

'Concept' and 'communication' in evolutionary terms*

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Introduction: Language and non-language

The idea that human linguistic ability has evolved from other, 'lesser' abilities is a notion which we accept almost intuitively today. Yet the intuition resists theoretical explication in several ways. The central problem is our lack of understanding of how the scale of such abilities — a scale which encompasses *both* human *and* non-human abilities — might best be formulated. We lack an adequate comparative framework in which questions of language evolution can be posed. Several additional difficulties attend this central problem.

From the outset, for example, language calls attention to non-language. It is difficult even to raise the question of the evolution of language without raising questions about the development of other semiotic abilities — such as conceptual and communicative abilities — across the phylogenetic spectrum. Yet terms such as 'concept' and 'communication' are not particularly well suited to reasoning about *evolutionary* processes. Even where these terms have precise, theory-shaped definitions, such definitions are designed, in a sense, to characterize *distinctively* human abilities. If we enquire after an evolutionary process by relying on terms which are definitionally biased towards its end, such an enquiry remains in the grip of a false teleology; what is worse, the very terms of the enquiry heighten the appearance of discontinuity between the evolutionary *telos* in question, and all stages prior to it.

Similar definitional impediments apply to the term 'language'. Ever since Saussure, 'linguistic' theory (in several incarnations and traditions) has maintained a restrictive focus on those aspects of human semiotic ability which distinguish us from all other animals. Ironically, Saussure himself imagined the 'linguistic' study of human 'language' to be part of a larger field of study which he called 'semiology'; but about semiology itself he had little to say. Since even distinctively human semiotic abilities are highly complex in nature, disciplinary 'linguistics' has had much to

do, of course. But an exclusive focus on those semiotic abilities which are *merely distinctive* (rather than fully characteristic) of humans hinders rather than helps our efforts today even to formulate evolutionary questions in an effective manner.

The problem that I wish to consider here is the problem of how differences in conceptual and communicative abilities may be scaled or calibrated across the phylogenetic spectrum from a semiotic point of view. I make no effort to give a necessary-and-sufficient definition of either 'concept' or 'communication'. My whole point, in fact, is that each term describes a gradable range of semiotic phenomena, even for the special case of humans. My main interest is in opening up the question of how this range can be studied at all.

Differentiating vs. integrationist perspectives on semiotic ability

If modern humans have acquired semiotic abilities which their predecessors lacked, they have also retained abilities which their predecessors had. Alternatively, if 'language' is defined narrowly, in a way which maximally differentiates human abilities from those of other animals, then 'the evolution of language' appears to be a saltationist marvel. Yet the appearance of discontinuity is itself sharpened by the way in which 'language' gets defined. Properties such as those in (1) are typically invoked in most current definitions.

(1) Some semiotic characteristics distinctive to human 'language' (*qua* grammatical system):

- (a) *double articulation*: superposition in linguistic signal of phonological (i.e., denotationally diacritic) and morphosyntactic (i.e., denotationally categorial) units of form
- (b) *hierarchical concatenation* of form units, yielding hierarchical (as opposed to linear) compositionality of 'sense': in complex constituents, the sense contributions of the parts are configured hierarchically to form the sense of the whole (e.g., in the noun phrase [**one** [of [the [[**boy**]-s]]]]NP, a PLURAL NOUN is nested within a SINGULAR partitive phrase; although the two parts are *notionally opposed* hierarchical concatenation yields a *notionally resolved* whole)
- (c) *recursive generativity*: morphosyntactic categories may be embedded within themselves (e.g., [... [...]NP ...]NP)

If 'language' is defined in terms of properties such as (1a-c), the definition has the (empirical) consequence that humans are the only present-day

animals who have 'language'; however, what is really at issue here is 'grammar'. The logical problem of language evolution, as it were, then comes to center on the question of which one of our biological predecessors acquired language-qua-grammar, and how.

Yet this problem is formulated around a false teleology since what we *are* is not merely what we *distinctively* are.

Grammar, in the sense of (1a-c), is merely what is most distinctive of us. Although modern humans differ from other animals in having the capacity for grammar, they also resemble other animals insofar as they share other semiotic abilities with them.¹ Since both kinds of abilities — unique vs. shared, distinctively modern vs. apparently atavistic — coexist together in modern humans, the question of the evolution of human semiotic abilities (such as language) can correctly be formulated only if we have a framework for comparison which is not biased towards semiotic abilities of the *uniquely* human kind (such as grammar). Such a framework must be 'integrationist' in the following sense: it must permit some insight into how *uniquely* human abilities are integrated into (or superimposed upon) abilities which humans share with other animals. Since we lack direct data on the semiotic abilities of our predecessors, such an integrationist perspective must rely on a comparative discussion of the mental and communicative abilities of contemporary animals, both human and non-human.

I undertake such a comparative discussion in this paper with three primary goals in mind. First, I wish to discuss the question of how we can (or do, in fact) study animal mentation and communication, and how we are able to make claims about it at all. Although I discuss a number of examples below, my main goal is methodological, not descriptive. A second goal is to consider the abilities of the human animal — both distinctive and non-distinctive abilities — in the context of such an integrationist approach. The third goal is to explore the consequences of such an integrationist framework for our understanding of human linguistic ability itself. I close, finally, by discussing the implications of these issues for questions of language evolution.

Semiotic activity and 'communication' effects

For humans, communication, conceptualization, and language use are overlapping orders of semiotic activity, frequently occurring together at the same time, but in no sense reducible one to another. Communication is itself a multi-layered or functionally stratified activity which yields several interdependent effects, frequently at the same time. Such effects

are often characterized as involving properties at the level of 'interaction' or 'information' or 'intentions', as noted in (2) below:

(2) Some semiotic effects of communicative activity:

- (a) the coordination of *interaction*
- (b) the transmission of symbolic/propositional/contextual *information*
- (c) the reconstructability of actor's *intentions* and other *mental states* by an observer

Although some theories of communication have argued for the primacy of one or the other of these levels, all accounts of communication are, in principle, attempts at characterizing a functionally interlocking pattern of semiotic activity involving *all* of these levels. This may be seen by the fact that (a), (b), and (c) are by no means independent of each other: (b) and (a) are related, for example, in that whatever 'information' is, it is also information about the interaction; (c) and (b) are related in that whatever intentions and mental states are, they are not reconstructible independently of propositional or contextual information; (c) and (a) are related in that the receiver can reconstruct the intentions of speaker-actor only insofar as the two of them are interacting in some current event-framework.

Nor are (a), (b), or (c) internally homogeneous notions. For example, 'information' is a notional construct which is difficult to delimit precisely; it is clearly based around models of propositional content, but not without some leakage to 'symbolic' and 'contextual' significance as well. 'Intentionality' is, similarly, a functionally heterogeneous notion, having several named varieties which differentiate distinct types of communication. The following varieties are distinguished by Dennett 1983; zero-order intentionality, yielding communication without mental states; first-order intentionality, yielding communication involving mental states about the *behavior* of others; second-order intentionality, yielding communication involving mental states about the *mental states* of others; third-order intentionality, yielding communication involving mental states about those mental states of interlocutor which *reflexively* model the speaker-actor's own mental states; and so on up the recursive ladder to higher orders of intentionality.

Dennett's third-order intentionality corresponds to Grice's notion of intentionality (Grice 1957, 1969), a notion which arguably *distinguishes* humans from other animals. From an *integrationist* point of view, however, it is equally clear that when humans communicate, such communication involves *all of these types* of intentionality, not merely the distinctively human type.

Conceptualization as a semiotic activity

Communication frequently calls attention to mental states, as noted in (2c) above. But what are mental states, and how are they experienced? Mental states exist, first and foremost, in the sense that they are experienceable from some inhabitable point of view. Notice that I have formulated (2c) above in terms of the 'reconstructibility' of mental states by an observer (such as an interlocutor), not in terms of the 'having' of mental states by the actor per se. The latter is derivative: an actor may be said to 'have' intentions, concepts, and other mental states only to the extent that such mental phenomena are reconstructible by some observer. The role of 'observer' may be filled by the same biological individual who fills the role 'actor', of course, as in cases of introspection. But since introspection is defined by this particular intersection of roles, it is — from a semiotic point of view, at least — only a special case.

However, this semiotically special case furnishes the most quotidian type of access to concepts in everyday experience. The first and most immediate experience that each of us has of the presence of mental phenomena — however they may be partitioned into types of concepts — is through subjective acts of introspection. Our abilities to engage in such acts and to find always the experience of inner contents — whether we describe them in folk-terms as 'states of mind' or as 'qualia' — is the undeniable *sine qua non*, the primordial experience without which the entire enterprise of looking for concepts in others would scarcely seem worthwhile or plausible.

Despite its quotidian character, the subjective experience of concepts fails to satisfy two essential conditions on empirical investigability as we understand it (see row [a], Table 1). First, the subjective experience of concepts is an experience that each of us can have only in one way: *alone*. Thus, concepts *qua* introspectable things lack the property of *intersubjective experienceability* which we seek in prototypical objects of empirical study. In addition, the subjective experience of 'concepts' is among the most transient and fleeting of human experiences. As objects of introspection, concepts lack the quality of *durational existence* which we require prototypical objects of empirical study to have as well. When we render our introspectable experiences into forms which are experienceable in other ways — for example, into transcribable words and expressions — we transform (more technically, 'transduce') the primary data into a second, more publicly accessible modality of experience, thus converting the data of introspection into data of an entirely

different kind. The resulting data belong to the second category noted in Table 1.

This second recourse to the experience of concepts (see row [b], Table 1) is defined by reliance on publicly observable signaling behaviors which permit inferences about mental states. Such behaviors include not only vocalized and audible signal, but also a gamut of other types, including bodily comportment, kinesis, gesture, etc., as well as cases where several such types are combined in multi-modal semiotic enactments. I discuss a number of examples below.

The critical property which unifies publicly observable semiotic behaviors as a single class is that all such behaviors are experienceable not only by the individual whose behavior it is (the 'source' or the 'sender' of the signal) but also by other individuals who are, at least potentially, 'receivers' or 'recipients' of the message. That is to say, publicly observable sign behavior inherently satisfies the condition of *intersubjective experienceability*.

However, such behaviors do not, inherently, have the property of *durational existence*. Semiotic activity is inherently fleeting and evanescent. Its units generally occur and unfold in fractions of seconds. Durational existence, therefore, is a property which we must impose on semiotic acts by constituting them as data, whether we do this on celluloid, through some method of audiotaping or videotaping such behaviors, or on paper, through some form of transcription. Each method of constructing such behaviors as data simplifies the total semiotic event, of course, and in practice we find that we often need recourse to several of these methods together in order to overcome the limitations of each, particularly — but not only — when observing the behaviors of non-humans.

Table 1. *Criteria on empirical investigability of 'concepts' by modality of experience*

Modality of experience	Criteria on empirical study	
	Intersubjective experienceability	Durational existence
(a) Introspection: subjective experience of concepts (e.g., introspectable inner states, qualia, etc.)	none	none
(b) Publicly observable semiotic behavior: (e.g., speech behavior, other types of transcribable signaling behavior)	inherent	not inherent; but can be imposed

Types of signs

I have been suggesting that communication and conceptualization are empirically investigable in the clearest way when they are regarded as products of semiotic activity rather than as *sui generis* phenomena in their own right.

As products of activity, both communication and conceptualization share certain properties: they are dynamic and contextualized phenomena; they are timebound (i.e., occupying temporal intervals), yet temporally open-ended (i.e., having no generally specifiable endpoint in time). Each is differentiable into several types, potentially gradable more finely by the application of additional criteria. For the case of humans, both communication and conceptualization are discernible effects of the activity of language use; however, if our main interest lies in cross-species comparison, we need a more general approach to both phenomena.

Any activity has a semiotic organization by virtue of having a very particular kind of relational structure, the structure itself constituting the semiotic relationship (CP, Peirce 1955, Silverstein 1985, Parmentier 1994). For present purposes, it will suffice to say that a semiotic relationship consists of a sign-form (or, more simply, a 'sign') invoking some conceptual content (more simply, 'concept'²) as its significance.³ Peirce distinguished three types of sign-concept relationships, noted in (3) below:

(3) Three elementary types of sign-concept *relation*:

- (a) iconic (i.e., through some type of resemblance)
- (b) indexical (i.e., through co-occurrence relationships, including cause-effect)
- (c) symbolic (i.e., not motivated either as (a) or (b), and in this sense 'arbitrary')

Although these terms will become clearer as I work my way through the examples below, a brief introduction is nonetheless in order here. A sign-concept relationship is *iconic* if there is some kind of resemblance between the sign-form and its content (e.g., in virtue of the internal organization of parts). A sign-concept relationship is *indexical* if there is a relationship of co-occurrence in some type of event-framework between the sign itself and what is understood as its content or significance (e.g., relationships of contiguity, copresence, causality, etc.). A sign-concept relationship is said to be *symbolic* if neither of the two conditions hold, i.e., the sign signifies something neither in virtue of some resemblance nor in virtue of some co-occurrence relationship with the thing which we take to be its significance. Symbolic relationships are 'arbitrary' in comparison to

the other two kinds, frequently having a conventional basis. Moreover, semiotic processes frequently involve cases of hybrid semiosis as well, where a given signal-form yields sign-relationships of more than one kind. I discuss several cases below.

A given sign-concept relationship may itself be constrained by underlying principle(s) of invariance⁴ which regularize its construal, delimiting such construal as comparable in outline from different points of view; in doing so, the principle of invariance constrains what Peirce called the 'interpretant' of the sign. In singling out the question of invariant relationships, what we are saying is that we are interested here not in all possible kinds of contents or meanings or conceptual entailments that follow when the sign phenomenon occurs, but primarily in those kinds of contents or meanings or conceptual entailments which hold in a comparably identical fashion *every time* a criterial token of the sign occurs.

In (4), I list some principles of invariance which are particularly central to the data of animal communication I discuss below. The list in (4) is not intended to be exhaustive. A finer partition of principles of invariance can doubtless be given; however, the five-way distinction in (4) will suffice for the present purposes.

(4) Some principles inducing invariance in semiotic relationships:

- (i) genetic predisposition or 'instinct' (biologically automatized significance)
- (ii) event-memory (learned significance, attributed only to familiar, criterial objects)
- (iii) 'lexical' meaning (significance projectable to classes of objects and events)
- (iv) morphosyntactically configured 'sense' properties (significance of hierarchical concatenation)
- (v) emergent patterning in pragmatic events (significance by co[n]-textualization)

Since I consider each of these in more detail in discussing the examples below, a brief outline will suffice here. Briefly, genetic predisposition or 'instinct' is the simplest kind of basis for semiotic invariance, available to the individual animal as part of its species characteristics.⁵ Event-memory, on the other hand, involves the remembered experience of the individual animal, thus forcing (or, enabling) the animal to rely on experiences of its own. Lexicalization, noted in (4.iii), is the principle whereby particular sign-forms have generic concepts associated with them; lexical meaning is the association of a particular form with a class concept. Morphosyntactic sense, noted in (4.iv), is a combinatoric prin-

ciple of sense construction; it has already been discussed briefly in (1b-c) ff. above, since it is apparently a property unique to human languages. Pragmatic patterning, noted in (4.v), is significance based on patterns of co-occurrence of pragmatic signs, a phenomenon that I discuss in the penultimate section of this paper.

I turn now to a discussion of a number of examples of semiotic activity in which animals of different kinds routinely engage. These examples are laid out in Table 2. Column I of Table 2 (titled 'basis of invariance') lists the five different principles of invariance distinguished in (4) above: these principles define the five boxes, numbered (i-v), in column I of the table. Similarly, column II of the table is differentiated into the sub-columns (a), (b), and (c); these correspond to the three types of sign-concept relationship distinguished in (3a), (3b), and (3c) above. I noted earlier that differences in underlying principles of invariance constrain the interpretation (more technically, the 'interpretant'; see Parmentier 1994) of the sign-concept relation. Column III distinguishes some of the more general features of these constraints for the five types of invariance here at issue. I return to the five resulting types of 'limits on interpretant' in the discussion below.

The examples of different types of animal semiosis which I wish to discuss here are arrayed in nine boxes or cells, labelled A-I, forming the core of Table 2. Let us consider each of these examples in turn.

Elementary iconicity and metalinguistic projection

One of the simplest kinds of iconic relationships that we observe in the animal kingdom is the iconicity of size for strength. The example listed in the cell labeled A in Table 2 is one found in many species of birds. When confronted with an animal which is perceived as a threat, or as an interloper, many kinds of birds will fluff out their neck and crest feathers in a display of size greater than the true size of the bird. In the table, boldface and underlining of the sign-form (namely, its representation as size in cell A), is meant to indicate that the sign is non-vocal and non-linguistic. In fact, in this case, the sign phenomenon is a kinesic extension of the plumage of the upper torso, neck, and head.

However, in glossing this form of behavior as bearing the conceptual content 'strength', I am in fact taking a metasemiotic step which itself imposes a structure on the object to be characterized. Such a step is highly problematic from the point of view of what we might call the problem of *metalinguistic projection*, a problem which is inherent to all attempts at cross-species glossing. In the case in point, the gloss imports

Table 2. Some well-known varieties of 'communicative' and/or 'conceptual' behaviors

I. BASIS OF INVARIANCE	II. TYPE OF SIGN-CONCEPT RELATIONSHIP (b) indexical		(c) symbolic	III LIMITS ON INTERPRETANT
(i) genetic predisposition (<i>'instinct'</i>)	A. <i>BIRDS: size</i> (plumage) 'strength, readiness to attack (of bird)'	B. <i>ANTS: oldic acid</i> 'removal response' <i>ALL ANIMALS: hunger</i> 'eating response'	—	significance pertains to objects of fixed types, delimited by genetically acquired categories
	C. (indexical icons) <i>BEEES: angle of wag</i> 'declination of nectar source from sun (with hive as origo)' <i>DURATION OF WAG</i> 'distance of nectar source (from hive)'		—	
(ii) 'event' memory (superimposed on (i))	D. <i>VERVETS: size</i> 'dominance, rank'	E. classical conditioning of stimulus-response associations in laboratory animals	—	significance extends to diverse types of objects made familiar through experience
(iii) 'lexical' repertoires (superimposed on (i-ii))		F. <i>VERVETS: collaboration</i> 'kinship tie'		
(iv) grammatical systematicity (superimposed on (i-iii))		G. (indexical symbols) <i>VERVETS: context</i> discriminating phonetic symbols <i>ECY1</i> 'leopard near (origo)' <i>ECY2</i> 'eagle near (origo)', <i>ECY3</i> 'snake near (origo)' sole principle of concatenation)		individuals categorized as members of closed, conventional classes; current event serves as indexical origo
(v) pragmatic patterning of discourse tokens (superimposed on (i-iv))	I. (indexical iconicity of text segments, including deictics) <i>HUMANS: pragmatic patterns of deictic usage in utterances:</i> (a) He is not <u>here</u> . Nor can I find him over <u>there</u> . (b) After she got <u>there</u> she said 'I live over <u>here</u> '. (c) Q: Is it over <u>there</u> ? A: Yes, its <u>here</u> .		H. (indexical symbols) <i>HUMANS: context</i> discriminating grammaticalized 'deictics' <i>this / that</i> 'thing proximal / distal (to origo)' <i>here / there</i> 'place proximal / distal (to origo)' <i>now / then</i> 'time proximal / distal (to origo)' elaborate morphosyntax)	open classes; principles of class construction; multiple frameworks for reckoning 'co-presence'; variable anchoring of origo possible
				alignment of variable origos through patterning of text tokens

various aspects of (what we understand by) the English word *strength* in characterizing (what is understood by the bird who is 'addressee' of) the plumage extension as a message. We have no reason to suppose that birds have any abstract notion of what 'strength' is. Secondly, perhaps a better description would turn out to be something like 'prowess in attack' or 'readiness to attack', and so on. However, any attempt to gloss it by means of a human language is problematic in this way. At best, we can understand *our* glossing behavior as a way of getting a handle on what the bird is doing in terms which may be singularly ours. And the claim that there is an iconicity of size for strength involved in the behavior of animals very different from ourselves is itself subject to these qualifications.

My point is that such qualifications apply in principle to any such gloss. We can never *avoid* the problem of metalinguistic projection as long as we resort to glossing, even though we can decrease the influence of such projections by being mindful of the limitations of glossing. At the same time, however, we can *see beyond* such projections if we concurrently use several other methods — additional to the method of glossing — to characterize the significance of the semiotic behavior at issue. I return to this issue in my discussion of example D later on.

Rudimentary indexicality

In cell B in the table, I turn to two examples of the simplest kind of indexical relationships found in the animal kingdom. Both examples are indexical to the extent that they involve co-occurrence relationships.

The first example involves the behavior of ants. It is well known that many varieties of ants will drag away any dead and decaying ant from the nest. However, this robust behavioral fact does not imply that ants have any general concept of decay or putrefaction, or even of death. It is now known that ants simply respond to the presence of **oleic acid** on the corpse of the dead ant. In fact, any living ant, dabbed with oleic acid, is also dragged, struggling, from the nest. What we actually observe is a co-occurrence based indexical relationship: the presence of oleic acid on the object co-occurs with the removal of the object in a regular fashion. In particular, the presence of oleic acid indexically entails the thing with which it co-occurs, i.e., it entails the removal response.

The second example in cell B involves animal behavior more generally. The tendency to eat when an organism is hungry exemplifies a co-occurrence relationship, found all over the animal kingdom, the co-occurrence of **hunger** and the eating response. The experience of

hunger is a stimulus which drives a particular response, such stimulus-response phenomena being the simplest kinds of indexical relationships found in the animal kingdom.⁶

Such relations are indexical because they involve a co-occurrence phenomenon, the co-occurrence between a sign and its contextual entailment. The removal response is the contextual entailment of the presence of oleic acid, just as the eating response is the contextual entailment of the sensation of hunger. Moreover, the ants' invariant behavior with respect to oleic acid (just like the hunger drive) is not based on remembering previous instances of removing objects (or being hungry). There appears to be an invariant genetic predisposition to such behavior (cf. Note 5).

Hybrid semiosis: The dance of the honey bee

In cell C of the table, I characterize the well-known dance of the honey bee (*mellifera apis*) in these terms. The dance is an extended communicative routine consisting of several signal components, and I focus here only on the movement of the lower torso of the bee. The dance has both indexical and iconic functions, united together in a single enactment. This hybrid character is represented in Table 2 by the fact that cell C is spread across columns II(a) and II(b) in the table.

The iconic functions of the dance are signaled by the lower torso of the honey bee which vibrates or wags intermittently during the course of the dance. Each period of wagging or vibration systematically conveys two pieces of information about the location of the nectar source (whose discovery occasions the dance): the first bit of information is conveyed by the angle of the wag, the second by the duration of the wag. The angle of the wag is a kinesically enacted icon of the angle between two imaginary lines: the line connecting the hive to the nectar source and the line connecting the hive to the sun. The duration of the wag, on the other hand, is logarithmically proportional to the distance of the hive from the nectar source. The kinesis of the lower body therefore conveys two types of iconic significance: the angle of the wag is iconic of the angular declination of the nectar source from the sun, and the duration of the wagging is iconic of the distance of the nectar source from the hive. These two icons together define a system of polar coordinates for navigating from the hive to the nectar source.

The indexical character of this system of polar coordinates lies in the fact that such reckoning of nectar location works by treating the *current* communicative event as the zero point for the system of polar coordinates. The dance specifies spatial relationships between the place of the dance

(i.e., the hive) and the place of the nectar source in a fashion reminiscent of deixis, treating the place of the dance as the zero point — or, to use Bühler's term, the 'origo' — of deictic reckoning (Bühler 1990 [1934]). Such behavior not only establishes an indexical connection between the hive and the nectar source within the current communicative event, it also serves indexically to coordinate the future activities of a collection of bees. The other bees know where to go once the dance is done.

We think of such behavior as communicative precisely in this sense — in the sense that the behavior of the individual serves to coordinate the behavior of the group. The behavior of the ants is a type of communication insofar as it results in action-coordination, something achieved during human communication as well. But human communication is unlike ant communication in other superimposed ways — e.g., conveying propositional content, third-order intentionality, indexically cueing many more contextual variables, etc.

We are forced to recognize, once again, that using the term 'communication' in a trans-species sort of way requires us to differentiate many degrees and orders of communicative ability. From the present point of view, the task of differentiating distinct *aspects* of human 'communication' and of describing different *types* of animal 'communication' are complementary tasks (though they are not the same task), but we cannot make progress in either task unless we formulate our criteria on types of communication independently of essentializing *assumptions* about the 'nature' of communication.

Differences in bases of invariance: Event memory vs. genetic predisposition

Cell D is like cell A in that it lists an iconic significance attributed to size as a signal. However, the significance of size-based iconicity in the case of vervet monkeys in cell D is entirely different from the example of the plumage extension of birds noted in cell A. I noted earlier that the limitations of any one method of characterizing semiotic phenomena can only be overcome by appealing to other methods used concurrently. The entries in columns I and III thus become reflexively significant for establishing the significance of entries in columns II(a–c). This can be seen most sharply by comparing the contents of cell A and cell D in the table, both listed in column II(a). Note, in particular, the difference in the underlying bases of invariance between the two cases, distinguished in column I.

Let us consider the vervet case in cell D first. Vervets are a highly social type of African monkey which live in fair-sized groups — consisting

of a score or more individuals — in which virtually every adult individual has a kind of established rank or social status.⁷ The rank or status of an individual has critical consequences for various kinds of group behaviors, such as feeding or grooming. Different criteria determine social rank among males and females. In the case of males, physical size is a critical factor: larger males are of higher social rank than smaller males, all other things being equal.

Now, in this kind of case, we may be justified in saying — relative to all the qualifications noted above — that physical size is iconic of certain perduring social characteristics of the animal — that the larger animal has certain privileges with respect to grooming, mating, territory, and feeding. The fact that particular individuals have such privileges does not, in itself, suggest that vervets have any kind of abstract or general understanding of the iconicity of size for rank; merely that criterial individuals — individuals who are seen to be bigger — are conceded certain special privileges.

There is some evidence, moreover, that other vervets who live in the same social group concede these privileges to such individuals — by not transgressing with respect to their territory or their mates — even when the larger individual is not visible. The larger animal need not be present in order for his size to be construed as iconic of higher rank.⁸ This suggests that the cognitive precondition of this type of attribution is not simply genetic predisposition to react to the characteristics of co-present individuals (e.g., as with plumage extension in the case of birds), but that it involves some kind of ‘event’ memory which associates particular animals — those of larger size — with social rank or dominance, in a temporally perduring fashion.

On the other hand, there is every reason to suppose that in the case of the bird example in cell A, the iconicity of size for strength is genetically programmed or ‘instinctive’, either completely, or to a very high degree. That is to say, there is every reason to suppose that birds have a genetic predisposition towards using the iconicity of size for strength. In making this observation, we are really characterizing the sign phenomenon relative to a hypothesis about its ‘basis of invariance’ (see column I, Table 2). However, even if the dominant semiotic effect of plumage extension is the enactment of an iconic relationship (the iconicity of size for strength), the significance of such enactment (e.g., greater strength, etc.) is only attributable to the bird whose plumage is extended in the current display (i.e., the bird whose feathers are fluffed out in the instance).

The vervet case in cell D is entirely different. If size is indeed iconic of social rank in example D (i.e., if bigger size means higher rank, all other things being equal), then such iconicity is entirely transformed by having

as its basis some form of event memory. In such cases, particular individuals (individuals who are remembered as being bigger) can be treated as having higher social rank, even when they are not physically co-present.

Event memory: Artificially conditioned vs. 'natural' indexicality

In cell E, I describe laboratory conditioned stimulus-response behavior as a type of indexical relationship. The example has little to do with communication in any obvious sense. The notion of indexical regularities in behavior is itself quite independent of assumptions about 'communication' even in the weak sense of interaction-coordination. I noted earlier that even a low level behavioral drive such as eating in response to hunger reflects an indexical patterning in behavior, a simple relationship of the co-occurrence of two events, namely the impulse to eat and the experience of hunger. Although such behavior may be seen as coordinating interaction in *some* sense — the interaction between the one eating and the one eaten, as it were — such 'coordination' is more in the nature of communion rather than communication. It is no more like language than lunch is.

Nonetheless, some of these genetically programmed drives can be used under laboratory conditions to train animals to respond in ways which are *not* genetically programmed. This is the basis of all classical conditioning of stimulus-response behaviors. Thus, when we train pigeons to depress levers for food, or mice to traverse labyrinths for it, we are in effect inducing an additional kind of predisposition towards an indexical connection. In establishing a conditioned connection in the behavior of the animal between, say, a blue button and a food pellet we are creating an artificial stimulus-response connection by exploiting genetically programmed ones. This kind of 'conditioned' response is clearly based on event-memory of some sort. The animal has to experience multiple events of such co-occurrence before its behavior becomes invariant in the relevant way.

Attention to differences in the bases of invariance allows us to differentiate indexical regularities of different types, a point which may be illustrated by comparing the cases listed in cells B and E. On the one hand, the memory-based indexical regularities in cell E are less stable than the genetically programmed or instinctive ones noted earlier in cell B; in the case of event memory, the animal can 'forget', but not in the case of instinct. On the other hand, regularities of behavior which rely on event memory tend to involve more versatile categories learned through experience: bees can navigate only to a nectar source in a single

genetically fixed way, whereas mice can navigate through as many kinds of labyrinths (finding their way to as many kinds of rewards) as become effectively familiar during laboratory conditioning.

Indexical behaviors which are based on event memory are also found 'naturally' in the animal kingdom (i.e., independently of human intervention). The notion of kinship found in vervet monkeys is perhaps a good example. Vervets appear to have no 'symbolic' concept of kinship, but they exhibit behaviors which indicate awareness of certain kinship ties, nonetheless. There appears to be no significant evidence that vervets recognize their fathers or paternal kin. But there is plenty of evidence that they recognize their mothers and maternal kin — such as maternal siblings, maternal aunts, etc. In fact, their ability to so recognize maternal kin appears to be based on their close association with a common mother during development. Mothers groom all their children up to a certain age. Beyond that age, male children move out of the social group to find — and sometimes to found — groups of their own. But grooming of daughters and granddaughters continues well into their adulthood. Matrilineal ties become highly developed among vervets *through* extended patterns of reciprocal grooming behavior, sometimes leading to cooperation in other activities as well. Young monkeys recognize who their matrilineal kin are due to the close association within matrilineal groups. Only matrilineal kin are recognized consistently, and with relative ease.

It should be clear, then, that the concept of a 'kinship tie' is based on a shared mutual history of the co-occurrence of certain individuals in cooperative grooming activities. Thus, ontogenetically, the basis of concept emergence is indexical co-occurrence of certain individuals in certain collaborative activities. On the other hand, there is no evidence whatsoever that vervets have any kind of symbolic class concept of kinship; merely that one individual can recognize a kinship tie to another. Moreover, ties between mothers and sons grow weaker as the latter mature, grow independent, and move away; but those between mothers and daughters remain constant even after maturation (since daughters do not move away). Thus, the indexical regularity which emerges across patterns of **collaboration (and consociation)**, which I have termed a 'kinship tie' in F in the table, also weakens as the shared mutual history attenuates. As far as the condition of invariance is concerned, the vervet, unlike the ant, has a rich capacity for event-memory: when it wakes up the next morning, it remembers, as it were, the individual with whom it has developed the tie. Of course, memory-based indexical regularities are, again, not as stable as genetically programmed ones (a fact as true of us as it is of vervets) and the 'kinship tie' often attenuates soon after the

patterns of consociation and collaboration are left behind, particularly in the case of male offspring.

Lexicalization: Vervet cries as indexical symbols

Vervet monkeys also employ a semiotically hybrid set of vocal cries, or alarm calls, which unite symbolic and indexical properties in the same stretches of acoustical form.⁹ These are noted in cell G in the table. The phonetic shape of these vocal cries is not iconically motivated at all; and although such cries have indexical or contextualizing properties, they are, rather, plurifunctional in terms of their contextualization effects. As a first approximation, we might say that these vocal cries are used by vervets to warn each other of the approach of certain types of animals, particularly predators. Three cries from among this set are listed as cry1, cry2 and cry3 in cell G in the table: cry1 is a loud barking sound, cry2 is a short double-syllable cough, cry3 is a 'chutter' or chattering sound. Now, these kinds of vocal utterances are described in the literature as 'leopard alarm', 'eagle alarm', and 'snake alarm', respectively (Cheney and Seyfarth 1990: 102 ff.), and there is nothing, in general, wrong with this type of semantically motivated labeling. My own reason for characterizing them as cry1, cry2, and cry3 is to call attention to the fact that the structure and usage of the vervet cries differs dramatically from the structure and usage of the English expressions *leopard*, *snake*, and *eagle*, even though the latter are sometimes used metasemiotically to characterize the former. The metasemiotic practice is useful only if we are aware of its limitations.

As Cheney and Seyfarth (1990) have noted, these vervet cries are quite plurifunctional in the sense that they simultaneously do several things: (1) they pick out external referents (i.e., predators); (2) they result in action coordination (i.e., coordination of escape strategies);¹⁰ (3) they differentiate male from female vervets by virtue of their acoustical form,¹¹ and hence are indexical of speaker sex; their acoustical form also discriminates (4) the age of the vervet making the call, as well as (5) the degree of excitement of the vervet, and, consequently, in many cases, (6) the immediacy of the predator.¹²

The repertoire of vervet cries (see cell G in Table 2) is like a lexical paradigm in a human language in some ways, but not in others. The two are alike in that both consist of phonetically arbitrary symbols. However, in the case of words of a human language, the phonetically arbitrary aspect of words has, superimposed upon it, degrees of system-relative motivation: words of a human language are formed from the specific

phonemic elements of that language; for each language, linguistic words have a characteristic morphosyntactic form which, along with facts of external syntacticosemantic distribution, constrains their sense properties. Thus, in the case of human languages, the superposition of grammatical value on phonetic form introduces system-relative motivation in this sense; but not in the case of vervet calls.

Secondly, each of the vervet calls has a distinctive semantic range, distinguishing types of predators. The very basis for using the English words *leopard*, *eagle*, and *snake* in a metasemiotic fashion to characterize the vervet calls is precisely that the English words can achieve comparable effects. However, the sense-discriminating properties of the English words are further delimited by their external morphosyntax, their privileges of occurrence — properties which we can model in terms of notions such as selection and subcategorization — so that the English words *leopard*, *eagle*, and *snake* do not merely differentiate denotata, they do so as pluralizable nouns, semantically [+count, +animate, -human] relative to the distributional tests necessary to isolate such semantic classes of noun. In the case of vervet calls, on the other hand, cry1 is associated not only with leopards but also with other feline predators. But the difference is not merely that the English word *leopard* is more specific with respect to semantic range. It is also that the lexical specificity of the English word *leopard* is constrained by morphosyntactic principles (e.g., that it is a pluralizable count noun, etc.); the vervet call, cry1, has lexical content which overlaps referentially with English *leopard*, but no grammatico-semantic properties of any kind.

Third, the vervet calls are used to describe the contextual co-presence of predators and of predatory danger. They are, after all, alarm calls. These cries are not used in any other kinds of situation — for example, to talk generically about leopards, or to describe hypothetical leopards, or anything of that sort. Cheney and Seyfarth's work leaves little doubt that the denotational effect of each of these cries is delimited around a distinct lexico-semantic range. However, quite aside from the question of lexico-semantic specificity, such a denotational effect consists in picking out a predator as co-present to the event of utterance, and not in any other way. Thus, if we are to interpret their denotational effects using English (or other human language) as a metasemiotic notation, we are better off treating the vervet cries as similar to the class of *denotational indexicals* or *shifters* in English, sometimes also termed the class of *deictic* expressions.

Fourth, treating them as akin to deictics explains why their semantico-referential effectiveness is typically tied to patterns of interaction-coordination, i.e., why their denotational effect is typically correlated

with an 'action' effect. The monkeys who hear the alarm call immediately begin to look around, seeking to locate the predator visually (thus attempting to find a cognitive correlation across semiotic modalities); they then run to find protection from the imminent threat. The monkey's utterance semiotically locates the referent (i.e., the predator) in an indexical relationship of co-presence (viz. as 'near') relative to the place of utterance; the other monkeys then either recalibrate the location of the predator relative to their visual fields, thus moving *away* from the location of the predator and *towards* shelter, or simply move *towards* the source of shelter *nearest* to their location at the time of audition (see Note 10).

One last point about vervet calls. One is tempted to ask questions such as what's the best translation of the vervet call: Is it 'leopard near here!' or 'find shelter!' or 'get away from here!', and so on. Such questions involve sub-questions such as: Which sense category in a human language better translates a vervet call? (a word? a phrase? a sentence-proposition?), or: Which indexical category in a human language better translates a vervet call? (a demonstrative? the imperative mood? some combination thereof?). None of these questions can ever be answered satisfactorily, since they are fundamentally based on a category error. Vervet cries under-differentiate sense categories and indexical categories relative to human speech, and the attempt to translate them into expressions of human speech — which are, conversely, relatively over-differentiating — can never yield unique solutions, simply as a matter of principle. When English (or any human language) is used as a metasemiotic notation, it makes distinctions which the objects of metasemiosis (the vervet calls) do not permit. In principle, several (over-differentiating) glosses are available as 'translations'. One can choose between them in practice, of course, but only by recognizing the limitations of each. And, it is the concurrent use of *other* metasemiotic approaches — viz., a contextual analysis of the conditions of use, a syntactic analysis of concatenation possibilities, a consideration of the 'bases of invariance', etc. — which helps us to overcome the limitations of lexical glossing per se, and the dangers of metasemiotic projection inherent to it as a method.

Indexical symbols and grammatical categories

If the vervet calls are indexical symbols, how do they differ from indexical symbols of a human language — such as the English deictics noted in H in the table? Indexicality is involved in both cases only in the sense that an utterance of the form points to an aspect of context. But the type of indexicality differs in the two cases. The contextualizing power of the

vervet calls is constrained by the purely 'lexical' symbolism invoked by the vervet call. The contextualizing powers of deictics in a human language are more subtle and richly varied. This is partly a result of the complexity of grammatical patterning superimposed on principles of lexicalization. Such superposition entails that the symbolic component of deixis is more complexly reticulated. This is not without consequence for the way in which the indexical component of deixis is understood in human speech.

Recall that vervet calls only index physically co-present referents. Secondly, such referents are characterized as predators belonging to one among a small set of lexical classes (viz. leopard, eagle, snake, etc.). Third, the predators indexically referred to by cry₁, cry₂ and cry₃ are indexed as co-present *to the place of utterance*: the zero-point, or origo, of indexical reckoning is always the current place of vocalization.

The linguistic deictics noted in cell H of the table differ from the vervet calls of cell G in all of these respects. First, human deictic categories permit the reckoning of 'co-presence' in a number of different frameworks. Part of the reason for such variability is that deictic expressions can be concatenated with linguistic categories of different kinds. For example, when demonstratives occur as modifiers to concrete nouns (e.g., *this car* vs. *that bus*) deictic reference is interpretable within a framework of physical distance; but when demonstratives are modifiers to abstract nouns (e.g., *this opinion* vs. *that truth*), the framework of 'physical space' is no longer relevant to the interpretation of indexical reference, giving way to what is sometimes called 'information space' (Lyons 1977; Agha 1996). Both facts of grammatical patterning — that demonstratives can occur as noun modifiers, and that the modified nouns may be [+concrete] or [−concrete] — are factors contributing to such variation, of course.

It is not merely that vervet cries have a near-zero syntax, while the morphosyntax of human deictic expressions is highly elaborate; it is also that the existence of grammatical systematicity in the human case further shapes the indexical effects of deictic usage. For example, any lexical distinction that can be implemented by a paradigm of deictic forms in a human language can be recategorized further in discourse by the superimposed effects of grammatical categories; such recategorization can proceed in indefinitely many ways. If the pair of English deictic forms *here/there* both characterize their denotatum as a 'region', such region can independently be characterized as *in London*, *near the river*, *above the house*, etc., through lexical cohesion with the deictic in some prior or subsequent stretch of discourse. But what makes such lexical cohesion possible is that all of these expressions (i.e., *here*, *there*, *in London*, *near the river*, *above the house*, etc.) are comparable with respect to their grammatical

category: all of them can function as adverbials of location. Grammatical categorization imposes a high degree of 'sense' comparability on all of these forms, a comparability that is superimposed upon the lexical differences among them. At the level of discourse, such comparability of sense yields effects which we recognize as the lexical cohesion of connected text.

A third differentiating aspect of deixis in a human language is the potential variability or transposability of origo. If vervet cries indexically refer to predators, such predators are only individuated as co-present to (or 'near') the current place of utterance. In the case of human deixis, the default value of indexical origo is indeed the current interaction. However, deictic origos can be transposed away from the current interaction to various other frameworks of reckoning. Grammar plays a role in such transpositions, to be sure; but the generalized phenomenon here at issue is the emergence of pragmatic patterning at the discourse level. It is to a consideration of this phenomenon that I now turn.

Indexical symbols as discourse tokens

Since deictic tokens in a human language characteristically occur in sequentialized utterances, their functional effectiveness as utterance-segments is unavoidably contextualized by other utterance segments with which they co-occur.¹³ Such co-occurrence of tokens constitutes the order of discourse text.

When text segments co-occur, the comparability (or 'resemblance') of distinct segmental phases of discourse constitutes an emergent principle of iconicity in text. Such iconicity is, in particular, a type of indexical iconicity since the iconicity at issue in such cases is an emergent structure of resemblance between indexically co-occurring parts. Such indexical iconicity includes resemblances motivated by the metrical properties of text (so-called 'poetic' structure), as well as by the sense comparability of lexical items (so-called 'lexical cohesion'), yielding an immanent, if provisional, framework for the interpretation of text-segments relative to their co(n)texts.

In cell I in Table 2, I illustrate a few simple cases of such co-occurrence-based indexical iconicity. In the type of usage illustrated in (a), for example, the two deictic forms at issue — *here* and *there* — are typically understood as having the same origo, i.e., they are typically understood as implementing reference relative to the same zero point of reckoning. Why should this be so?

Since we are considering utterance (a) — namely, 'He is not *here*. Nor can I find him over *there*' — in a relatively decontextualized way (i.e.,

we don't know who said this to whom, and where), we are really in no position to specify the locations being talked about in this instance. The lexical properties of the two deictics differ in a typifiable way, moreover, with *here* being proximal and *there* being distal to origo in indexical reference. However, by knowing that both deictic tokens are uttered by the same corporeal speaker as (part of) a single utterance-act (whatever its external contextualization may be), we are nonetheless in a position to formulate the following pragmatic inference: the deictic *here* indexically refers to a place which is proximal to the same origo, or zero point, of reckoning to which the place referred to by the deictic *there* is distal. The inference of the identity of the two origos only has a conditional validity, of course: the pragmatic condition (i.e., same corporeal speaker) which motivates the inference (i.e., identity of deictic origos) is defeasible under conditions of implicit 'voicing', for example.

In (b), on the other hand, the reported speech construction — '... she said ...' — itself contextually entails that the origo of *there* is non-coincident with the origo of *here* since the two deictic tokens are interpreted as belonging to different event frameworks. The origo of *there* belongs to the current speech event. But the reporting utterance itself — 'After she got *there* she said ...' — is in the past tense, thus specifying that the reported event occurred in past time relative to the reporting event; the origo of *here* — in the reported utterance 'I live over *here*' — is therefore anchored relative to that prior occasion. To this extent, the zero point serving to locate the referent of *there* is, by inference, noncoincident to the zero point serving to locate the referent of *here*. The validity of the inference that the two origos are non-coincident has a conditional form once again. It is potentially defeasible by external contextualization, but it is locally robust, nonetheless.

In the question-answer exchange exemplified in (c), the origos of *there* and *here* are typically inferred to be non-coincident as well: the distal deictic *there* is understood as referring to a location distal from the questioner, the proximal deictic *here* marking proximity to the answerer. Such inferrable non-coincidence is regimented locally, once again, though the criterial fact(or)s of pragmatic patterning may be very different from the reported speech case discussed above. For example, if the questioner and answerer are standing at some distance to each other, and if the deictically shaped indexical reference is accompanied by appropriate gestures by the two participants, such internal contextualization implies that the location referred to presentatively by *there* — and, resumptively, by *here* — is closer to the answerer than to the questioner.

In this case, the fact that two different speakers are involved, as well as facts of relative corporeal position, gestural kinesics, and independent

visual access to referent serve not only to locate the referent but also, reflexively, to clarify the relationship between the origo of *there* and the origo of *here*. The potentially variable origos of the two deictics *here* and *there* are made determinate by the multimodal signal which contextualizes their use. The patterning of signal components — the different speakers, their corporeal positions, their gestures, the location of referent — constitutes an emergent structure of signs, immanent within the pragmatic event itself. If the lexical indexicality of *here* and *there* regiments indexical reference to a location, the emergent structure of the pragmatic event serves reflexively to specify that the origos of the two deictic tokens, and of the two instances of locational reckoning, are noncoincident; they are potentially determinate relative to distinct pragmatic frames.

At this second level, the semiotic behavior of humans is not so very different from the behavior of bees noted in cell C above, even though the profound differences between the two cases tend to obscure the underlying similarity. The differences include, for example, the fact that human communication involves complex lexico-grammatical symbolism, serving to create a much more open-ended universe of denotation. However, the similarity between the two cases lies in the fact that like bees, humans *also* rely on pragmatic patterning within the interaction itself in order to fix or delimit the parameters of communication.

In the case of bees, the movement of the lower torso of the bee constitutes a type of emergent patterning in interaction, a patterning which is indexically iconic of the location of the nectar source. In the case of humans, emergent pragmatic patterning is organized along very different dimensions — dimensions such as utterance sequence, speaker's corporeal position, turn taking, gesture, as well as other extra-'grammatical' features of different types. Such pragmatic patterning imposes a structure on the construal of any grammaticalized devices which occur in discourse, including deictic devices. Whether or not textually distinct deictic tokens have the same origo, or zero-point of reckoning, depends upon whether or not the textually contiguous (hence, indexically relatable) phases of discursive interaction in which the deictics occur are construable in similar (hence reciprocally iconic) ways. Emergent patterning — along multiple simultaneous dimensions of form and function — itself becomes the organizing principle which makes distinct phases of discursive interaction comparable within pragmatic events. Even the busiest of humans are not bees. It would appear, however, that the business of communication involves indexical iconicity in both cases. At this level of significance, '[t]he pattern is the thing', as Bateson recognized nearly three decades ago (Bateson 1968: 623).

Conclusion

The foregoing considerations suggest that the semiotic complexity of human linguistic behavior is not simply an outcome of the complexity of grammar. It is a result, rather, of the way in which the systematicity of grammar is superimposed upon other principles which are implemented along with grammar in observable behaviors of communication and conceptualization. When humans use language to communicate, or to conceptualize their experience, such behavior relies on all of the principles of invariance noted in Table 2 — namely, genetically based instinct, event memory, lexical symbolism, grammatical categories, and pragmatic patterning. What we do with language is not best characterized by focusing exclusively on what we do best, namely our use of grammatical categories.

The ability to use language-qua-grammar is an ability which is always implemented in human behavior in the context of other semiotic abilities, implemented in a concurrent fashion. The integrationist perspective on human semiotic ability which I have outlined here provides a framework for approaching questions of language evolution relative to other evolutionary questions. From the standpoint of neurobiological approaches to these questions, we know that the human brain consists of thousands of computational networks, many acting relatively independently of others, many integrated into higher order networks with functionally superimposed effects. Although our understanding of phenomena at this level remains in its infancy, we do know that apparently simple behavioral outcomes have structurally superimposed biological substrates. An integrationist perspective on semiotic behavior allows us to see that such behavior has a superimposed semiotic organization as well.

What we call 'concepts' and 'communication' are both products of semiotic activity. These are terms in which semiotic activity apprehends itself. We, humans, are able to name particular varieties of each when we shift from the role of agent of such activity to the roles of observer and analyst. But we cannot devise a framework for calibrating gradable varieties of conceptual and communicative ability without attending to the structure of semiotic relationships which give rise to them. From this point of view, our formulation of evolutionary hypotheses must be guided by our answers to the following question: Is the relationship between these two types of superimposed organization — biological and semiotic — itself systematic across species?

There are many questions about the evolution of language, in particular, which we cannot answer at present. We do not know, for example, what particular neurobiological organization gives rise to the possibility

of grammar. It appears likely, however, that this question will remain biologically intractable as long as we are unable to answer the question of how grammar, as a distinctively human endowment, relates to other non-distinctive endowments — such as instinct, event memory, lexical meaning, and the significance of pragmatic patterning — in the semiotic behavior of humans. Meanwhile, a better understanding of how such endowments interrelate in the semiotic activity of other animals must remain a parallel goal.

Notes

- * The current version of this paper was prepared for presentation at a conference on the 'Evolution of Human Language', University of Edinburgh, April 1–4, 1996. An earlier version was presented at the 1994 annual meeting of the American Association for Applied Linguistics. I am grateful to audiences at both conferences for comments and discussion.
- 1. In many cases, semiotic abilities shared by different species may be retained from common predecessors, though this is not a question that I explore here.
- 2. Peirce used the term 'object' for the element which I call 'concept' in the present discussion. The usefulness of Peirce's terminology lies in its greater generality. However, my concern here is with a specific type of Peircean 'object', namely, an object of mental activity, for which I use the (non-Peircean) term 'concept'.
- 3. A sign-form may have more than one conceptual content associated with it, either by being inherently plurifunctional (i.e., syncretic, portmanteau, etc.), or by allowing more than one perspectival construal (e.g., multiple contextualizations). Uniqueness of conceptual content is only a special case. However, non-uniqueness does not imply indeterminacy. Whether or not a sign-form has a unique construal, any given construal is constrained by the particular semiotic organization which gives rise to it. The examples presented in Table 2 are, for this reason, displayed as lying at the intersection of several independent semiotic principles. The larger the number of independent principles we consider, the more fully determinate our understanding of the semiotic phenomenon to which they jointly give rise.
- 4. Peirce used the term 'Legisign' for what I am calling a 'principle of invariance'.
- 5. The criterion which distinguishes genetically based 'instinct' from other semiotic principles is that all individual members of the species acquire such behavioral disposition without exception through the normal course of ontogenetic maturation. There are differences across closely related species, of course, but each species has an ontogenetic norm.
- 6. Indexical phenomena in human languages are more complex, as we shall see later, such complexity being the outcome of superimposed principles of invariance.
- 7. For the vervet examples, I rely primarily on Cheney and Seyfarth's (1990) extraordinary — and in many ways exemplary — description of vervet communication, both here and in my subsequent discussion.
- 8. I do not mean to suggest that challenges to authority are not possible — whether in the presence or the absence of the dominant male. Indeed, both kinds of challenges occur all the time. The point is only that the dominance of these individuals is often

accepted tacitly — and regularly — even when such individuals are not physically present.

9. The three alarm calls I discuss do not by any means constitute the total inventory of vervet vocal cries. This inventory is larger, though still constituting a relatively small and apparently closed set. See Cheney and Seyfarth 1990.
10. The coordination of escape strategies is itself context sensitive. When airborne danger is signaled by cry2 (i.e., the 'eagle alarm'), vervet monkeys which are on the ground look up in the air and/or run into bushes; vervet monkeys which are in trees at the time of the call also look up, but their subsequent response, if any, is to run down the tree, and then into a bush. Alarm calls are also ignored some of the time; at other times, the vervet responds by checking its environs and then resuming prior activity. The interaction-coordination which alarm calls make possible is clearly mediated by other semiotic activity (such as sensory confirmation, etc.), so that interaction coordination in this case is by no means an automatized type of one-to-one response behavior.
11. Whereas male and female vervets produce similar tokens of cry2 and cry3, tokens of cry1 (i.e., the 'leopard alarm') are acoustically distinct: for males, 'a repeated series of barks', for females, 'a single high-pitched chirp'.
12. It is very clear, moreover, that such plurifunctionality results in some 'leakage' across functional dimensions, and the possibility of interactional strategies. Cheney and Seyfarth 1990 report that in a few cases of eagle attacks (fewer than 1 percent), the approach of the eagle was marked by cry1 — the 'leopard' alarm — not by cry2, the one normally used for eagle attacks. In these cases, the attacks took place in open country with many vervets on the ground and the eagle's talons only seconds away. The call that was, in fact, used, namely, cry1, is not only associated with leopards, it is also the longest and the loudest cry within the repertoire, generally also implying the highest degrees of speaker excitement and predator immediacy. Such case of functional 'leakage' between type of predator and type of cry may in fact be systematic, and may imply that vervets are able to respond to contextual conditions in a multifactorial way.
13. In general, deictic contextualization is a multi-modal phenomenon involving the effects of gesture, non-linguistic phonation, the corporeal location of discourse participants, and so on (see Hanks 1990, Agha 1996). In the examples in the present section, I focus only on linguistic co-text and participant structure. In doing so, I am appealing only to a limited range of contextualization effects. However, even such limited appeal to phenomena of pragmatic patterning is sufficient to illustrate the significance of pragmatic patterning as such.

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