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LANGUAGE – COGNITION – COMMUNICATION[1]

The aim of the article is to show the relations between language, on the one hand, and cognition and communication, on the other. The two main functions of language, i.e., to serve as a medium of representation in human minds of the external world and to serve as a medium of communication among people, have been recognized in most of the approaches to the study of natural languages. This article treats the specificity of these functions in relation to language. The specificity of the representational function resides in the duality of patterning of linguistic meaningful elements, and the specificity of the communicative function in the decentration abilities of human beings. Our concern is the phylo- and ontogenetic development of both functions. The last section of the article directly compares the development of language, cognition, and communication stressing the quantitative nature of the changes in the diachronic development of language as contrasted with the qualitative changes in the development of cognition and of communication.

Introduction. The relations between the three terms under consideration

The point of departure in this article is human natural language with its relations to cognition and thought on the one hand and to communication on the other. Natural language is treated as a specific feature of Homo sapiens – no human society lacks this feature and none of the other species in the animal kingdom possess it. The general definition of language describes it as a system of signs and rules to combine these signs into more complex meaningful entities. The general approach to language treats it as a tool of thought or cognition and as a tool of communication. Thus language has two functions – to represent the world in human minds and to communicate among people. We cannot identify human thought with language because there exist many forms of nonlinguistic, image-like thoughts in adults as well as in prelinguistic children, and neither can we identify language with communication since there are many different forms of human nonverbal communication. Furthermore, while seeing language as uniquely human we still must attribute cognitive and communicative abilities to many nonhuman species.

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The definition of language given above is probably too general to apply to any communicative system – natural or artificial – and the two mentioned language functions, representational and communicative, ought to characterize as well any such system. Thus the first task of this article is to describe the specificity of the natural language functions.

The term "natural" implies biologically based ability, and language is treated in the most recent theoretical approaches as developed during the process of natural evolution. There are some disagreements between these approaches stressing either representational aspects of language or its communicative features. Our next task will be to show how these two main lines of evolution of the language faculty are interrelated.

In this context Noam Chomsky introduced the notion of Universal Grammar (UG) as the genetic basis of human linguistic competence or faculty, i.e. the component of the human mind/brain dedicated to language. UG common to all human beings consists of an initial state (like other bodily organs) which undergoes state changes under triggering and shaping influences of the environment in the form of verbal input. The most influential theory describing Universal Grammar is the Principles and Parameters approach – principles being universal but their realization differing according to the parameter values chosen by a particular language. This notion of UG will guide our considerations of the phylo- and ontogenesis of human language.

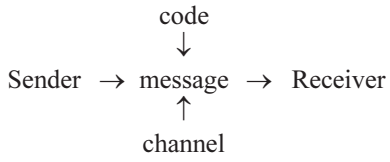
In the final section of this article I will compare the linguistic and cognitive systems on the one hand and language and communication on the other. The main aim of these comparisons will be to show how qualitative cultural changes in the processes of cognition, and especially of communication, meet only with quantitative changes in the development of particular languages. The relations between cognition and communication are beyond the scope of our present discussion.

The specific features of language functions[2]

The specificity of the representational function

Every natural communicative system in the entire animal kingdom, apart from its communicative aspects, has to serve a representational function in the sense of reference to something outside the system. What is specific for the representational aspects of human language?

Different authors, like Karl Bühler, John Lyons or Michael A.K. Halliday used various terms to describe this function – symbolic, descriptive, referential, ideational, etc. At the time when the model of language as a code dominated psycholinguistic research Roman Jakobson discerned several representational, or referential, functions of the linguistic message. They are attached to different parts of the so-called mathematical model of communication (Shannon and Weaver, 1949):



[2] Sections "The specific features of language functions", "The phylogenesis of human language", and "The ontogenesis of human language" are based on Kurcz (in press).

The main representational function of a message refers to the reality outside the whole model. But the message may refer to different parts of the model, for instance, to the sender in which case its function is called emotional or expressive. It may concern the receiver, the function then being instrumental, pragmatic, conative (in the sense of evoking a given reaction). It may take into account the channel – 'do you hear me?' or the code itself – 'do you understand me?' or the message itself which Jakobson called the poetic or esthetic function. Thus even in the clearly communicative model of language use its representational functions are fully present.

But what is really crucial for the specificity of the representational function of natural language is the duality of patterning, or two levels of representation, by this system. On one level, the meaningless elements, the so-called phonemes (vowels and consonants) are combined by rules of phonology to form meaningful words (or better, morphemes – the smallest meaningful elements of language). On the second level, these meaningful elements are combined by rules of syntax to form other meaningful compositions, that is, sentences whose meanings are not just the sum of meanings of their composite words.

The other natural communicational systems dispose of only some equivalents of the first patterning system – all sorts of signs with their associated meanings (like different calls of vervet monkeys signifying distinct kinds of danger: eagle, snake or leopard). Only human language, as Chomsky claims after Humboldt, can make infinite use of finite means. And from the three language components – phonology, semantics and syntax – only the last one is responsible for this unique achievement. For these reasons, syntax (or Universal Grammar in the narrow sense of the term) was treated by Chomsky and other generativists (with the exception of Ray Jackendoff /1997/) as the only generative component of linguistic competence or I-language (internal, intentional).

Given that syntax is decisive for the functioning of linguistic competence, is it at all possible to use language without syntax? The answer is Yes. It would be a sort of protolanguage, presumably the candidate for the prelinguistic forms of human language in phylogenesis and ontogenesis. Derek Bickerton (1990), the well-known researcher in the domain of protolanguages, distinguishes four different forms still in existence in Homo sapiens and one, under special conditions, by his nearest cousin – the chimpanzee.

What does a protolanguage look like? We can imagine it as a list of lexical entries without syntax. It is simply the first level of symbol patterning. Its existing forms are the following:

1. pidgin (but not creole where syntax is in full use);
2. language of the child under 2 years of age;
3. language of the child not exposed to any human language until puberty (the famous case of Genie described by Susan Curtiss /1977/);
4. language spoken in very disturbed conditions;
5. American Sign Language (ASL) used by chimps.

ASL comprises a full human language yet what chimps who are taught this form of language reveal is a complete lack of grammar in their "utterances".

Let us treat the last three cases as special and not of concern here. The first two will serve as the arguments in our later discussion on the role of the two language functions in phylo- and ontogenesis.

The specificity of the communicative function

First, some remarks on terminology. I use the term "communicative" only in the sense of communication between people or eventually with oneself (Alter Ego in internal speech). But the term is also used in a different sense by philosophers of language (Carruthers & Boucher, 1998). They distinguish two approaches to the study of the relations between language and cognition – one, so-called "cognitive", when thought is equated with language, and the other, "communicative" when there is no equivalence between these two systems which only "intercommunicate" in the human mind.

The communicative function of language is given priority by such authors as Jerome Bruner, Herbert Clark, and Michael Tomasello. They stress the role of shared attention between mother and child during language acquisition as well as the "common ground" between two adult speakers.

What is important in these approaches is the assumption that human communication is based on the mutual sharing of beliefs about the world, about the mind (so-called theory of mind, TOM, Baron-Cohen, 1999) and how to communicate effectively with one another. The latter example of shared knowledge is well captured by Paul Grice's (1975) maxims: of quantity (make your contribution as informative as is required), of quality (do not say what you believe to be false), of relation (be relevant), and of manner (avoid obscurity and ambiguity). This is not simply wishful thinking about how we ought to behave, but describes how we actually behave in most everyday communicative situations. Only when people deviate from these maxims is this really noticed and becomes a problem to be solved. Normally, things go smoothly.

To become a transactive self who is able to use the narrative mode of thought is, in Bruner's (1986) opinion, a distinctive prerequisite of humanity. The foundations for human use of language are, in Clark's (1996) view, joint action and common ground. And for Tomasello (1999), the only prerequisite for the evolution of language in hominids was a feature absent in chimpanzees – the ability to decentrate, to take the perspective of others, and to understand their intentions. I will call this ability social cognition.

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What is characteristic of the main theoretical approaches to the study of human uniqueness in the use of language is that they stress either the emergence of grammar as the turning point in language evolution or the emergence of a theory of mind, the ability to understand others, that is, the ability for social cognition. According to the view presented here, both features are equally important as prerequisites for the descent of human language and for its ascent in the young child.

The phylogenesis of human language

Let us first look at the representative function of language for which the emergence of syntax, that is, of Universal Grammar (UG), is considered the decisive and specific factor.

First, some newly established facts about hominid evolution, which began less than 6 million years ago when Australopithecus started his bi-pedal life in the very hard and dangerous environment of the south-eastern African savannas. The main feature of this evolution was a significant growth of the hominid brain reaching, in Homo sapiens, the highest encephalization quotient (and especially the neocortex ratio) among the primates.

While no further brain-growth tendency has been observed with the emergence of Homo sapiens, the encephalization quotient is still regarded as an important prerequisite for the entry of Homo sapiens on the scene, when many branches of the hominid evolutionary tree had already died off with only a few still existing (Homo erectus, Homo neanderthalensis). The date of this entry is still a matter of discussion with the tendency to shorten this period even to 45.000 years ago (Corballis & Lea, 1999). Other estimations do not cross the border of 200.000 years.

Around 45.000 years ago the intensive cultural evolution of Homo sapiens started a steady development as compared with more than the two million year existence of Homo erectus with almost no change in their use of tools. This cultural evolution is often linked with the emergence of full language, that is, language with syntax as we have defined it earlier. Language created humans, not the other way around. The argument goes like this – language, being itself a product of biological evolution (or, as some prefer to maintain /Gould, Chomsky/, a by-product of it) is, on the other hand, the main factor in cultural evolution.

Let us see what was really crucial for the biological evolution of syntax. There are several hypotheses, most of them based on the prior existence of protolanguage in hominid development. One, gradualistic, presupposes the gradual development and enrichment of protolanguage ending through the process of natural selection with the emergence of syntax (Pinker & Bloom, 1990; Pinker, 1994). The other, catastrophic, sees the emergence of syntax as a result of sudden genetic mutation (Bickerton, 1990). According to Derek Bickerton (1990, 1995; but not Bickerton, 2000; see later) protolanguage was useful at the first stage of representation, common to humans and animals, but with syntax the second stage of representation became possible allowing for abstraction and all sorts of displacement.

One can now see – I think – a quite new step in this evolutionary way of thinking about the emergence of syntax. In an article in *Nature* (March 2000), Martin A. Nowak et al. presented a mathematical model for the evolutionary dynamics leading to the transition from nonsyntactic to syntactic form of language. Their model is based on the reproductive ratio of signals /or words/ in protolanguage. The emergence of syntax will only be favored by natural selection when the number of these signals exceeds a threshold value (which, according to their calculations, comes to around 400 elements). This means that the protolanguage consisting of fewer than 400 signals (each signal S_{ij} denoting one event E_{ij}) is even preferred to the language with syntax which requires the decomposition of S_{ij} in relation to different aspects i and j of E. Let us imagine that an event E_{ij} is composed of an action (A_j) of hunting where the object (O_i) is an antelope. The whole event is signaled in protolanguage by S_{ij}. There are also other signals denoting eating the antelope or hunting a bison, eating the bison, and so on. But when the critical threshold of events to be signaled has been exceeded, the decomposition of S_{ij} into N_i and V_j has to become the preferred option.

$$\begin{array}{c} S_{ij} \\ \downarrow \\ E_{ij} = O_i + A_j \\ \qquad\quad \downarrow \quad \downarrow \\ \qquad\quad N_i \quad V_j \end{array}$$

Verbs (V) denoting different actions: hunting, eating, etc.
Nouns (N) denoting different objects: antelopes, bisons, etc.

A nonsyntactic language or protolanguage has signals that refer to events. A syntactic language has signals or words (verbs and nouns) for objects and actions and rules for combining these words. The mathematical analysis developed by Nowak et al. (cf. also Nowak, 2000) can be adapted to more complicated situations. I merely want to show the idea underlying their reasoning.

I am not concerned here with the form of protolanguage realization. Probably for a long time it was realized in manual fashion. According to Philip Lieberman (1973), the appropriate development of the vocal tract for producing speech sounds, among all hominids, was only reached by Homo sapiens. But since the neural/brain localization is just the same for human vocal speech and for sign language used by deaf people (which is probably a later readaptation), this question does not change the whole reasoning.

So if we accept that the proof for the evolution of syntactic language has been obtained and that using syntax constitutes the crucial feature of the representational function of human language, does this suffice for using language for communicative purposes? While many authors really stop here in their reasoning about the biological bases of human language, several others who even ignore the role of syntax seek other biologically evolved features for the specificity of human communication. As I have already mentioned, this specificity consists in the ability of decentration, of understanding the other person's perspective, of having a theory of mind, i.e. a sort of social cognition.

Again, there are several hypotheses concerning the evolutionary prerequisites for these social linguistic abilities. Derek Bickerton in his dialogue with William H. Calvin about *Lingua ex machina* (2000) sees the source of syntactic rules that map the predicate to argument/s/ relations in reciprocal altruism as opposed to kin altruism, both being the well-known mechanisms of Dawkins' selfish gene. But a specific prerequisite should by definition be unique to humans, hence the proof ought to be forthcoming that it is not shared with other primates. But there are some doubts about that.

One such proof is offered by Michael Tomasello (1999, pp. 16-17) in his decentration thesis when he compares the cognitive and social abilities of chimpanzees with those of humans. Both are social beings. Among their common cognitive abilities are the following:

I. In perceiving and understanding the physical world:
   an episodic memory (what, where, when);
   a perceptual object constancy;
   an ability to categorize based on perceptual similarity;
   an insight in problem solving;
   an ability to manipulate in working memory of small numbers of things.
II. In perceiving and understanding the social world:
   an ability to identify particular members in a group;
   to make direct relations with other members based on kinship, friendship and dominance;
   to understand third-party relationship;
   to cooperate in problem solving situations;
   to learn from observation;
   to foresee the behavior of others on the bases of their movement directions and emotional states, and
   to use strategies to out-compete others for valued resources.

So what really differs in the social cognition of these two species? Tomasello's findings based on his intensive comparative studies of infant and chimp behaviors are that, in contrast to humans, nonhuman primates **do not** (p. 21):

point to objects or places for others;
offer anything to others;
hold things to show them to others;
teach intentionally others new behaviors.

Some authors (Gomez, 1998) maintain that the great apes are capable of ostensive behavior – showing things to others – but probably they do this only for instrumental reasons. They want others to do something for them, and not for the benefit of others.

Tomasello's conclusion is that all the above mentioned behaviors, which are precisely typical of humans, comprise the sufficient biological endowment for using language. There is no reason to look for other evolutionary factors responsible for this phenomenon. There are several other theories with a similar conclusion. Particularly representative here are the authors of social mind theories like Andrew Whiten (1999) and Simon Baron-Cohen (1999).

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In my view, syntax and social cognition, representation and communication could even develop independently, each responsible for the unique characteristics of human language. The main argument which will be presented in the next section is that each of them might be independently impaired.

The ontogenesis of human language

The very well known arguments in developmental psycholinguistics coming from generative theories state that children are innately equipped with a common human possession – the language faculty or language organ. They go through fixed stages with a rapid transition from one to the next, starting from prelinguistic babbling through one word, two-word and finally attaining the full grammar stage at the age of about three. At these peak periods of language growth, the child is acquiring words at the rate of about one word per hour and the child's tacit knowledge of language grammar vastly surpasses what his/her experience has provided. In Chomsky's own words: "Language acquisition seems much like the growth of organs generally; it is something that happens to a child, not what the child does." (2000, p. 7).

Children acquire with equal ease any language spoken on the Earth independently of their diversity and complexity. So the theories of language should satisfy not only the descriptive adequacy (how well they account for the properties of the given language) but also explanatory adequacy, i.e., "a theory of language must show how each particular language can be derived from a uniform initial state under the «boundary conditions» set by experience" (Chomsky, 2000, p. 7). This initial state is what a child is equipped with, recently called Universal Grammar (UG).

Many proposals of generative grammars as theories of linguistic competence have been elaborated during the last 40 years and many of them have been discarded especially in the most recent approaches called the minimalist program (Chomsky, 1995) or the internalist linguistic theory (Chomsky, 2000). What remains – as already mentioned – is the Principles and Parameters theory (Chomsky, 1981) as the basic approach to the study of UG. The principles are universal and parameters their specific realizations by particular languages. In this approach the rules of grammar (like transformational rules for passive

or relative clauses) are decomposed into general principles which interact to yield the properties of linguistic expressions. Thus UG consists of a fixed network (principles) which is connected to a sort of switch box (Chomsky's expression); the switches are the options to be determined by experience with a particular language. These principles independently of their particular realization operate on the lexical entries of the mental lexicon.

The nature of these universal principles is still a matter of discussion among the prominent authors in this domain like Chomsky (1995, 2000), Lasnik (2000), Pinker (1999) and Jackendoff (1997).Without entering into the details of this discussion, I shall simply treat this general approach as the one accentuating the specificity of language competence taken as a biological organ. This approach is not concerned with any cognitive or social prerequisites for that competence.

Nevertheless, there are many previously mentioned authors like Bruner and Tomasello who accentuate the role of social cognitive factors in language acquisition. Tomasello (1999) stresses that there is a culmination in the understanding of others as intentional agents at precisely nine months of age, prior even to the one word stage (12 months) and offers a simulation explanation of this nine-month revolution.

The understanding of others rests on a special kind of knowledge different from that which we use to understand inanimate objects. It is based on the analogy to self. According to Tomasello, when human infants attempt to understand others they use their own experiences especially with regard to self-agency. In his simulation model – others are like me – the child sees the difference between animate and inanimate objects which are much less like me. The understanding of others, so well documented in the observation of infants between nine and twelve months of age, is a result of a uniquely human biological adaptation which also offers to the child the possibility of a new understanding of his/her own intentional actions. There are some connections between this approach and the so-called "theory theory" (a protoscientific theorizing) approach by Allison Gopnik and Andrew Meltzoff (1997) who propose that this infant attitude – others are like me – starts even from birth. I mentioned before other theorists of mind theories. This child's attitude provides him or her with the prerequisites to communicate with others using linguistic means.

There are also opponents to any nativist approach in developmental psycholinguistics who emphasize much more the role of experience and who treat linguistic competence as a special case of a more general cognitive competence for information processing (Slobin, Bates, McWhinney). But the arguments for an independent development of linguistic and intellectual skills (language is acquired by children with very low IQ, severely mentally retarded) are for me strong enough to accept the nativist perspective of language as a specific organ.

Again, as in the phylogenesis of language emergence in explaining language acquisition both approaches are for me quite consistent. The child enters into his or her interactions with the external world biologically equipped with the ability to understand others and then uses another biologically evolved ability to acquire language. Children start with protolanguge going through one- and two-word stages, then enter very smoothly into a full grammar stage (a sort of replication of phylogenetic evolution).

While the followers of generative approaches stress the link of the linguistic organ to other systems of mind, especially the cognitive and intentional, they do not occupy themselves with where these intentions come from. The proponents of specific decentration abilities of the young child, i.e., of intuitive socio-cognitive knowledge, treat this knowledge as the sufficient prerequisite for language. The crucial argument for their thesis are

autistic children, the only humans who lack this social knowledge, who do not understand other people's intentions and whose language is not well developed. But there are autistic children with quite well developed linguistic skills, so the argument goes the other way around. There are human beings who acquire language without any theory of mind.

The main arguments for keeping both biological endowments in the theory of language acquisition and of language use come precisely from these pathological cases where genetic causes seem to enter into play. We observe the independent impairment of only one of the skills under consideration. The genetically transmitted grammatical impairment studied by Myrna Gopnik (1990) in one family is an example of only a linguistic deficit. Children with SLI (Specific Language Impairment) suffer also only from linguistic deficit. Children with the Williams syndrome, with language fully developed but general intelligence very low, can serve as evidence for the independence of linguistic and intellectual abilities. And those cases of autistic children, and of schizophrenics with social intelligence impairment but linguistic abilities intact might also be as examples of the independent functioning of linguistic and communicative abilities.

Language and thought, language and communication

The normal use of language involves both linguistic functions, representational and communicative, but the existing evidence speaks for independent sources and independent impairment. Let us first look at the representational function and its role in the relations between language and thought (treated as a specific form of human cognition). We are obviously not interested here in any approach identifying language with thought although such a view is still very popular in people's attitudes toward all sorts of censorship (the famous Orwell example: no word for "freedom" – no possibility of thinking about freedom). The interrelations between language and thought, well documented in the long-lasting discussion on the so called Sapir-Whorf hypothesis, or linguistic relativism, are also beyond the scope of this paper (see Whorf, 1956; Kurcz, 2000). We will focus our attention first on analogies between the structures of both systems and then on the differences among them.

There are similarities in the structural organization of both systems. If we adopt Chomsky's descriptions of UG from his *Minimalist Program* (1995), its structure will comprise the syntactical computational rules operating on the lexicon and generating the phonetic and logical forms of the sentence, i.e. its sound and meaning, as in the following schema:

$$\begin{array}{lcccc} \text{UG} & = & \text{Computational System} & \rightarrow & \text{Lexicon} \\ & & \downarrow & & \downarrow \\ & & \text{phonetic form} & & \text{logical form} \end{array}$$

We can draw the structural analogies between the Lexicon and the conceptual structures, and between syntactical rules of the Computational System and all sorts of rules of propositional reasoning. As concerns the former set of analogies, let us use the Pinker and Prince (1999) examples. They compare the distinction made by cognitive psychologists between classical (based on necessary and sufficient conditions) and family resemblance

categories with the organization of the mental lexicon analyzed by Pinker in his *Words and Rules* (1999). According to this author, there are two ways of mental lexicon creation, one rational (like some rules for word formation, i.e. past tense of regular verbs), the other associative through overlearning (like past tense of irregular verbs). The analogy concerns only similar mechanisms, similar kinds of rules (rational versus associative), not the rules themselves. There is no similarity between seeking necessary and sufficient conditions to build a classical category and adding -ed to form a regular past tense, but both processes are rational.

The analogy between syntactic rules and rules of propositional reasoning are even more remote. In the newest model of UG the direct access to the Lexicon must take into account the tripartite description (phonological, semantic and syntactical /parts of speech/) of all lexical entries, which prevents the generation of nonsensical sentences (like "Colorless, green ideas sleep furiously" from Chomsky's famous example). However, the truth conditions of any sentence are out of the scope of linguistic rules. These conditions ought to be assigned by logical rules of propositional reasoning. From the two fully comprehensive sentences: *Socrates is mortal* and *Socrates is immortal* only the former is true, if we treat it as a syllogistic conclusion from the two premises: *All men are mortal* and *Socrates is a man*. Yet besides the propositional reasoning which belongs to the paradigmatic mode of thought (Bruner, 1986), characteristic for scientific inquiries, there exists as well a narrative mode of thinking where figurative and metaphorical interpretations are in full use. So if we think that Socrates is still living in our memories the latter of the two sentences is also true. But none of these truth conditions comes from the linguistic rules per se.

There are even more striking differences between the two kinds of rules. Syntactic and other linguistic rules are acquired effortlessly during childhood and function in an automatic and intuitive way as I-language (Chomsky, 2000). We can describe them but not really explain their structure. The rules for logical reasoning are much more explicit and have to be learned after hard training. Moreover, both kinds of rules undergo noticeable changes. And we can reasonably state that most changes in the reasoning rules, especially the paradigmatic mode of thinking, are progressive in the Kuhnian sense of scientific revolution as the decisive way of knowledge accumulation. Even as concerns the narrative mode of thought, all sorts of formalization of its styles (i.e. in semiotics or poetics) might be regarded as progressive as well (see also Lightfoot, 1999).

The opposite holds for linguistic rules. We observe changes in all of the language components: phonology, semantics and syntax. But its main characteristic feature – double patterning – remains intact during all these changes. There are no fixed stages in the diachronic development of a language. The Lexicon may grow more or less during particular historical periods, some words die, some change meaning, some new ones emerge (often by borrowing from another language). And probably the only way of crediting any progress to language changes is the growing lexicon, since usually more words are coined than old ones die. All the other changes in any given language functioning have no qualitative character. We cannot say using purely linguistic criteria that contemporary English is more advanced than Old or Middle English or that Latin is more sophisticated than Italian or French, nor can we say that any existing language in the world is better, more developed or whatever than any other. There might exist among them only quantitative differences in the vocabulary span.

The same remarks apply when we compare language and communication. Again, sig-

nificant qualitative changes might be attributed to the ongoing changes in communication forms and channels. Human communication is realized through interactive cooperation based on a common ground, i.e., shared knowledge of the participants. This knowledge formed on the bases of socio-cultural conventional rules is much less automatic than purely linguistic knowledge. The use of language created Homo sapiens. But the communicative aspects of this use, once detached from the biological way of evolution, have been subjected to the social and cultural changes observable even within a single generation. Communicative needs are responsible for the invention of writing and all the contemporary technological services enabling the attained state of global village.

Language has been a product of biological evolution but its use for communicative purposes is no longer so. It is not language but communication which undergoes all these revolutionary changes.

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