

From the Jurassic Dark

Linguistic Relativity as Evolutionary Necessity

PAUL R. HAYS

Sugiyama Jogakuen University

The use of language cannot change reality, but it can change the perception of reality. As such it would be an evolutionary advantage. Parents bringing up offspring can use language to mold the cognitive structure of children in ways that promote survival. This molding of the cognitive or conceptual structure only works as an evolutionary advantage if we see a strong form of linguistic relativity at work in language acquisition. This process becomes one of structuring perception by using the acquisition of vocabulary and grammar to modify perceptual categorization.

1. Evolutionary biology

The use of language must be rooted in our biological heritage. Certainly, the organs involved, if not the actual behavior, are rooted there. So this discussion must begin with a look at evolutionary biology. Of course, the structures of the brain and behavior of animals are not preserved in the fossil record, and so the following comments are more speculative and meant to be suggestive rather than definitive. For this discussion two references were especially useful. One is McLoughlin (1980), who traces the evolution of therapsida and the rise of dinosaurs and mammals. The other is MacLean (1990), who in *The Triune Brain in Evolution* focuses on the evolution of the structures of the brain.

To look at the formation of the organ which is central to the use of language, we must go back to the earliest appearance of therapsida at the beginning of the Mesozoic. Therapsids, reptilian-like precursors to the mammals, arose prior to the advent of the dinosaurs. However, their demise, the reasons for which are not certain, allowed the earliest dinosaurs to adapt to

the landscape and quickly push the earliest mammals aside. This might be understood in terms of a Kauffman fitness landscape in which therapsids were at the top of a fitness peak and somehow dropped or were pushed off the peak into a less desirable, local peak. In this case, the less desirable environment was the night.

The day was the environment of the dinosaur. We have no fossil nervous systems, but from the size and position of the brain cavities, it appears that dinosaurs used a sophisticated nervous system which, combined with the eyes, allowed them to respond in a very efficient manner to the environment. See – react was the method used by the dinosaurs. That requires little processing, but rather hard wired behavior. There was no need for a large processing apparatus; the biggest dinosaur could function quite well with tiny brains. Dinosaurs, although developing later, quickly came to dominate the daytime environs (McLaughlin 1980: 93-95).

Finding a lesser peak in the fitness landscape, mammals were literally left in the dark. Mammals were unable to develop a nervous system which depended on the sense of sight. They needed senses which would serve them in the dark. Mammals had to operate on a sense of smell, which doesn't have the immediacy which vision does. The physics of smell is such that it is slower in conveying information about the environment than sight. Using a sense of smell means that the cause of the odor is at a distance; immediate reaction is possible, but not immediate results. If we see food and jump on it, we eat. If we smell food and move toward it, it may take a while to get there. It may even have moved when we arrive. The temporal relationship between the perception and the result is delayed. This allows longer processing time. It also means that the perception, what is important or foreground stimulus, must be interpreted to a greater degree. What direction is the smell coming from? Is it fresh? Is there a wind carrying it? Is it prey or is it predator? The interpretation must be more complex than for purely visual perception (which operates at the speed of light.) In parallel with this reliance on the sense of smell is the increase in the size of the cortex, especially in the area of the olfactory apparatus. As the brain stem extends from the body into the skull, the olfactory sense is furthest along the stem. While there is still question about the function and structures of the brains of fossil animals and the origin of modern mammalian brain structures, it is clear that there are strong connections between the cortex and the olfactory apparatus in the modern brains (MacLean 1990: 257-267). It has been suggested by some paleontologists that this olfactory apparatus and the need to interpret the information it provides was the origin of the cerebral cortex (McLaughlin 1980: 112-13).

Perception, the mediated, internal awareness of the external world, arises in the early evolution of mammals. The nocturnal niche leads to longer and

longer processing times between the external stimulus and the response of the organism. This internal processing is often referred to as an internal model of external reality. Lengthening time for mediation gives rise to the abstractions of the internal mediation process. As the time between the stimulus and the response is lengthened, the time for internal mediation is lengthened. This gradual lengthening of the process of internal mediation gives rise to greater and more complex processing.

One aspect of mammalian life which is related to the larger brain is that the offspring are not born fully developed and take time to develop outside the womb. MacLean (1990: 249) refers to "olfactory dependant maternal attention" in reference to the evolution of mammalian brains. Current research suggests that many of the physical structures, the neural connections, arise out of the processing of stimuli after the child is born. According to Lamb (This volume) the plasticity of the brain and the proximity principle dictate much of the structure of the brain. These depend on the input which the infant receives. Some of this may be related to the physical world all life inhabits, but there are many things passed from the adults to the offspring. In humans, these are passed through language. Lamb shows how language functions as a pre-configured conceptual system which provides stimulus to the growing nervous system in order to form particular neural pathways.

This passing of experience to mold the brain also occurs in our animal cousins. As species become more complex, they spend an increasing amount of time raising offspring. Part of this is training in proper behavior or survival skills. This must include orienting the offspring so that the internal processing orders the stimulus in such a way that the response is geared towards survival. Parents bring up their kids to be successful. In some animals this takes the form of providing experiences for the offspring. Cats, for example, will lead the kittens on hunting expeditions, or bring animals to play with. These experiences all help to develop hunting skills which are survival skills. This providing of structured experiences for the offspring must stimulate the ordering of perception into patterns, the formation of internal concepts. In this process of facilitating the ordering of experience into categories, language as a perceptual filter can be seen as facilitating the process. This idea of language as perception will be elaborated on later. However, for now, suffice it to say that a parent who stimulates the formation of categories of perception which lead to successful behavior by instilling a conceptual structure through the use of language gives its offspring an advantage in the struggle for survival.

In order for something to be of survival value, it must assist the organism in coping with its environment. It must be something that gives the organism an advantage in responding to reality. In the case of most animals, this might

merely be a physical or ecological reality. However, in the case of humans, there is an additional reality which must be considered, social reality.

2. Social reality

In *The Construction of Social Reality* (1995), Searle has discussed the nature of social reality and its relationships to physical reality. While social reality is grounded in the physical world, it is the reality in which we largely exist, the reality of money, marriages, ownership and social roles such as judge or teacher. Searle (1995: 64) shows that words are constitutive of this social reality. He claims that the thoughts with which we create this social reality are language dependant. The reality of money exists only as long as we believe, think, and refer to it as money. These are entities which exist only through the use of linguistic symbols. They cannot occur without language. So, beginning with experiences in a physically real world, through language, we quickly augment it with a social reality.

The functions of language in determining this social reality are complex. In many ways, the manner in which we describe an event structures the event. Hawkins (This volume) has described the manner in which language structures the interpretation of an event as ideological deixis. Our ideological orientation causes a shift in the language we use to structure our interpretation, and thus our memory of an event. Hawkins suggests that ideology "is akin to space and time in that it constitutes a major variable in the context in which any particular speech act is grounded". The implication is that the linguistically constituted social reality is as important as the physical environment in our perception of events.

In his 1996 book, Dunbar suggests that social relationships are the driving force behind the origins of language. He traces the development of the neocortex and compares it to the size of primate social groups. While not conclusive, Dunbar makes a persuasive argument that the function of language was to maintain the larger groups necessary for survival on the open savannas. Language allowed early humans to foster relationships which were necessary to maintain the structure of the group. He relates this to the grooming behavior of other primates. This grooming behavior is used to sustain social relationships which are necessary in maintaining the social group as a unit. Each member is aware of the various obligations based on time invested in a relationship, primarily through the act of shared time picking nits from each other. Dunbar says (1996: 78), "Language evolved as a kind of vocal grooming to allow us to bond larger groups than was possible using the conventional primate mechanism of physical grooming". If the process of the

evolution of language is to maintain social relationships, then the construction of an extensive social reality such as the one in which we live is a logical result.

I would suggest that it is in this social interaction, the construction of social reality which is where the strength of linguistic relativity lies. Social reality arises out of the common human experience, what Lakoff (1987: 318-320) would call functional embodiment. The external world and our bodies provide a common input into the central nervous system. People experience the feel of the earth beneath their feet or the smell of a rose. They may feel the sense of hunger or of pleasure based on their bodies. But beyond this is a reality constructed by the members of social groups. There is a calibration of meaning and collective intent which are constitutive of a social reality. The relativity of language is inherent in the categorization of these social concepts, relationships and functions.

The relationship between our experience of the physical world and our conceptual structure has been shown by cognitive researchers, such as Lakoff (1987: 276-278) and Sweetser (1990: 12). This experiential basis of conceptualization provides a basic structure and motivates the extension of concepts into other areas in ordered but unpredictable ways. Lakoff gives the example of 'more is up'. This is based in the embodiment in the physical world. This process is equally at work in our conceptual model of social reality. Our conceptual structures may be based in certain social relationships, such as families, but they are extended into new areas of meaning. An example is the concept of grandmother. Everyone has two grandmothers. This is a family relationship which all humans experience. But this concept is extended in some languages. In Japanese, the term *Obaachan* 'grandmother' can be used as a reference for any older woman with certain connotations of respect and intimacy. It might be used, for example, with an old woman selling things by a customer as phatic language. Our common social experience has been extended into a new meaning. A certain kind of kinship between two individuals has been abstracted and then generally applied to non-related individuals in an attempt to create a bond.

Another example is the strict ordering of Japanese society and the way this order is encoded in the grammar. The levels of politeness which are so much talked about are in fact an easily learned system of lexis and syntax. However, the appropriate use of this system is problematic for learners. The difficulty for acquisition is the understanding of the factors involved in the social system which is encoded in the language. One standard reference text (Niyekawa 1991: 10) suggests that the best that can be hoped for is not to be rude. Each sentence in Japanese conveys information about the relative social position of the speaker and listener. Many factors, such as age and social

class are combined in a subtle manner and encoded in the utterance through verbal inflection and lexical choice. These factors are learned very early. The formation of these social concepts and categories which are so important in Japanese society must occur at the same time and be connected with the acquisition of the language which encodes them. If the language which the child is learning reinforces those social categories which are important to know, then the force of the language to mold thinking becomes a powerful survival trait. It enables the child to navigate a complex social system.

This rooting of language in the social reality of human groups would make the relativity hypothesis harder to observe or to prove. If linguistic relativity is in many ways involved with relationships between humans, then it would be less observable or testable than if it was in the categorization and perception of the so-called material world. We often refer to the physical sciences as "hard sciences" and the social sciences as "fuzzy sciences". Linguistics has a difficult task of balancing the border between the two. It is easy to test gravity by dropping a rock, but it is difficult to conduct an experiment which involves the relationship with one's grandmother. Thus in the realm of social reality, where linguistic relativity may be the strongest, it may also be the most difficult to observe.

The lengthening of the nurturing period of mammals provides time for training the offspring to cope with and succeed in responding to the external environment. The social reality of the human is a different matter. Although there is a basis in an external reality, much of the reality in which we live is largely a social construct. If Dunbar is correct in that language develops out of the need to maintain social connections between larger groups which were necessary for survival, then we can see the origins of language in the creation of this social reality. The language itself, which maintains this reality is, in some sense, the reality itself. It is probably not useful to examine the relationship between language and our social reality in order to ask which comes first or which causes the other. They would arise together. This would be true in individual acquisition as well.

3. Perception

A key aspect of acquisition is the process of categorization of perception. Until recently, researchers often assumed that pre-linguistic cognitive development was fundamental to the organization and categorization of perception. In line with Piaget's ideas of the development of cognitive abilities in children, many researchers have treated basic categories, such as spatial categories, as fundamental and non-linguistic. Recent research has brought

the assumption of the pre-linguistic nature of these categories into question. The influence of the ambient language, the language taught by the parents, on our perception is so fundamental and pervasive that researchers may assume that categories encoded in their native language are universal. In speaking of the acquisition of spatial categories, Bowerman (1996) points out that "...the 'non-linguistic spatial concepts' often hypothesized to underlie spatial prepositions – e.g. 'containment'[for *in*] and 'support' [for *on*] – lend themselves much more readily to the shaping of categories of English than, say, of Tzeltal" (160). Bowerman gives a lengthy discussion of the role of language in the acquisition of spatial categories and shows that there are more subtle relationships encoded by languages other than English that are important in the distinctions between locative prepositions. These are important in the categorization of the spatial perception. She gives the example of research by Choi and herself into the acquisition of locatives in Korean. Korean encodes different aspects of spatial relationships and children acquiring Korean do not seem to match the English fundamental spatial categories. In describing the difference between Korean and English she gives the example of the putting of an apple in a bowl, a cup on a table, a cassette in a box and a lid on a container. In English, the language encodes the perceived similarity of 'on the table' and 'on the container' using the locative preposition *on*. In Korean, the fit of two 3 dimensional objects to each other is considered basic, and so the putting of a lid on a container or a cassette in a box are both realized by the motion verb *kkita*. The putting of a cup on a table and a lid on a container are not perceived as being the same spatial relationship. They are distinctly different. Children learning Korean have a different set of spatial relationships from those encoded in English and the order of acquisition is different. This would not be true if the spatial categories were based on some pre-linguistic cognitive development. The acquisition of spatial terms by children seems to be directed by the relationships encoded by the language, rather than some hypothesized fundamentals. Adults, by teaching children a specific language, mold the cognitive categories and perceptions of their children.

Bowerman suggests that the developing mind seems to have a high degree of plasticity and is susceptible to "language specific principles of semantic categorization" (169). She does not make a strong claim but says that there is a "...possibility that ... spatial thought – undeniably one of our most basic cognitive capacities – bears the imprint of language" (170). However, continuing research on the acquisition of spatial terms in many languages supports and strengthens this claim. (For example, see comparative studies of Danish and Zapotec reported by Jensen de Lopez and Sinha 1999.) Furthermore, studies of speech perception show that monolingual adults are lan-

guage specific perceivers and the ambient language is critical for the development of the perceptual abilities. While it is possible for adults to learn to perceive new speech patterns, it is often difficult. The first year of life is critical in setting the pattern. Bohn (Forthcoming) summarizes much of this research and points out that "infants initially display universal patterns of speech perception, but these perceptual abilities are dramatically and profoundly affected by the ambient language long before (other) linguistic abilities develop". It is not that adults lose the ability to sense the sounds of other languages, but "rather their attention has shifted to those phonetic distinctions, and the clues that signal them, that serve to differentiate the native phoneme inventory". This is not merely learning the sounds of their native tongue, but it is in fact a fundamental cognitive change. The focusing of the child's perception of speech is only the beginning of a long process of the influence of language on the cognitive ability to organize and categorize the world around them.

The processes of perception, categorization and conceptualization are dynamic and fluid. The concepts or categories are not static things which are located somewhere in the brain, but they are revealed by the states of the neurons in the brain. Categories are not developed and then stored somewhere in the brain; rather they are expressed by the mental state, i.e. the state of excitement of all the neurons in the brain. Perception is influenced as much by the mental state as by the external stimulus. The same stimulus may be interpreted in different ways depending on the neural state of the central nervous system. If the process of acquisition of language is interdependent with the acquisition of categorization, then it can be seen that, from the view of the offspring, the function of language in perception precedes the function of language as communication. This is suggested by Gumperz and Levinson (1996: 33) when they point out that at the very least, if a grammar encodes some aspect of reality, then that aspect must be foregrounded in the perception of that reality. As seen above, at least in the area of speech perception, this focusing of attention has profound effects. It is extremely unlikely that this is limited to the perception of speech. Language must also focus the perception of other aspects of the world.

Much of the discussion of perception and cognition assumes that the perceptual stimulus is in all cases the same and that the resultant cognitive processes may alter the mental representation. However, Kelso's work (1997: 213) shows that "... there is a clear separation between the neural analogues of the acoustic (or any other) signal, and what the brain is doing when people perceive". The dynamic nature of category formation in the brain is such that what is perceived at any moment depends on the previous states of the brain, as much as the actual neural stimulus. This means that the presence of

thoughts, in the form of language or other cognitive processes, has a filtering effect on perception. It is not the case that we all see the same thing and then somehow the mental processes store it or alter it. Our mental state at the time of seeing affects what we see. If this claim is true, then it is certainly true that there is linguistic relativity. Language, at the least, filters perception at the source. Which language is used changes the filters, changes our perception. The ability of language to filter perception is a key feature of the linguistic relativity of language. Our conceptual structure, based in our language, actually changes our perceptions. Language becomes a tool of perception.

Language as perception would be an evolutionary advantage. It would allow parents to help children learn the features which are important for backgrounding and foregrounding in the environment. Bateson (1979: 29) claims that all perception is a matter of foregrounding. Language acts to filter or emphasize what is foregrounded. Children able to acquire an efficient set of filters would be at an advantage in functioning effectively. The encoding of these concepts into a system of abstractions which can be transmitted would then be an advantage. If a parent can cause the formation of certain categories of perception without the time and situations which are required by providing structured experiences, that is a survival advantage. An additional advantage would be that parenting would not be limited to day, or structured experiences. Long winters and nights without the outside world could be used for teaching.

The question arises of how this teaching is related to the development of the mind, the higher cognitive abilities. Lamb (This volume) shows that it is directly related to the formation of neural pathways in the brain. Further evidence comes from research into the language abilities of chimpanzees and bonobos. Susan Savage-Rumbaugh has found that the acquisition of the rudiments of language has altered the social behavior of these primates. She argues (Savage-Rumbaugh and Lewin 1994) that comprehension of language is a separate ability. This would support the function of language in building cognitive abilities, language as perception. She also suggests that language is not used to convey skills, but to establish and maintain the social rules in which those skills are used.

David Premark, who trained the chimpanzee, Sarah, concluded that her mind had been 'upgraded' by being taught a symbolic language (cited in Dunbar 1990: 105). However, Dunbar, in speaking of the cognitive abilities of the chimp says, "I am not so convinced that Sarah's mind was upgraded merely by the learning of a language: the language did not suddenly create concepts or knowledge that her mind did not previously possess. Rather, Sarah's mind was upgraded by language because language provided her with

access to Premark's mind". He was able to pass on to her concepts and ways of looking at things that she might never have thought of on her own. And the emphasis here is very much on the 'might' rather than the 'never'. Dunbar seems to be arguing both ways by saying that language did not create new concepts, but that through language Premark could pass on new concepts. The process of learning is dynamic and not a fixed thing. So, the process of passing on these new concepts is part of the teaching the language. It is not a before and after choice; it is a continuous process, synchronous, mutually reinforcing and limiting. The same interdependency relates the teaching of language and the development of cognitive abilities.

Perceptual stimulus is not just external. Beyond perception, there is proprioception and reflection. All three of these occur within the central nervous system. We can assume a common external world which causes stimulus, but there can be no such assumption of a common internal neural state which leads to common reasoning. With millions of neurons involved, the dynamic complexity of our nervous system is such that similar initial states would still suffer from the butterfly effect. Kelso's work shows this. Granted that with the use of words, and perhaps other modes of communication, there can be a reconstruction or convergence of these states. There may even be similar mental states which arise independently, but it can not be assumed that these states are the same. The complex interaction of these processes is such that prediction of states becomes impossible.

Furthermore, it quickly becomes difficult, if not impossible, to distinguish between externally stimulated experience and internally stimulated experience. Chafe (*This volume*) points out that "...both memory and imagination produce pseudo-perceptual experiences that are present in the absence of any external stimulus." Language can also trigger these pseudo-perceptual experiences. Studies have shown that as many as 25% of a tested population recalled events which did not happen in their childhood, but were suggested by a reading session (Loftus 1997). Here the effects of language are not on the perception but on the storage of the experience. False memories are easily created by language. One reason may be that our experience is often stored as a story, rather than the actual sensory experience. As experiences are talked about, the words used to describe the event are also stored and may replace the memory (Johnson 1990: 229-233). This might be for economy of memory, or it might be the result of the very process of acquisition of categories and the language filter. The power of language to create the illusion of actual experience is an area where much study is needed.

The difficulty in separating out reported information from directly experienced information might itself offer some evidence. If actual experiences can easily be confused with memories created by language, then it would be

useful to have some way to distinguish between varieties of experience and perception. Many languages, English among them, have ways of distinguishing between actually experienced perceptions and those which have been passed verbally. This marking shows that languages themselves seem to code this distinction in an attempt to clarify sources of information.

4. Conclusion

It is clear that language can alter our memories, and therefore the basis on which we make judgements, and that language can alter our perceptions. This makes language a useful tool in surviving in both the physical reality and the social reality. The acquisition of language is the acquisition of a conceptual structure which filters perception. The work on false memories shows that words can create memories of experiences which did not occur. Words can also supplant the actual experience in memory. This ability to use language to modify perception in children becomes a survival advantage. The ability to create appropriate states in the mind of offspring through language is an efficient means of developing appropriate behavior, survival behavior. It provides a way of instilling in offspring a successful manner in which to respond to the physical environment as well as the social relationships which are equally important.

If parents can use language, and especially the acquisition of language, to alter the perceptions of their offspring and to provide the offspring with a conceptual structure that enables them to excel in survival, then linguistic relativity can be seen as a survival trait. However, it can also be seen as presenting an ethical dilemma for our modern society.

As Lakoff (1987: 337) and Lee (1996: 33) both point out, one of the frequently overlooked aspects of Whorf's writing is his strong sense of ethics. The idea that parents can use language to mold the minds of children is very much a part of this ethical awareness. In times when we see so much difficulty with accusations arising from so-called therapists and the cause of so much anti-social behavior laid at the feet of parents, it may be important to realize that the acquisition of language is the acquisition of mind. The conceptual structures which we pass to our children will affect their behavior for their entire lives. As parents, we can provide our offspring with a good conceptual structure or a flawed one. Whorf sought greater understanding and a broader awareness of alternative views of the world amongst linguistic groups, but perhaps we can also look much closer to home in the acquisition of a mother tongue by a child.

Note

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