ways. For current purposes I distinguish three meanings (or related aspects) of intentionality:

*Intentionality*₁. Purposiveness or goal-directedness.

*Intentionality*₂. Orientation to others as “minded” beings.

*Intentionality*₃. Directedness to the world, or reference.

I suggest that these different aspects of intentionality are inter-related in symbol usage, which involves the purposive use by a speaker of a symbolic sign to manipulate or direct the mental orientation (construal, or, minimally, attention) of a hearer with respect to an intersubjectively shared aspect of reality (*joint reference*). N.B.—“speaker” and “hearer” should be understood as producer and interpreter of a symbolic sign in any modality, “reality” should be understood as any aspect of the shared universe of discourse.

It is important to emphasize here that symbolicity is here defined in terms of the semiotic and pragmatic *logic of communicative representation*, not on the specific

typology, in the Peircian sense, of the relationship between sign and object (Sinha, 1988). Even an indexical sign, such as simple pointing, provided it is intentionally produced in an intersubjective field of joint reference, can be regarded as a kind of “proto-symbolic” communication, and the intentional and conventional production and comprehension of iconic representations such as maps clearly fall under this pragma-semiotic definition of symbolization.

My claim here is that the first criterion for symbolization, or the existence of a symbolic capacity in any organism or simulated organism, is *reference*. It is, however, important to specify that reference, in this definition, is not a property of signs or symbols “in themselves”: symbols refer only by “inheriting” the referential function intended by their users—senders or receivers (Sinha, 1999).

Reference, however, is only the first of two criteria for fully developed, or “true”, symbolization. I will claim that joint reference is the criterial basis for the *emergence* of symbolization, while the second criterion, which I shall call following (Langacker, 1987) *construal*, constitutes the set of cognitive operations which underpin the *elaboration* of proto-symbolic joint reference into true symbolization.

Simple, unadorned joint reference, such as implied by the production and comprehension of an indexical pointing gesture, serves to orient the attention of the receiver, but does not (in the general case) direct the receiver to any particular *understanding* or *conceptualization* of what is being referred to. The use of a truly symbolic sign, such as a word, however, at the very least implies a categorization of the referent, and may involve complex manipulations of perspective and Figure-Ground relations. This cognitive-functional analysis of symbol usage is essentially the same as that advanced by Bühler (Figure. 12.3).

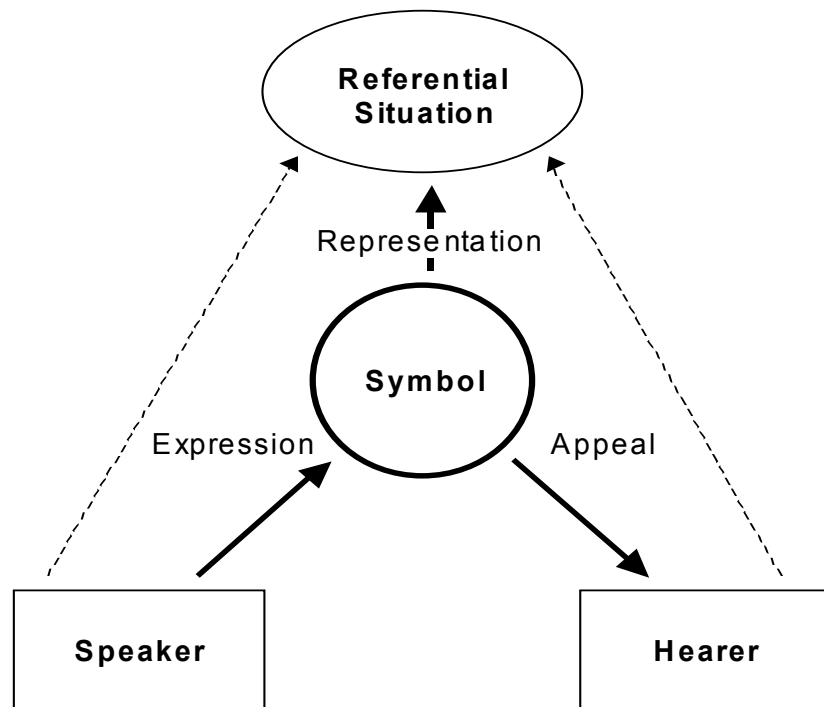


Figure 12.3 Symbolic communication. A modified version of Bühler’s Organon model of language. Broken lines represent joint attention.

The Emergence of Symbolization

It is possible to envisage an evolutionary scenario for the phylogenetic emergence of symbolic communication from signal communication. We may hypothesize the following four steps:

1. The receiver comes to pay attention to the sender *as* the source of communicative signals.
2. The sender comes to pay attention to the receiver *as* a recipient of communicative signals.
3. The receiver comes to pay attention to the evidential reliability of the sender’s communicative signals as a source of information, by checking what the sender is paying attention to, or doing.
4. The sender comes to pay attention to the receiver’s readiness to reliably act upon the information communicated, by paying attention to what the receiver is paying attention to, or doing.

The first two steps of this sequence do not involve intersubjective “sharing” by the communicating organisms of a referential world, but they do require orientation towards, or social referencing, of a communication partner either as a source of information or as an actor whose behaviour can be influenced. This level of communicative competence is probably widespread amongst mammals, underpinning complex signal-mediated social behaviours. Not only communication between conspecifics, but also communication between humans and domesticated or working animals such as dogs, horses and elephants often seems to involve an understanding on the part of the domesticated animal that the human can both send and receive signals. My young border collie, for example, brings a ball and nuzzles me with it, while looking at me, when she wants to play (an instance of Step 2 above). This can be considered an elementary instance of Communicative Intentionality, in the sense that the dog is able to treat communication as a means to indirectly achieve goal directed action (Intentionality₁).

Communicative signals, it has been suggested, may emerge from non-communicative signals through a process of ritualization, in which the expression of an emotional-motivational state, or the initiating sequences of a social behaviour, become stylized and acquire a communicative value. (Huxley, 1966; Hauser, 1996). A communicative signal indexing a non-communicative intention (such as a wish to engage in play, grooming, or any other social behaviour) often has its origins in an initiatory segment of the behaviour, which may be abbreviated or stylized in shifting its status from “just behaviour” to signal. Ritualization and abbreviation are also observed in the development of dyadic mother-infant communication in humans (Lyra and Souza, in press).

It is the understanding by each of the communication partners that the other can both send and receive such signals that constitutes the mastery of Steps 1 and 2 above. Communication, with the achievement of Steps 1 and 2, remains signal-based, but it implies the establishment of a first level of intersubjectivity, consisting of a recognition by each communication partner of the other *as* a communication partner, and the recognition by each partner of the other as an agent capable of acting as initiator or mediator of goal directed action.

In phylogenesis, then, the basis of intersubjectivity is (I hypothesize) constructed through the mediation of goal directed social behaviours by signals, and the understanding of the communicative partner as a potential agent. The ontogenesis of intersubjectivity in humans seems, however, to follow a different route: primary intersubjectivity has been claimed to be innate (Trevarthen and Hubley, 1978) (figure. 4).

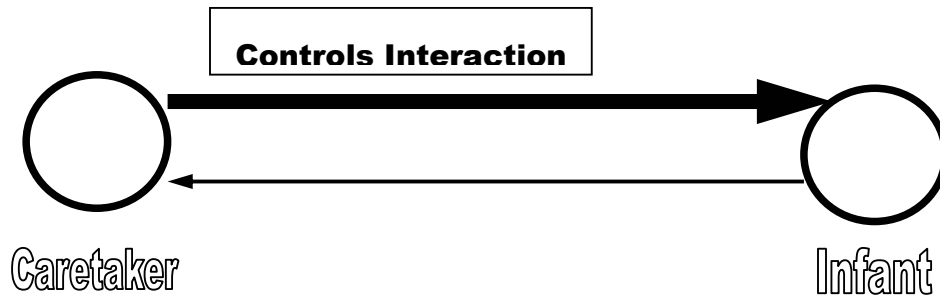


Figure 12.4 Primary Intersubjectivity. Caretaker-neonate interaction from 3 weeks.

Caretakers (usually mothers) and infants engage from a very early age in episodes of “communication” in which the bodily movements, facial expressions and vocalizations of the two participants provide the signals necessary for the maintenance of the communicative channel or intersubjective “we” formed by the dyad. The real time temporal meshing by the mother of her actions with those of the baby is of fundamental importance to the maintenance of intersubjectivity, indicating the emergence of a psychologically real “ontology of the social”. Whereas I have suggested in the evolutionary scenario above that communicative intentions emerge phylogenetically from elaboration of the recognition and signaling of social intentions, in human ontogenesis communicative motives are innate (or at least intrinsic to the socio-emotional relation between mother and infant). Whether it is innate or not, the mutual gaze component at least of early mother-infant interactions appears *not* to be species specific, and its frequency in interaction is culturally variable in both humans and chimpanzees (Bard *et al.* 2002).

In taking Steps 3 and 4, the sender and/or receiver develop the capacity to understand that a signal indexes an intention, rather than the action intended. With this, the possibility is opened for deception and suspicion regarding intentions. The

most basic level of understanding of the communicative partner not just as a potential agent, but as an experiential subject within the intersubjective field, is the ability to follow gaze, as evidenced by human infants from about 6 mo. of age (Butterworth and Jarrett, 1991) and by a number of other species (Figure. 5). Gaze following allows the receiver to monitor the activity and attention of the communicative partner, but not to manipulate as sender the attention of the receiver to a specific object or referent.

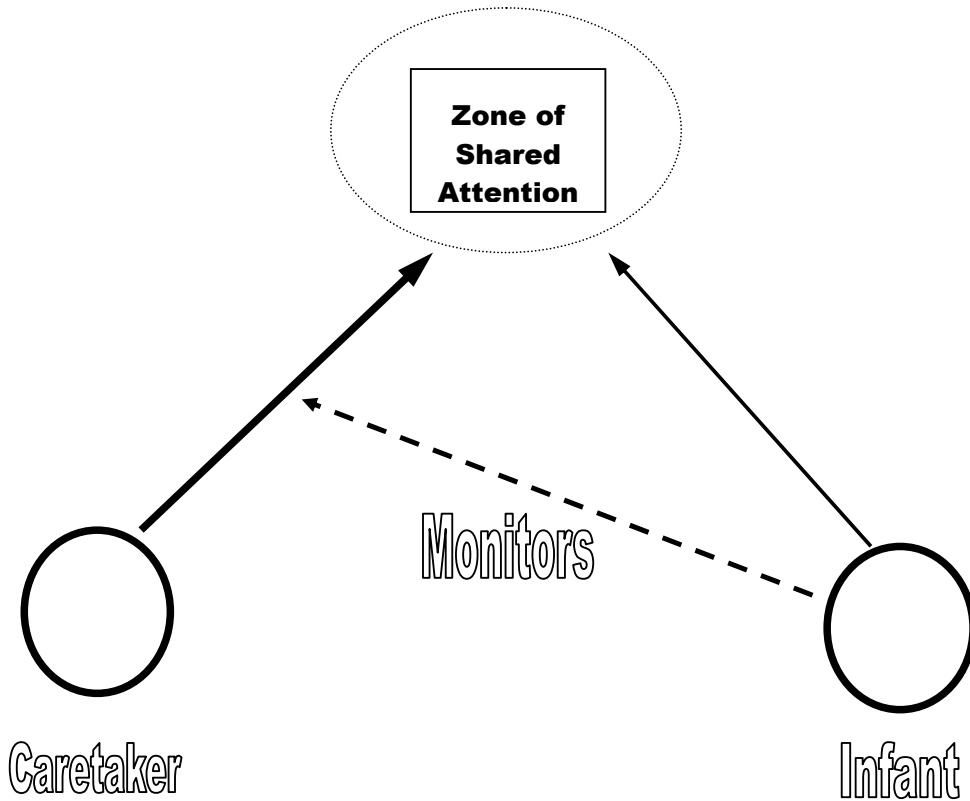


Figure 12.5 Gaze following. Human infants 6 mo., chimps, dolphins, sheepdogs.

The ontogenetic development of this capacity has been well researched in the past couple of decades. From around nine or ten months of age human infants “begin to engage with adults in relatively extended bouts of joint attention to objects ... In these triadic interactions infants actively co-ordinate their visual attention to person and object, for example by looking to an adult periodically as the two of them play together with a toy, or by following the adults gaze. Infants also become capable at this age of intentionally communicating to adults their desire to obtain an object or to share attention to an object, usually through non-linguistic gestures such as pointing

or showing, often accompanied by gaze alternation between object and person.” (Tomasello, 1996: 310; see also Franco and Butterworth, 1996). The achievement of joint reference in human infancy establishes the “referential triangle” (Figure. 6), also referred to as “secondary intersubjectivity” (Trevarthen and Hubley, 1978). Spontaneous productive pointing in free-ranging non-human primates has been observed (Bard, 1992), although its extent and frequency in the wild is unclear.

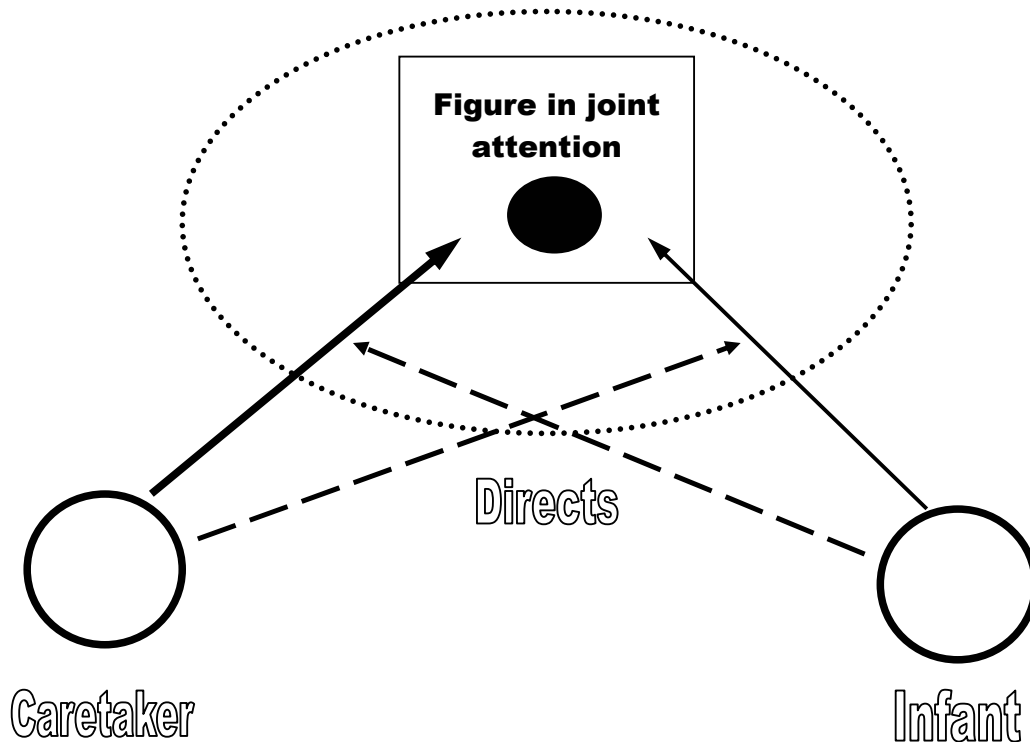


Figure 12.6 The referential triangle. Joint reference at 9-10 mo. in human infancy.

The emergence of the “referential triangle” marks the emergence of the first criterion for symbol usage, namely reference in the intersubjective field. From this point until about 14 mo. of age, infants increasingly mediate the manipulation of the field of joint attention by manipulating objects in give-and-take routines, and early in the second year of life they begin to demonstrate active mastery of the conventional or canonical usage of objects in play situations, their usage of such objects being dominated by the cultural specification of conventional function until well into the third year of life (Sinha, 1988; Moro and Rodriguez, 1998; Sinha and Jensen de López, 2000). It seems to be a well-founded conclusion that by early in the second

year of life, the basic foundations of symbolization in intersubjectivity, and in an understanding of conventionality, have been laid.

At this point, we can return to the question asked above: are vervet monkey calls symbolic, or at least, proto-symbolic? The basic model of the social exchange of signals, represented in Figure. 2, implicates neither intersubjectivity nor social convention. Instead, it involves simple *co-ordination* of individual organismic behaviour (which may, indeed, be complex, arising like many complex behaviours from natural selection). This mechanism also lacks not only reference, but even direct attentional co-ordination between the communicators. The vervet monkey system may well be more complex than this, especially inasmuch as it seems to cue visual attention as well as locomotion. The tendency to arbitrariness and systematicity displayed by the vervet monkey call system, a result of far-reaching ritualization, may serve to enhance the attentional orientation of the communicators both to each other and to the shared context of situation, facilitating the logic of emergence described above. If this is so, we should perhaps view the properties of arbitrariness and systematicity as possible prerequisites for, rather than criteria of, the emergence of symbolization from signals.

The Elaboration of Symbolization into Grammar

Fully developed symbol usage, I have argued, involves the mastery of a symbolic system with a representational function. The baseline of symbolization is, I have also argued, reference in an intersubjective field, exemplified at the most fundamental level by nonlinguistic means for sharing and manipulating joint attention. From here, it is only a relatively short step to a proto-symbolic system of conventional word-signs, but there still remains a long road to travel before we arrive at evolutionary modern natural languages, with their multidimensional cognitive, grammatical and pragmatic complexity. What drives the elaboration of symbolization into language? Does increase in structural complexity merely accompany the increasing differentiation and integration of cognitive and communicative functions, following its own autonomous developmental pathway? Or is structural elaboration motivated by, and interdependent with, functional elaboration?

Since there is no consensual answer to this question in respect of the ontogenesis of language, consensus can hardly be expected in interpreting the meagre

evidential base for language evolution. What follows is therefore a speculative account, based upon a core thesis of cognitive-functional linguistics, namely that natural languages are complex, multi-level systems of *mapping* between linguistic conceptualization and linguistic expression (Sinha, 1999). Conceptualization in and through language involves manipulations of Figure-Ground relations, the adoption and shifting of perspectives, and the exploitation of the symbolic power of language to construct virtual realities, enabling speakers and hearers to share universes of discourse extending beyond the actual spatio-temporal frame of reference (Hockett, 1960; Oller, chapter 4 in this volume). Grammar, in this view, is not confined to rules governing linguistic expression, but is the structural means for integrating conceptualization and expression in discourse contexts. The variety and power of linguistic constructions affords a rich flexibility of *construal* of actual and virtual referential situations.

The notion of construal (Langacker, 1987) can be simply illustrated by example. Any referential situation which requires characterization in terms of the *relationships* obtaining between more than one entity may so be characterized in more than one way. I can say, for example, that the cup is on the saucer, or that the saucer is under the cup. In the first case, the cup is the Figure (or Trajector), and the saucer the Ground (or Landmark) in relation to which the location of the cup is specified. In the second case, these cognitive roles are reversed. Similarly, the lexicalization “father of” represents the same relationship as the lexicalization “child of”, but the two lexicalizations are perspectivized from different points of view. Construal in language also often involves the superimposition of virtual properties onto actual referential situations, as has been emphasized in the case of spatial conceptualizations by Talmy (1996), who designates usages such as “The tunnel goes from Dover to Calais” as instances of “fictive motion”.

The hypothesis that I advance is that the evolutionary elaboration of symbolization into grammar involved the construction of natural language subsystems functionally subserving flexible construal. Probably, this process of elaboration accompanied, and was led by, increasing socio-cultural complexity, necessitating more complex perspectival co-ordinations and more complex discourse representations, including narrative representations consolidating group identity,

planning of socially co-ordinated activity, and naming practices based upon increasingly complex kinship relations and growing social differentiation. Whatever the details, the hypothesis proposes that the emergence of grammar was not a happy accident, but a developmental process governed by a social cognitive logic of elaboration. Figure. 7 diagrams the semiotic structure resulting from the elaboration of joint reference into linguistic (symbolic) conceptualization *via* the mastery of symbolic vehicles enabling flexible construal.

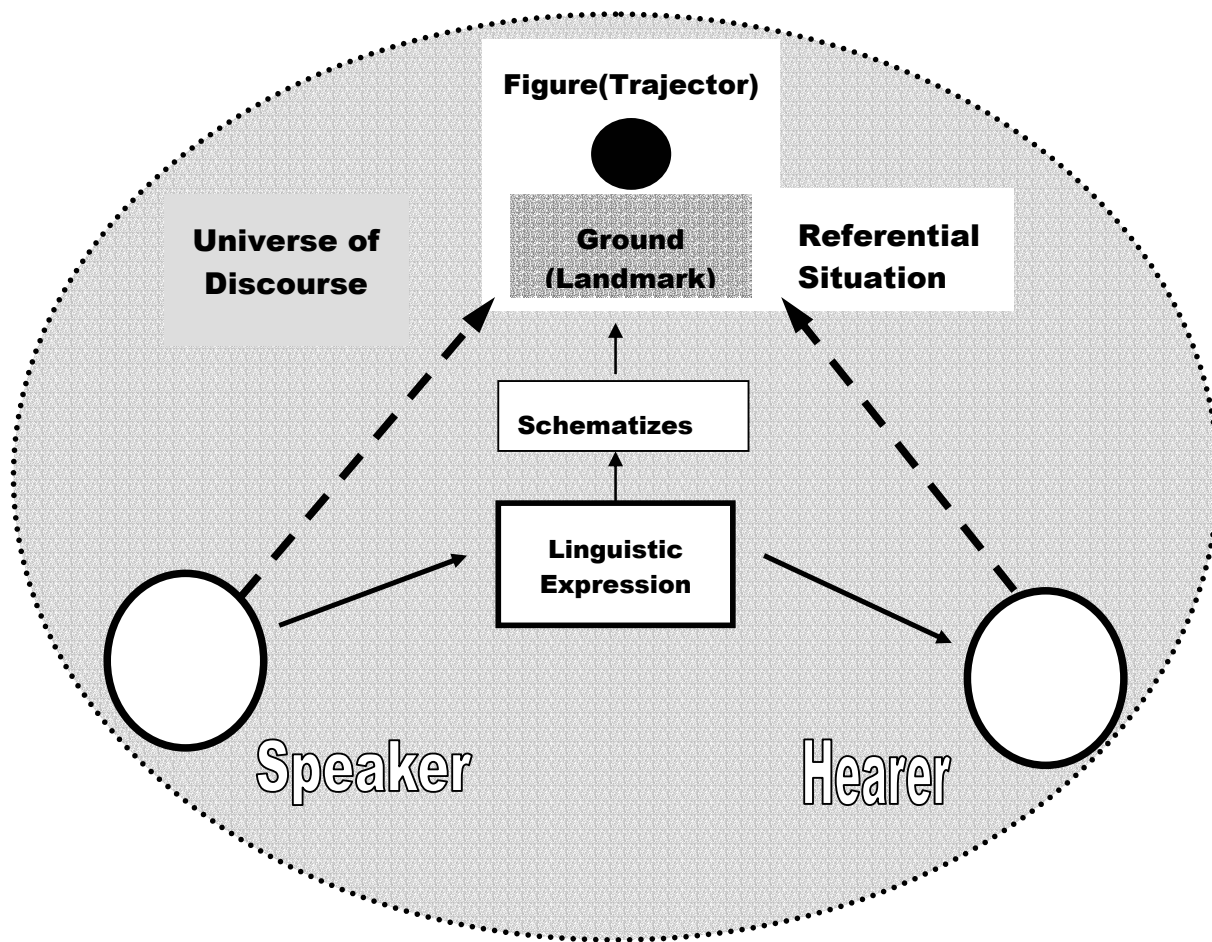


Figure 12.7 Semiotic mediation. Linguistic conceptualization as symbolic construal.

Infancy, Evolution and Culture

There is a common epigenetic logic to the phylogenetic and ontogenetic development of symbolization. The logic is one of process, from signals to the emergence and elaboration of symbols. This logic involves the following sub-processes, which significantly temporally overlap but which emerge in the order below:

- Intentionality, intersubjectivity and reference
- Conventionalization based in intersubjectivity
- Structural elaboration yielding flexible construal

Each of these sub-processes represents a contrast with specific cognitive characteristics of signal based communication. Intentionality contrasts with stimulus dependence, conventionalization contrasts with (though is perhaps emergent from) simple social co-ordination, and structural elaboration contrasts with code rigidity. The sub-processes of *conventionalization* and *elaboration* are dynamically coupled: novel, elaborated constructions are entrenched in usage, and can subsequently be recruited for further elaboration, eventuating in a “ratchet effect” (Tomasello, 1999) capable of producing potentially very rapid structural change and evolution.

It should be emphasized that there is no claim in this model that ontogenesis necessarily involves, within any one of these processes, the recapitulation in ontogenesis of stages passed through in phylogenesis. Although we can observe analogous phenomena in (for example) the communication strategies of human children and non-human primates, there are also many differences. We have seen, for example, that primary intersubjectivity appears to be innate (or intrinsic) in humans, and perhaps in some other primates too, while it is hypothesized to be emergent in phylogenesis from the mediation by communicative signals of non-communicative social behaviours. Similarly, although it is plausible to draw very general analogies in terms of principles of motivation between grammaticalization processes in historical language change, and the acquisition by the child of the constructional resources of grammar, the stages and strategies characterizing each of these processes are very different (Slobin, 1997).

Commonalities in developmental logic do not, therefore, imply that ontogenesis recapitulates phylogenesis. Instead, I would like to suggest that

ontogenesis—and in particular the ecological niche of infancy—played a crucial role in the evolutionary development of the human symbolic capacity. Human infants, as has often been pointed out, are extraordinarily well adapted to the demands of enculturation and the acquisition of symbolic communication (Tomasello, 1999). I suggest that this is because, once established, the emergent social ontology of intersubjectivity and conventionalization sets up new parameters for the selection of context-sensitive and socially situated learning processes, rather than “content-dedicated” cognitive mechanisms. In such an evolutionary process, a major role might have been played by “Baldwin effects” that lend a teleological directionality to natural selection, mediated by the inherent teleology of the elaboration of symbolic communication (see Section 1).

The traditional and still-dominant view of evolution and development is one in which the development of “higher” levels of organization is dependent upon prior developments in “lower” levels of organization. In particular, the priority of individual organismic properties is assumed to carry over from the level at which natural selection occurs to the level of psychological processes. Even if the existence of emergent, higher level (socio-cultural) properties is conceded, the autonomy of these levels is continually undermined by theories that reduce them to the causal properties of supposedly “more basic” levels.

An alternative view, consistent with recent findings in developmental psychology and cultural primatology, proposes that an emergent socio-cultural level of organization set the evolutionary stage for subsequent epigenetic development and genetic selection. This account stresses the emergence of the first foundation of symbolization and language not in individual cognition, but in the quintessentially social space of intersubjectivity and normativity. It is this space that constituted the niche for the emergence of symbols from signals. Further epigenetic dynamics involved the evolution of infancy towards adaptation to intersubjective communication and conventionalized patterns of interaction, facilitating rapid ontogenetic acquisition of symbol systems. I have proposed above a model for the further elaboration, in the context of increasing socio-cultural complexity and, perhaps, group size (Dunbar, chapter 14 in this volume), of the symbol system into grammaticalized natural language, perhaps relatively recently in human evolution.

It is possible, too, that the same epigenetic dynamics responsible for the adaptation of human infants to intersubjectivity, produced adaptations to structurally complex symbolization. As yet, we have no decisive evidence to accept or reject hypotheses regarding the innateness of a specifically grammatical component of the human language faculty. It should, however, be emphasized that in an epigenetic perspective, any developmental predisposition for learning language is unlikely either to involve direct coding of, or to be dedicated exclusively to, linguistic structure (Mueller, 1996; Sinha, 1996).

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