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Language, Name, and Concept

Language expresses a human mode of analyzing experience into conceptual units and the rules that link them.

J. Bronowski and Ursula Bellugi

The experiment of teaching a young chimpanzee to use American sign language (*1*) is an important advance on previous attempts to test the linguistic potential of primates. For the first time, a primate's capacity for a language used by some humans has been clearly separated from his capacity for making the sounds of human speech. In the nature of things, this pioneer study has been made under special conditions, and (like any single study) cannot be assumed to be perfectly representative. Nevertheless, it does offer evidence of a new kind, in the light of which it is timely to reexamine the relation between human language and the signals that animals use or can learn to use.

Chimpanzee and Child

It has never been in doubt since the time of Aristotle that language is a characteristically human accomplishment, and that some of the capacities which it demands are either absent in other animals or are present only in the most rudimentary form. Among these is the fundamental capacity to make and interpret the intricately modulated continuum of speech sounds. Lieberman *et al.* (*2*) have stressed the differences between the articulatory apparatus of the chimpanzee and that of man. Thus the Gardners' decision to bypass the articulatory problems of the chimpanzee and undertake instead to teach a gesture language was a good one. They reasoned that the use of the hands is a prominent feature in the behavior of chimpanzees, who have a rich repertoire of gestures both in the wild and in captivity. By contrast, the futile efforts to teach the chimpanzee Viki to talk (*3*) had already shown that a vocal language is not appropriate for this species. In 6 years of intensive training, Viki had learned to make only four sounds that grossly approximated English words. The results of the Gardners' efforts with Washoe are spectacular by comparison. By the time Washoe was about 4 years old she had been taught to make reliably more than 80 different signs. This comparative success therefore poses a question of substance: What is the true nature of the language performance that has been achieved by a chimpanzee (under these special conditions of training and environment) and how does it differ from that of humans?

We first describe some of the characteristics of the gesture language which Washoe was taught. The Gardners had learned sign language from dictionaries and from a teacher of sign, expressly for their experiment. They used gestures and manual configurations to represent the concepts in sign language and avoided the use of finger spelling as much as possible. All signs are arbitrary to some degree (although some have iconic origins and aspects), and American sign language has many highly arbitrary and conventionalized signs which must be learned. With the addition of finger spelling, it can be used by a literate signer as a direct translation of English in order to communicate with hearing signers; but it generally is not so used among the deaf themselves, whose rules of use may vary in different areas and may not necessarily derive from English. However, the Gardners state that, as far as they can judge, there is no message which cannot be rendered faithfully in translating from English to sign (apart from the usual problems of translating from one language into another). They also report that they tried to follow the word order of English in their signed sequences.

It might be held that ideally Washoe's progress should be compared

The authors are affiliated with the Salk Institute for Biological Studies, San Diego, California 92112.

with that of a deaf child of deaf parents who is learning sign as a native language. We cannot yet do this and so must be content to compare Washoe to children learning spoken language. There are grounds for arguing that the Gardners' method of signing makes this an appropriate comparison.

The Chimpanzees' Signs as Names

Studies of chimpanzees in their natural environment have indicated that their own communication systems are employed largely to signal motivational and emotional states of the individual. There are few if any calls given by nonhuman primates that convey information about their physical environment. More generally, in communicating among themselves, humans separate the components of their environment and use a great variety of names for them, and animals do not. It has therefore been argued, for example by Washburn (*4*) and by Lancaster (*5*), that the capacity for language in humans is based on a specific ability to give names to things which is absent in other primates. To quote Lancaster:

> An understanding of the emergence of human language rests upon a comprehension of the factors that led to the evolution of a system of names. The ability to use names allows man to refer to the environment and to communicate information about his environment as opposed to the ability to express only his own motivational state. Object-naming is the simplest form of environmental reference. It is an ability that is unique to man.

We now see from the experiment with Washoe, however, that there is convincing evidence that a chimpanzee can be taught to use names for things. Her use of the names she has learned is not more narrow and context-bound than that of a human child. The Gardners report that in general, when introducing new signs, they have used specific referents for the initial training, and that Washoe herself then used signs in ways which extended far beyond the original training. For example, Washoe first learned the sign for *open* with a particular door. This sign she then transferred to *open* for all closed doors, then to closed containers such as the refrigerator, cupboards, drawers, briefcases, boxes, and jars. Eventually, Washoe spontaneously used it to request opening of the water faucet and of a capped bottle of soda pop. Washoe has learned distinct signs for *cat* and *dog* (primarily with pictures of each) and appropriately uses the signs while looking through magazines or books, as well as for real cats and dogs. She also used the sign for *dog* when she heard an unseen dog barking in the distance, and when someone drew a caricature of a dog for her.

There are errors in her spontaneous signing which resemble the overextensions in children's early use of words. Washoe has a sign for *hurt* which she learned first with scratches or bruises. Later she used the sign also for red stains, for a decal on the back of a person's hand, and when she saw a person's navel for the first time. Washoe used the sign for *listen* when an alarm clock rang to signal supper preparation, and then for other bells, and for watches. Washoe also signed *listen* when she found a broken watchband, and when she saw a flashlight that blinks on and off. This is characteristic of the range and extensions of words used by children in the process of first learning a language. There seems little doubt therefore that Washoe (and presumably other chimpanzees) can be taught to name in a way which strongly resembles the child's early learning of words.

We must conclude that the prolonged experiment with Washoe proves that the ability to name is not biologically confined to humans. Hence serious doubt is thrown on any theory of human language which seeks to explain its uniqueness or its origin in a human ability to name.

A Characterization of Language

A searching examination needs to step back instead from the mechanics of human language, and to ask rather what are the global features that characterize it, and differentiate it from the sharp and immediate messages that are evoked in animals either by their internal state or by their environment. One such characterization is behavioral —human utterances are more detached or disengaged from the stimuli that provoke them than those of animals—and this is a general feature of human behavior. Another characterization is logical—human language relies on an analysis of the environment into parts which are assembled differently in different sentences. (By contrast, the signals of animals are complete utterances, which are not taken apart and assembled anew to make new messages.) Both the behavioral and the logical component must play a part in any treatment which seeks to relate the way humans shape their utterances to the way that the human brain operates in general.

One of us has formulated such a treatment (*6*) in terms which make it possible to see by what steps language might have developed during human evolution. Some of the steps in this sequence are:

1) a delay between the arrival of the stimulus and the utterance of the message that it has provoked or between the receipt of the incoming signal and the sending out of a signal;

2) the separation of affect or emotional charge from the content of instruction which a message carries;

3) the prolongation of reference, namely, the ability to refer backward and forward in time and to exchange messages which propose action in the future;

4) the internalization of language, so that it ceases to be only a means of social communication and becomes also an instrument of reflection and exploration with which the speaker constructs hypothetical messages before he chooses one to utter; and

5) the structural activity of reconstitution, which consists of two linked procedures—namely, a procedure of analysis, by which messages are not treated as inviolate wholes but are broken down into smaller parts, and a procedure of synthesis by which the parts are rearranged to form other messages.

The steps 1 to 4 express the behavioral ability of humans to disengage from the immediate context; without this, it would not be possible to make predicative statements; that is, to give information about the environment in a form which does not imply an instruction to act. Step 5 expresses the logical ability of humans to influence their environment by understanding it; that is, by analyzing it into parts and then making new combinations from the parts.

In this evolutionary characterization of language, the primates can be seen to share in a rudimentary form some of the necessary faculties of the human brain, for example, the delayed response. This may be the case in some small degree also for the separation of affect, the prolongation of reference and even the internalization of language. In these respects we can perhaps find examples in Washoe's use of sign language which resemble some of the earliest stages of a child's language. But

the child rapidly passes beyond these precursors into the characteristically human use of language, and outstrips the chimpanzee completely. The crucial activity which the child reaches is reconstitution of the language. Human language is highly structured, and, as they grow from age about 1½ to 4 years, children analyze the structure of language in several distinct ways and reconstruct this structure in their own speech. In this ability the nonhuman primates are quite deficient. We have evidence for this defect, for example, in the study by Zhinkin (*7*) of the communication system of baboons, and it appears clearly again in the way in which Washoe forms combinations of signs.

We shall compare Washoe's development with that of a child's learning language in terms of the characterizations made above. Since the growth rate of chimpanzees is faster than that of humans, it seems reasonable to compare her development with that of children of the same age. These and other details have been discussed (*8*).

Disengagement from Context

We make the comparison between Washoe and a human child in two parts. One is concerned with the behavioral steps 1 to 4 in which Washoe and the child appear similar at the inception of language, although within a few months the chimpanzee is left far behind. The other is the logical step 5, the reconstitution of language, in which we believe the human capacity is unique.

1) *Delay between stimulus and utterance.* The evidence for this will be found throughout the following sections, and no special discussion of it is required. There is a wealth of research which connects the increase in the delayed response of primates with the development of the frontal lobes of the brain (*9*).

2) *Separation of affect from content.* The child's learning of language naturally begins in situations heavily loaded with affect. Children's early sentence-words frequently have the force of command or instruction stemming from their immediate desires, discomforts, pleasures, and displeasures (*come here, give candy*). Washoe's signs are also primarily concerned with immediate situation, her desires, and her emotional states (*hurry open, gimme drink*). Yet there are some indications of a primitive ability on Washoe's part to separate affect from content of signs; for example, her spontaneous naming of objects around her when there is no indication that this involves the desire for the object or an instruction to someone else.

However, there is a great difference in this regard between the signs produced by Washoe and the sentences of a 3-year-old child. By this age or before, the child is able to make cognitive statements, including those which he may not have heard before. He is able to understand and interpret correctly cognitive sentences without emotional charge. He has mastered the difference between "I want that" and "She fed him," and can separate out the immediate pleasures and emotional components of words from their objective meanings in sentences. There is by now good evidence with children of only 2 years which attests to the ability to understand cognitive statements, including novel ones (*10*).

3) *Prolongation of reference.* Children's early one- and two-word sentences (like Washoe's signing) are based almost entirely on the immediately perceptible context. They are often uninterpretable as messages without reference to the situation as context. They are primarily in the present, about objects, persons, or events which are in the here and now. However, they do include rudimentary references to situations in the immediate past (*all gone juice*) or demands for something not present (*more cookie*). In this respect, the chimpanzee and young child are not far different. Washoe, for example, signed *listen* when an alarm clock stopped ringing and signed *more food* when there was no food in sight.

At 3 years old the child comes to present a markedly more advanced picture. He does far more than "name" objects and events not immediately present, as Washoe does. He makes statements which are predicational and cognitive and may refer to events in the more distant past, which have a future sense or intent but are not just demands for action and which involve pretense or possibility. These have been documented for a group of children (*11*).

4) *Internalization.* There are few indications that gesture language is used as an instrument of reflection by Washoe. She has been seen to name objects while looking through a picture book, and occasionally corrects the signs she makes. Washoe has been observed on several occasions signing spontaneously to herself, in front of a mirror, or in bed at nap time. The Gardners have described these signs as idle chatter.

Weir (*12*) collected tape-recorded samples of her 2½-year-old son alone in his room and found that the child clearly uses language as an instrument of exploration. His monologues show a great deal of syntactic play, arrangements and rearrangements, transformations of sentence types, substitution of words in fixed sentence frames, and so forth. It is not just idle chatter, although it has no social function, no content to instruct someone else, and consists in large part of explorations of structure. It is in fact the extreme form of that "distancing" from any immediate context which characterizes behavioral modes 1 to 4.

The Child's Sentences

In turning now to the last of the five characterizations of human language, reconstitution, we face a process which is different in kind from the preceding four. In its full meaning it implies an analysis of the sentences the child hears (and indeed of the environments in which the child experiences their meanings) as a condition for the child's formation of his own sentences. In the first place, however, we shall confine ourselves to the child's construction of sentences in a meaningful way from primitive signs or names which are already known. Then later we shall ask how the child (and the human mind in general) is able to extract signs or names from their context—is able, in fact, to form concepts by an inner analysis of cognitive sentences.

The most subtle yet crucial way in which Washoe's performance falls short of that of a hearing child is in the failure so far to develop any form of sentence structure. The Gardners report that they did not make deliberate attempts to elicit combinations, but almost as soon as Washoe had eight or ten signs in her repertoire, she began to use them in combinations. It is common for her to sign in combinations now, and by June 1968, the Gardners had recorded 330 different strings of two or more signs. A number of these combinations may be spontaneous and original with Washoe; that is, it is unlikely that they are direct imitations of sentences which she has observed. We may compare her combinations of signs

with the sequences of words produced by a child of 3. The comparison makes clear both the limitations of the chimpanzee's utterances, and the nature of the capacity and the steps by which a child learns his first language.

1) The child of 3 already gives evidence that he has a concept of a sentence, which includes an understanding of grammatical relations (such as subject of a sentence, predicate of a sentence, object of a verb). These are not only clearly understood but are well marked in the child's own speech. McNeill (*13*) suggests that these relations are present before the first combinations of words into utterances in children's speech, and he considers them as a part of children's linguistic predispositions. Our evidence indicates that a child of 3 years expresses the basic sentence relations with great precision in English (where these are often signaled by word order in simple sentences) (*14*).

The Gardners in their diary studies report that, for many combinations, all orders of signs have been observed. Various orderings seem to be used indiscriminately by Washoe and do not differentiate the basic grammatical relations. The signs for *me, you*, and *tickle*, for example, have occurred in all possible orders in Washoe's signed sequences. These different orders do not seem to refer to different situations in any systematic way. For the same situation (requesting someone to tickle her), Washoe signed *you tickle* and *tickle you*. Washoe signed *me tickle* for someone tickling her and again *me tickle* to indicate that she would tickle someone. Washoe's spontaneous signed combinations seem so far rather like unordered sequences of names for various aspects of a situation.

2) Children of about 3 years seem to have well-developed means for expressing the full range of basic sentence types. They not only make demands and commands, they also negate propositions and ask innumerable questions. Children seem to have rudimentary ways of asking questions and of negating from the early stages of language development. What develops, along with more complex meanings, are the grammatical rules for expressing those meanings (*15*).

The Gardners in the past year have concentrated on the question-answer process with Washoe. They write (*1*), "We wanted Washoe not only to ask for objects but to answer questions about them and also to ask us questions." They have taught Washoe to respond to questions of several types (for example, *What you want? Who that? Where Susan?*) and in the process Washoe has seen many models. Despite the ample opportunity to learn about questions (and certainly some opportunity to learn negative sentences as well), there is no evidence in the diary summaries that Washoe either asks such questions or negates.

3) The child of 3 organizes his vocabulary into categories and subcategories which resemble in some respects the categories of the adult language. These are combined into sentences not as unordered naming but according to grammatical principles, which include hierarchical organization of the parts of a sentence (*16*).

We find in general that the child forms or extracts rules from the sentences he hears, and resystematizes them in his own speech. The child is not taught and does not need to be taught specifically the underlying rules of grammatical structure, yet careful study of his development shows that he gradually reconstructs the system for himself (often not precisely the same system as in the adult language, but by stages approaching the complexity of the adult system). Children seem to develop rules of maximum generality, often applying them at first in more instances than required, and only gradually learning the proper domain for their application. For example, 3- and 4-year-old children say things like *He comed yesterday, It breaked, I falled; two mans, my foots, many sheeps.* It is clear that these are not phrases that children have heard; they have generalized the past tense and plural forms from regularities like *walked* and *cats*. Children do not need to be taught the rules of grammatical structure because they discover them for themselves, just as they discover and do not need to be taught the rules of correspondence for recognizing the same object under different conditions of light and position. We see that small children whose cognitive powers are limited in many respects show a remarkable ability to reconstruct the language they hear, just as they reconstruct (give structure to) their experience of their physical environment; the process and the capacity are not specifically linguistic, but are expressions of a general human ability to construct general rules by induction. What is involved is not just the capacity to learn names as they are specifically taught by the humans around the child in the early stages. Far more basic and important is the child's ability to analyze out regularities in the language, to segment novel utterances into component parts as they relate to the world, and to understand these parts again in new combinations. It is this total activity, analysis and synthesis together, which is described in the term reconstitution. We conclude by considering this in more philosophical terms.

Language and Concept

It has been proposed (*6*) that the human practice of naming parts of the environment presupposes and rests on a more fundamental activity, namely, that of analyzing the environment into distinct parts and treating these as separate objects. That is, there is implied in the structure of cognitive sentences a view of the outside world as separable into things which maintain their identity and which can be manipulated in the mind, so that even actions and properties are reified in words. In this philosophical sense, predication is not merely putting together words in syntactical patterns, nor even the manipulation in the mind of ready-made objects and categories. Rather, predication is in the first place a way of analyzing the environment into parts, and only after that can they be regrouped in new arrangements and new sentences.

Thus a child may first learn the word for *chair* with one particular chair, and may extend it at first to all pieces of furniture without being specifically taught to do so. Through his analysis of sentences about chairs in his parents' speech and his experiences with these sentences ("Please sit in this chair, Mrs. Jones," "John, move your chair around") the child may gradually narrow his use to the range of objects that we might also describe as chairs. It is important to note that there is no way to give a definition of *chair* in terms of size, dimensions, color, material, or other aspects of physical measurements. To recognize another object we have not seen before as a chair, we must ignore many aspects of the differences between chairs, and attend to criteria which include something like the following: A movable seat that is designed to accommodate one person, and usually has four legs and a back. Notice that a chair is a man-made object designed for a specific function or action, and that this is part of its implicit definition. Learning the word for objects like *chair* is considered to be one of the simplest problems of language learning. Yet for the child to

understand his parents' sentence "The chair broke," he must first analyze out the state of being of the chair at the time of the utterance, and then interpret the meaning of the word *broke* (perhaps violently separated into parts, no longer functioning) from this. He can construct the sentence "The toy broke" for himself only after having analyzed out the relevant aspects of the environment in the parts of the sentence above. The new predication can result only after the definitive attributes of *break* and *chair* have been taken apart as independent units, and the activity of predication presupposes this kind of analysis.

What we have been describing in the child is a general characterization of the relation of human thought to the environment. For humans, the environment consists of objects, properties and actions, and we are tempted to assume that these exist ready-made in the outside world, and present themselves simply and directly to the senses. But this is a naive simplification of the complex of interlocking processes by which we are persuaded of the existence and the persistence even of so unitary a natural object as a tree or a bird. Most of what we regard as objects in our environment, however, are far more sophisticated concepts than these. Thus the logic by which a child unravels the sentences he hears and his experience of the environment together is much more than a capacity for language and expresses in miniature a deeper human capacity for analyzing and manipulating the environment in the mind by subdividing it into units that persist when they are moved from one mental context into another.

What language expresses specifically in this scheme is the reification by the human mind of its experience, that is, an analysis into parts (including actions and properties) which, as concepts, can be manipulated as if they were objects. The meaning that these concepts have derives from their construction (as parts of reality) and cannot be displayed by a direct appeal to the senses, singly or in combination. Very few concepts derive directly from the senses, as the word *cold* does; the great majority are at least as indirect and intellectual as the word *two*. They are constructions of the mind from a variety of contexts, and in making them, the mind acts exactly as the child does who learns to give meaning to a word by analyzing the variety of sentences in which he hears it. Concepts are artifacts extracted by reification from the contexts or sentences in which they occur. Some of them, like *two*, can be taught to animals, but they remain artifacts of the human mind. We may even speculate that the human mind began to reify objects by their function when man began to make tools as functional artifacts for future use.

If the reification of the environment serves to manipulate its parts in the mind, then the laws which distinguish admissible from inadmissible rearrangements round out and complete the same mental process as a necessary part—as the addition *one* and *one* belongs to the concept *two*. That is, we cannot separate the naming of concepts (objects, actions, and properties) from the rules which govern their permissible arrangements—the two form an interlocking whole. Looking for these rules is in essence the search for structural relations in the environment which characterizes the human mind and is the same as the procedure of generalization which in science is called inductive inference (in the widest, nonpartisan sense). For humans, the division of the environment into parts only has meaning if they obey rules of structure, so that permissible arrangements can be distinguished from arrangements which are not permissible. So in human language, words and grammatical structure form an interlocking whole, from which nonsense words and ill-formed sentences are equally excluded. The match between a sentence and the reality that it maps strikes us now, when we know the language, as made by putting the sentence together; but it begins in the first place, in the beginning of language, by taking reality apart. And it is taken apart into words and grammatical rules together (concepts and structural laws)—just as we create a scientific theory of, say, the atomic structure of the physical world by inferring the existence of the elementary particles and the laws of their combination at the same time.

In short, we must not think of sentences as assembled from words which have an independent existence already, separate from any kind of sentence. This puts the matter in linguistic terms; in more philosophical terms, we must not think of the external world as already existing in our consciousness as a previously analyzed assembly of conceptual units, such as things, actions, and qualities. The experience of learning about the world consists of an inner analysis and subsequent synthesis. In this way, human language expresses a specifically human way of analyzing our experience of the external world. This analysis is as much a part of learning language as is the more obvious synthesis of sentences from a vocabulary of words. In short, language expresses not a specific linguistic faculty but a constellation of general faculties of the human mind.

When we watch the way a child learns to speak from his point of view, we become aware of his mental activity in finding for himself inductive rules of usage which constitute both a grammar of language and a philosophy of the structure of reality. The child does not "recapitulate" the evolution of language, of course; instead, he demonstrates the logic which binds the development of language to the evolution of the human faculties as a whole. What the example of Washoe shows in a profound way is that it is the process of total reconstitution which is the evolutionary hallmark of the human mind, and for which so far we have no evidence in the mind of the nonhuman primate, even when he is given the vocabulary ready-made.

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