Biology of Cognition

How Humberto Maturana’s Biology of Cognition Can Revive the Language Sciences

Alexander Kravchenko • Baikal National University • sashakr/at/hotmail.com

Purpose
This paper demonstrates the conceptual relevance of Maturana’s biology of cognition for the theoretical foundations of the language sciences.>

Approach
Stuck in rationalizing, rather than naturalizing, language, modern orthodox linguistics is incapable of offering a comprehensible account of language as a species-specific, biologically grounded human feature. This predicament can be overcome by using Maturana’s theory to stress that lived experience gives language an epistemological “lining.”>

Findings
The key concepts of Maturana’s biology of cognition provide a more coherent theoretical framework for the study of language that can give new life to the language sciences by stressing language and the importance of connotation.>

Conclusion
Maturana’s concept of “languages” allows the language sciences to depart from the view of language as a system of symbols. Instead, focus should be placed on how the relational dynamics of linguistic interactions trigger changes in the dynamics of the nervous system and the organism as a whole, and how their reciprocal causality is distinguished and described by the language observer in terms of mind, intelligence, reason, and self-consciousness.>

Keywords
Linguistic orthodoxy, observer, consensual domain, languaging.

Introduction

The sciences depend on knowledge, which is the product of humans as a biological species. All knowledge is generated by human beings in language as humans operate as units of interaction in a consensual domain. As the features of our existence that constitute our humanness “pertain to our relational domain and occur in our ‘language, not in our bodyhood” (Maturana, Mpodozis & Letellier 1995: 24), knowledge can be traced to its biosocial functions, which lie in relational dynamics. Indeed, as long as these dynamics are not identified, one cannot fulfill the purpose of scientific inquiry.

Humberto Maturana’s (1970) Biology of Cognition marks a key point in the rise of biologically oriented cognitive science. While interest in his ideas has attracted many followers in various fields of theoretical and empirical research, his theory (also known as “autopoiesis”) is still often seen as exotic, if not esoteric (cf. Cashman 1989; Harnad 2007). This is explained by Margaret Boden:

“...The vocabulary of autopoiesis is unfamiliar to most biologists [...] On the one hand, they reject theoretical terminology that is common in both biology and psychology. On the other hand, they speak of knowledge and cognition in many contexts where psychologists and most cognitive scientists would not.” (Boden 2000: 132f.)

However, the problem is that most cognitive scientists persist in talking about a twenty-first-century problem (the nature and essence of cognition as a biological phenomenon) in an outmoded mid-twentieth-century vocabulary based on the computational metaphor. Departure from tradition, even when it is an unproductive tradition, can be a very slow process in academia. Luckily, as a consequence of my personal developmental history as a scholar, I was not burdened with this computational tradition at the beginning of my linguistic career. As a result, the understanding of language and grammar that I constructed differs from that offered by orthodox linguistics in the course of standard instruction (for a related discussion see Dykstra 2005).

Early on in my teaching career (I taught English as a foreign language) I realized that grammars were not giving a full picture of linguistic phenomena, often offering explanations that were of little practical value, and even misleading in regard to certain facts of language use. That aroused in me curiosity tinged with suspicion, and triggered a change in my state of mind that, through a series of thorough perturbations, eventually got me deeply involved in empirical research on English grammar.

While working on my first thesis, I realized that, as a phenomenon, indexicality had a much wider scope than was traditionally believed, and it could not be properly understood or adequately described without reference to a special pragmatic parameter, the observer. As a matter of fact, any comprehensive analysis of language must prioritize the observer over the speaker. This line of analysis was pursued in a series of publications (Kravchenko 1992, 1993, 1996) showing the methodological efficacy of the premise: the key to understanding various linguistic phenomena as they are identified and described in traditional, text oriented linguistics, lies precisely in this contrast. Although a speaker is always an observer who makes distinctions in a consensual domain of interactions, in written texts the observer, identified with the help of various lexical and grammatical means known as indexicals, is not always or necessarily the speaker/
writer, even though this other-than-the-speaker observer – that is, his experience on which the speaker/writer draws – does prompt the latter what to say/write. This contrast was effectively put to practical use in a cognitive English grammar for speakers of Russian (Kravchenko 1997). However, the idea that linguistic analysis should make recourse to the novel concept of the observer seemed strange, dubious, and weird to many linguists in Russia.

In 1997, my friend Victor Vinogradov, from Moscow, gave me a recent book with select abridged translations of some works published abroad. There I read for the first time Maturana’s Biology of Cognition, which contained the famous thesis, “everything said is said by an observer to another observer who can be himself or herself.” This was a pivotal point in my research. By then, the pragmatic shift in research on linguistic meaning was already obvious and, with this move, semantic analysis could be tied to concepts such as “perceiver,” “experiencer,” “viewpoint,” “vantage point,” and so on. Human perception had inescapably become part and parcel of how many linguists conceptualized problems of meaning, categorization, conceptualization, and communication. It had become clear that meaning draws on perception and, by extension, categorization processes (Schyns 1997). Even object recognition and categorization is largely an on-going process, affected by experience of our environment (Wallis & Bülthoff 1999). Such findings were affected by experience of our environment.

1997). Even object recognition and categorization is largely an on-going process, affected by experience of our environment (Wallis & Bülthoff 1999). Such findings were in conflict with the theoretical foundations of orthodox linguistics in that they treat language as inseparable from our biology and the praxis of the living. Accordingly, using Maturana’s (1978) Biology of Language, I argued for a new linguistic epistemology (Kravchenko 2003). By contrast with the orthodox view, which separates identification of form from identification of meaning and posits that forms enact (denotative) functions, it emphasized the necessity of viewing sign, meaning, and knowledge as intrinsically interdependent and codetermined. This view was further elaborated in a more recent work (Kravchenko 2008) showing that Maturana lays out the foundations of a theory whose epistemological potential can transform the study of language. In this paper, I begin by outlining the predicament of orthodox linguistics and, having done so, show how Maturana’s theory can resolve some of its major problems.

The impasse of mainstream linguistics

Modern linguistics builds on the idea that language as a symbolic system (an arbitrary code) can be separated from an “objective reality” that is not constituted in language and is thus “represented” in it. As a result, linguistics is caught between the Scylla and Charybdis of two main conceptual-theoretic trends. One is the offspring of analytic philosophy with its propensity for analyzing language phenomena down to the limit of analyzability and proclaiming atomistic truths about language that it claims, are all that is needed to understand linguistic facts. Different schools within this tradition may be labeled as “modern orthodox linguistics” (Harris 1981). As a result of separating language from non-language, most schools view language as a fixed code. It is taken to depend on determinate forms with underlying meanings that are exchanged in the process of communication. In contrast to this, the linguistics of mainstream (first-generation) cognitive science (Chomsky 1966) treats the mind as akin to a von Neumann computer and views language as a special symbolic system for translating thought. In this version of the code view, therefore, thinking is computation: symbol use is governed by a set of rules that predict what possible sentences can be generated in a given language. Thus generative linguistics (grammar) aims at providing an analysis of human grammar-forming capacity (the so-called Universal Grammar). Instead of positing a parallel with an external code that is learned, it is supposed that a built-in universal code enables each human being to acquire their native language.

Both versions of the code view focus on rarefied abstractions that have little to do with living language or human experience. In assuming that languages resemble a fixed code, they sustain what Roy Harris (1981) calls the language myth: the doctrine that languages consist in sets of determinate forms that are used to “send” messages from sender to receiver. In this context, I lack the space to critique the claim that language consists in determinate forms (but see: Ruhmelhart 1979; Harré & Harris 1993; Love 2004; Port 2010). However, it is important to recognize that it is not only institutionalized by orthodox linguistics, but also in our educational systems. It gives rise to the publicly shared illusion that language is a tool for the transfer of thought. Thus language and thought become ontologically independent of each other and, as explained below, this gives rise to the vicious circle problem – one that can be removed by taking the biology of cognition view seriously.

The code model of communication emphasizes speakers. These are seen as agents that “encode” information about the world in linguistic forms (which become “symbols”), and, in normal circumstances, “transfer” it to the receiver as “meanings.” This model draws on two basic assumptions: first, we casually speak about verbal communication as an activity, second, we take a more or less mechanistic vision of communic-ation where concepts such as “symbol,” “communicate,” and “meaning” are treated as depending on objects or physical operations (the precursor to ubiquitous computational metaphor). Because we express thoughts by looking for and finding the right words, and because the goal of speaking is often seen as getting meanings across, giving and taking ideas or giving someone a piece of our mind, etc., it is not really surprising that the so-called common-sense view of language treats it as a kind of tool, or medium, for transferring thoughts from one head to another. However, common sense is not science. On the contrary, it is often the job of the latter to show how and why common sense views of certain phenomena are misleading or downright false (Love 1998; Spurrett 2004).

Paradoxically, as far as understanding of the role and function of language goes, linguistics as a self-defined “scientific study of language” has offered little to refute these layman common-sense assumptions. Both modern orthodox linguistics, institutionalized in educational practices, and first-generation cognitive linguistics, institutionalized in contemporary theory, fail to overthrow the “sender–receiver” model of communication (Reddy 1979). The alleged analyticity of language, where linguistic
analysis is compared to the chemical analysis of molecules into atoms (Wierzbicka 2004), is a fiction. In fact, language is not reducible to the sum of its parts. Although the written language bias in linguistics (Linell 2005) tempts many to view language as a system of manipulable things (symbols), it fails to clarify language as a whole – just as knowing the molecular structure of water (H₂O) fails to explain its properties, which are radically different from those of the constitutive atoms. As for generativism, its blind infatuation with computer science as the "paradigm" for explaining language and cognition is unproductive. This is, first, because the brain is not a computer, and, second, "the suggestion that we should think of ourselves as computer programs is not coherent" (Bennett & Hacker 2002: 432).

Linguistics has also profoundly misconstrued language through its myths about autonomy, systematicity, and the rule-bound nature of language (Sinha 1999, Pennycook 2008). Language is persistently portrayed as something locked inside the black box of the "mind" (Pinker 1999), from which mental content is transferred over space/time to another such black box in the process of what Roy Harris (1981, 1996) sarcastically refers to as "telemantation."

The professed goal of cognitive science is to understand how the mind works (Pylyshyn 1999, Ritter 2005). The belief that language "is in the mind," or that "mind creates language" (Pinker 1995) implies that the scientific study of language should be able to tell us important things about the architecture of the mind (Culicover 2005). In the internalist, "centralist" account of first-generation cognitive science (Chomsky 1975; Pinker 1995; Fodor 1998; Harnad & Dror 2006 inter alia), cognition takes place entirely within the brains of cognizers. The picture drawn by internalists is very straightforward: there is an independent (objective) world to be "cognized" by an autonomous cognizer in the course of interactions with the world. Far from regarding these interactions, or structural couplings, as the basis for language and cognition, these are seen as "performance capacity" arising from the processes that go on in the brain. By accepting an internalist account of mind and language, "centralist" cognitive science is obliged to face the methodological consequence of "segregating" language from the so-called "external" physical world (Harris 2004). Quite simply, it loses sight of how language appears to observers. Since the classical view of language lies at the root of the classical view of mind, the latter also is segregated from the world. Such segregational or dualistic logic results in a profound theoretical and conceptual tangle. Instead of recognizing the key role of the observer, the code view assumes that there are "mechanisms" that link language as activity and as product. In ways that are never specified, these are assumed to allow it to function both as a sign system for "representing knowledge" and as a communicative activity.

If emphasis is given to "symbolic" aspects of language, the focus of attention shifts to interindividual relationships between different types of signs and structures for representing knowledge (whatever those may be). Inevitably, this opens up controversies about the nature and character of categories, concepts, representations, etc. Meaning becomes information (Fodor 1998) – that is, symbolically recorded and transmitted messages – with linguistic structure as its vehicle. The theory of meaning developed within this framework is burdened with logical formalizations aimed at providing an explicit well-defined theoretical (as opposed to empirical) model of semantics governed by sets of rules that ultimately constitute the so-called I-language as a biologically based feature of the brain (Chomsky 1965; for a critique, see Hutton 1998). However, such issues are readily avoided if, instead of focusing on inner concepts, one turns to the interactional features of language that enact joint activity (H.Clark 1996).

From this view, language consists in the continuous making of linguistic choices from a wide and unstable range of variable possibilities in a manner that is driven by highly flexible principles and strategies. In this, one can move beyond the vicious circle problem – that of trying to explain language systems in terms of use and, at the same time, use in terms of systems. However, in so doing, it also becomes necessary to explain how communication is possible (Verduyn 1999). This is what really scares the traditional linguist who does not want to admit that understanding text as structure amounts to not understanding language at all. For these reasons, "a more comprehensive view of language as a system of signs must also include the human 'conceptualizer' and the world as it is experienced by him" (Dirven & Verspoor 1998: 14).

For Maturana, the scientific explanation of language as a biological phenomenal consists in the proposition of a generative mechanism that gives rise to the dynamics of interactions and co-ordinations of actions that an observer distinguishes as language.** (Maturana 1988: 45, my emphasis)

To emphasize this fundamental shift from a focus on inner concepts to interaction, Maturana introduces the term "language" to stress the dynamics of linguistic behavior that arises in a consensual domain of interactions, opposing this to language in its etymological sense – something done with the tongue (Fr. langue + -age "pertaining to"). In focusing on languaging, he shifts the emphasis from patterned acoustic sequences produced by human individuals and their alleged denotational "meanings."

Second-generation cognitive science draws on the notions of "radical constructivism," "embodiment," and "enaction" (Glaserfeld 1984; Varela, Thompson & Rosch 1991; Zlatev 1997; McGee 2005a, 2005b) in moving beyond purely internalist accounts of language and cognition. It views perception as consisting in perceptually guided action, and cognition not as problem solving based on the (symbolic) representation of a pregiven world by a pregiven mind, but rather as the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs. In Ernst von Glaserfeld’s terms, “cognition serves the subject’s organization of the experiential world, not the discovery of an objective ontological reality” (Glaserfeld 1995: 51). However, enactivism fails to take a strongly defined position in regard to the nature of mind. Rather, it links two important claims. First, “knower and known, mind and world, stand in relation to each other through mutual specification or dependent co-ordination” (Varela, Thompson & Rosch 1991: 150). Second, the role of intersubjectivity is crucial because “interactions between people are codependently defined, experienced, and acted out” (Rosch 1999: 72). While the
claims are clear, what is left in doubt is how these are to be reconciled: though making mind dependent on codependent relations is a clear advance on the computer model, the mind remains strangely embodied, even though co-originating with the world. In second-generation cognitive science (Lakoff & Johnson 1999), while we are coupled to the world through our embodied interactions, the biology of language and reason is still taken to depend on the naked brain. In this, there is a contradiction: on the one hand, cognition is interaction with the environment, yet on the other hand it “takes place within the brain.”

The notions of distributed cognition (Hutchins 1995; Spurrett 2004) and distributed language (Cowley 2009) take cognitive explorations conceptually still further, representing what might be called third-generation cognitive science. From the distributed view, language and cognition, being operational domains, are not entirely embodied; cognitive processes, especially in living systems, exploit and are interconnected with bodily and environmental resources. However, contemporary cognitive linguistics remains, essentially, centralist in its understanding of cognition and language. Following Marvin Minsky (1975), first-generation cognitive science continues to view mind as built from many “mindless” processes going on inside the brain, and language as a neural function of the brain, which “computes” language (Feldman & Narayanan 2004; Feldman 2006). Not surprisingly, dissent is brewing within the cognitive science community, especially among those who have first-hand experimental knowledge of how living organisms function, and who have ample empirical evidence that this functioning is essentially different from an algorithmic script followed by a machine – that is, biologists. A new, non-Cartesian approach to cognition has emerged (Maturana & Varela 1980; Glasersfeld 1995; Clark 1997; Deacon 1997; Rockwell 2005; Wheeler 2007), setting the stage for a biologically oriented cognitive science. This approach calls for a revision of initial epistemological assumptions in mainstream linguistic research, especially in view of the fact that, so far, linguistics as a science has not been able to provide revolutionary insights into the nature and function of language and its relationship to mind.

An existing impasse in the study of this relationship cannot be overcome as long as the problem itself is not reformulated to rid it of the intrinsically dualistic assumption that there is, in fact, a phenomenon called “language” that is ontologically independent of the phenomenon called “mind.” As has been suggested elsewhere (Kravchenko 2009), in the spirit of Vygotsky (1987) and Maturana (1978), mind cannot be understood without and outside of language as a manner of operating in consensual coordinations of consensual coordinations of behavior. Because a human organism is a structure determined system, what happens in language also becomes, as part of the relational space, part of the domain of transformation of the human nervous system, giving rise to what appears as mind/body mutual modulations. Yet the notion of mind, along with the notions of consciousness, thinking, and intentionality “correspond to distinctions that we make of different aspects of our relational dynamics in our operation as human beings, and as such they do not take place in our bodies, nor are they functions localizable in our brains” (Maturana, Mpodozis & Letelier 1995: 24).

An understanding that, in the case of humans, cognition and language are biological processes that characterize living systems as unities of interaction calls for a biology of cognition and language developed by Maturana.

In the context of what has been said above, the study of language aiming at understanding its structure and function must naturally and necessarily have an epistemological “lining.” I use this expression to refer to a set of epistemological assumptions about science and explanation that Maturana proposes in order to understand language as a biological phenomenon, and above all, to the concepts of observer (a living system capable of making distinctions), unity (an entity specified by operations of distinction and characterized by the properties assigned to it by such operations), organization (a composite unity), structure (the actual components of a unity and the relations they must satisfy as such), property (a characteristic of a unity specified and defined by an operation of distinction), structural determinism, and structural coupling (Maturana 1978). And of course, the concept of observer is at the core of Maturana’s epistemology, just as it is crucial in understanding the biology of language.

**Biology of language and its implications for the language sciences**

According to Maturana (1970), cognition (in the broad sense of the word) is not a means to acquire knowledge of an objective reality. Knowledge is instead entirely dependent on what an observer distinguishes or brings forth in language. The process of cognition, as sensory motor coordination, is made evident through the actual acting or behaving in the domain of interactions and is made possible by the organization of the living system. Thus, “as a basic psychological and, hence, biological function, cognition guides [man’s] handling of the universe” (Maturana 1970: 1). This reflection may be extended by adding that, in the case of language, human beings, cognition serves an organism in its active adaptation to the world of experiences, without which there may be no “handling of the universe.” This crucial distinction, in my opinion, is the reason why in the vast cognitivist literature the biology of cognition is rarely mentioned – despite the fact that it has been around and elaborated for several decades (Maturana 1975, 1987, 2006, 2007; Maturana & Varela 1987; Maturana, Mpodozis & Letelier 1995; Maturana & Poerksen 2004). To take it seriously “would be to undermine many concepts and theories familiar within cognitive science” (Boden 2000: 141). Yet such undermining is inevitable in the evolutionary development of science (Kuhn 1962).

In the biology of cognition, living systems are unities characterized by circular organization and operating as units of interactions. In the case of living systems, their circular organization effects a homeostatic system by producing and sustaining the components that instantiate and integrate this circularity of organization. All the particular features of various kinds of organisms overlay and support this fundamental circularity by sustaining its unin-
terrated continuity in sequences of interactions with the constantly changing medium.

A detailed exposition of Maturana's views on linguistic interactions is given in his 1978 seminal paper "Biology of Language: The Epistemology of Reality." He begins with some initial epistemological assumptions necessary for a scientific explanation, emphasizing the role of the observer without whom scientific explanations do not exist, and who brings them forth in language:

"Science is a closed cognitive domain in which all statements are [...] valid only in the domain of interactions in which the standard observer exists and operates. [...] It is only when we want to consider the observer as the object of our scientific inquiry [...] that we encounter a problem if we do not recognize the subject dependent nature of science." (Maturana 1978: 29)

Therefore, to give a scientific description of the observer as a distinction made in language, the subject dependent nature of science must be taken as a starting point. This basic assumption is in sharp contrast with the theoretical principles of linguistics as an "objective" science. Even though it was natural scientists who began to speak of the necessity to take into account the observer when formulating their scientific outlook on the physical world (Neumann 1955, Char din 1956; Schrödinger 1959), paradoxically, in modern linguistic orthodoxy the subjective nature of science continues to be dispensed with, and science itself continues to be looked upon as a body of "truths" about the physical ("objective") world to be "expressed," with the help of language as simply a tool or "conveyance" for such truths. No wonder that anything else that Maturana's theory has to offer becomes -- to orthodox thinkers -- inconsequential because of the "absurdity" of the starting premise. Maturana (1978) sees "normal" science as continuing to remain in the grip of vitalistic reductionist explanations for observed phenomena in the world in its quest for the ultima ratio, to which he opposes his own approach based on non-reductionist mechanistic explanations:

"The reality described through mechanistic explanations [...] implies the possibility of an end

less generation of nonintersecting phenomenal domains as the result of the recursive constitution (organization) of new classes of unities through the recursive novel combinations of unities already defined." (Maturana 1978: 30).

There can be no science or scientific explanations without the observer, as explanations, realities, worlds are dependent on what the observer brings forth in language. How does Maturana define language, though? Rejecting the denotational nature of language as a fallacy, he focuses on the notion of the consensual domain as the domain of interlocked conducts that results from ontogenetic reciprocal structural coupling between structurally plastic organisms:

"Linguistic behavior is behavior in a consensual domain. When linguistic behavior takes place recursively, in a second-order consensual domain, in such a manner that the components of the consensual behavior are recursively combined in the generation of new components of the consensual domain, a language is established." (Maturana 1978: 50).

An understanding of language as behavior in the consensual domain gives a new perspective on natural language grammar. Since the behavior of organisms in a consensual domain is a set of recursive operations, the surface structure or grammar of a given natural language may be only a description of regularities in the structural coupling between the elements of consensual behaviors made by an observer. This surface syntax may be whatever, since its development would be a matter of historical contingency, not of structural necessity determined by a particular physiology of an organism. In this context,

"the 'universal grammar' of which linguists speak as the necessary set of underlying rules common to all human natural languages can refer only to the universality of the process of recursive structural coupling that takes place in humans through the recursive application of the components of a consensual domain without the consensual domain." (Maturana 1978: 52)

To an observer, linguistic interactions appear as semantic and contextual interactions. Yet what takes place in the interactions within a consensual domain are strictly structure-determined, interlocked concatenations of behavior. Therefore,

"the context on which the outcome of a linguistic interaction depends is completely determined in the structure of the interacting organisms, even if this is unknown to the observer. The overheard sentence, 'They are flying planes,' is ambiguous only for the observer who wants to predict the outcome of the interaction with insufficient knowledge of the structural state of the speaking organism." (Maturana 1978: 53)

Taking the consensual domain of interactions of organisms as fundamental in the construal of a new epistemology allows Maturana to make the next step and define reality as a "domain specified by the operations of the observer." Finally, "all that remains is the observer" with his unique "ability through second-order consensuality to operate as external to the situation in which he or she is, and thus be observer of his or her circumstance as an observer" (Maturana 1978: 60f.).

The key to understanding language is the observer and the observer's descriptions of interactions with which he, in his turn, interacts by means of language. Once this is acknowledged, it leads to a dramatic change of the entire view of language as a system of arbitrary symbols: the "symbolism" of linguistic signs becomes a second-order phenomenon, derivative from their intrinsic indexicality.

Charles Peirce used the term index for

"a sign… which refers to its object not so much because of any similarity or analogy with it, nor because it is associated with general characters which that object happens to possess, as because it is in dynamical (including spatial) connection both with the individual object, on the one hand, and with the senses or memory of the person for whom it serves as a sign, on the other hand." (Peirce 1932: 170, my emphasis)

However, Peirce's famous trinity of icon, index, and symbol has been somewhat misinterpreted in linguistic semiotics as a rigid hierarchical system of sign vehicles (i.e., linguistic signs, such as words, are defined as either symbolic, indexical, or iconic), while Peirce's approach was based on how a sign
vehicle was to be interpreted in a particular instance of its use. The symbolic function of linguistic signs is made possible by their groundedness in indexical reference. As Terry Deacon points out,

“Symbolic reference is often negatively defined with respect to other forms of referential relationships. Whereas iconic reference depends on form similarity between sign vehicle and what it represents, and indexical reference depends on contiguity, correlation, or causal connection, symbolic reference is often only described as being independent of any likeness or physical linkage between sign vehicle and referent. This negative characterization of symbolic reference – often caricatured as mere arbitrary reference – gives the false impression that symbolic reference is nothing but simple unmediated correspondence.”

(Deacon 2011a: 394)

For a child learning language, linguistic structures (signs) function, first and foremost, as icons and indices, thus ensuring perceptual groundedness of language as an orientational activity in a consensual domain of interlocked conducts. For that matter, all nervous systems support iconic and indexical reference as a meaning-making process of interaction with the environment. However, organisms with a nervous system cannot go beyond their limited realm of first-order consensual domain; to do so requires language as a second-order consensual domain not limited by the here-and-now of the physical context of communicative interactions. This freedom – as it appears to an observer – from the here-and-now of the cognitive niche is a distinctive property of symbols as coordinations of coordinations of behavior. The symbolic function of linguistic signs, viewed as artificial entities in orthodox linguistics, is an emergent property, arising with the establishment of language as a second-order consensual domain in which elements of the first-order consensual domain (linguistic signs perceptually grounded in the physical context – icons and indices) are used without the consensual domain. Since indexicality is, to use the terminology of the biology of cognition, a consensual property by definition, the concept of “sign” approached from this perspective leaves no room for the idea of coded equivalence as unmediated correspondence (Kravchenko 2007), thus making the “fixed code” doctrine void.

As with any idea that revolutionizes a particular area of knowledge, and exactly because it serves this particular purpose – to set a new direction in thinking about things that appear to be well-known because they have been the object of scientific inquiry for a substantial period of time – the biology of cognition may not offer a complete picture of cognition and language in the minutest detail. After all, Maturana is, originally, a biologist, and he has been explaining cognitive phenomena from a biological basis. This is probably why, while speaking about the biology of language, he seems to leave open the question of meaning-making, which is the core issue in cognitive science. Although Maturana himself denies “teleology” as an intrinsic attribute of both autopoietic systems and mechanistic explanations, according to Di Paolo (2005) autopoiesis provides a systemic language for speaking about intrinsic teleology. As argued by Deacon and Sherman (2007), the current conception of causality based on mechanistic metaphors is incompletely specified even for very simple biological systems; this can be traced to a conception of the natural selection process that tacitly assumes, but systematically ignores, essential relationships and requirements of this process. However, there is an emergentist, constructivist alternative. Deacon and Sherman outline a biological approach to adaptive function that taps into new insights about the organic processes recruited by natural selection, and their findings allow them to argue that adaptations involve irreducibly teleological features and yet emerge from evolutionary and self-organizational processes that are themselves non-teleological.

Di Paolo (2005) suggests that the original formulation of autopoiesis needs to be elaborated further in order to explain meaning-making. This has been attempted by Weber and Varela (2002), who, as Di Paolo describes it, tried to link autopoiesis and sense-making through “the instauration of a natural perspective from which encounters with the world are intrinsically meaningful for the organism” (Di Paolo 2005: 429). While describing this effort as a “promising starting point,” Di Paolo points out Weber and Varela’s “unspoken reliance on apparent implications of autopoiesis which are not elaborated in the theory and do not immediately follow from the original formulation” (Di Paolo 2005: 433). By examining the primary formulation of autopoiesis and the distinct concepts of robustness and adaptivity, Di Paolo concludes that autopoiesis implies only the former while sense-making needs the latter. However, even though it may appear that structural coupling is overlaid in the autopoietic tradition because human cognition is not just biological but biocultural, the very idea of reciprocal structural coupling cannot be divorced from the concept of consensual domain of interactions in which this coupling occurs and in which consensual coordinations of coordinations of behavior emerge, giving rise to language and culture in the case of humans. The role of culture is not denied by autopoiesis, as autopoiesis is linked with the niche through structural coupling; the role of culture in conserving adaptation is implied, even though not elaborated. Socio-cultural aspects of language and meaning-making have recently been addressed by Maturana and Verden-Zoller (2008), as well as by researchers in the biology and dynamics of cognition (Tomasello 1999; Zlatev 2003; Tomasello & Rakoczy 2003; Cowley 2004a; Cowley, Moodley & Fiori-Cowley 2004; Rusch 2007; Deacon 2010 inter alia).

Biology of cognition as a theoretical framework for the study of language

The advantage the biological approach to cognition and language has over the orthodox Cartesian framework is that it resolves the “vicious circle” problem in explanation (that is, circularity that traditionalists despise) by proposing an explanation of an organism as a living system with a circular organization. This allows one to reconcile the two approaches to language – as a system of signs (a “thing,” a “product” of human semiotic activity) and as communication activity (a “process,” which consists in producing and using signs). Because living systems are characterized by circularity of
their organization, and because they exist as units of interaction in a consensual domain of coordinations of behavior, language may be defined not as a capacity, but as a relational (behavioral) domain sustained by the use of linguistic and non-linguistic signs in the course of such coordinations. It is not surprising, therefore, that circularity of the organization of a living system finds its manifestation in the relational domain of language. It becomes strikingly obvious in semantics as the study of meaning of linguistic signs: all attempts to provide a hierarchically organized linear system of relational (behavioral) domain sustained by the use of linguistic and non-linguistic signs are subject to change to the extent that the nervous system enlarges the domain of interactions of the organism by making its internal states also modifiable in a relevant manner by “pure relations,” not only by physical events (Maturana 1970: 5). These relational components (i) recursively participate through their interactions in the realization of the network of productions (and disintegrations) of relational components that produce them; and (ii) by realizing their boundaries, constitute this network of productions (and disintegrations) of components as a unity in the space they specify and in which they exist. Thus, relational neuronal activity is constitutive of categorization (individuation) processes that are largely determined by interpretation as a kind of interaction with communicative (orientational) representations. Therefore, in the case of language as a domain of cognitive activity (consensual coordinations of coordinations of behavior), it is appropriate to speak of interpretation of interpretation.

2| Any entity, whether linguistic or non-linguistic, is identified and categorized as such only in the course and as a result of an organism’s interactions with the environment, through the observer’s operation of distinction. What linguistic orthodoxy has become so much used to call languages and non-linguistic signs, to an observer are just another variety of components of his domain of interactions with which he may interact, just as with any other entity.

The core tenet of the biology of cognition, “Everything said is said by an observer to another observer who can be himself or herself,” implies that every distinction, by virtue of being a sign, requires an interpretation based on the interpreter’s (= observer’s) experience in general, and experience of linguistic signs in particular. On the one hand, as phenomena perceived/distinguished by an observer, linguistic signs are components of the always changing environment insofar as “the observer beholds simultaneously the entity that he considers (an organism, in our case) and the universe in which it lies (the organism’s environment)” (Maturana 1970: 2). On the other hand, as verbal patterns, linguistic signs are constitutive of an organism’s particular (communicative) behavior as a (first order) description of the environment, so they are subject to change to the extent that the organism and the environment are in a state of reciprocal causality (Krauchentzenko 2007): a change (as a result of interactions) in the organism effectuates a change in the environment, modifying the environment, which, in turn, exerts a modifying influence on the organism, and so on in recursive order. Languaging is a circular interpretative process in the course of which a human organism tries to maximize the effects of its enaction of the environmental niche it occupies in order to better adapt to the environment. Therefore, any empirical entity capable of producing enactive effects is viewed as meaningful, and the circle of interpretation includes both linguistic and non-linguistic entities, whose ontologies are different but which epistemologically stand to one another in a relation of reciprocal causality. In the course of knowledge acquisition as a life process, cognitive “processing” (interpretation) of linguistic signs as elements of a communicative description of representations of enactions depends on the interpretation of enactions themselves. However, any representation presupposes categorization in the sense that, being an operationally closed structure determined system, the nervous system may be viewed as a network of productions (and disintegrations) of relational components because “the nervous system enlarges the domain of interactions of the organism by making its internal states also modifiable in a relevant manner by “pure relations,” not only by physical events” (Maturana 1970: 5).

As a cognitive phenomenon, the meaning of linguistic sign cannot be defined other than as a certain associative potential that is basically a person’s memory of the previous uses of a particular sign (Allwood & Gärdenfors 1999). The meaning of a sign is specified and co-determined in the course of interactions in a consensual domain. An entity becomes a sign by acquiring value that emerges as the result of such cognitive interactions. Consequently, just as a word (a linguistic sign), which itself is a physical entity, can be a sign of another entity, any physical entity can be a (non-linguistic) sign of a word. Circularity and reciprocal causality as specifying properties of a living human organism result in the semiotic multiplication of the world. The reality of these multiple worlds is something that modern theories of knowledge should take into account.
The biology of cognition and language, rejecting certain maxims in thinking about language, offers solutions to a number of problems that have been plaguing orthodox linguistics.

(1) The conceptual contradiction between the two approaches to language (the product approach vs. the activity approach) is eliminated since language evolves in the consensual domain of interactions of autopoietic systems: the biology of language resolves the vicious circle problem in linguistics, taking circularity as a fundamental principle in the organization of living systems. Epistemologically, circularity in the organization of living systems (and, by extension, of language) is a necessary consequence of the metaphysical approach to reality, which aims to explain the fundamental nature of being and the world.

(2) Because, from the point of view of the epistemology of reality, “all that remains is the observer,” the traditional understanding of language subjectivity and egocentricity, based on the paramount importance of the speaker as the ultimate point of reference, takes an about-face turn. The speaker acquires the status of a secondary factor, yielding the “right of birth” to the observer, with all the entailed consequences, whose number and degree of significance linguists will yet have to determine.

(3) The notion of “universal grammar,” rather than a purely linguistic conceptual construal, acquires a phenomenological status, simultaneously validating (at least, in part) recently articulated claims about the experiential nature of grammar (Bod 1998; Deacon 2003; Geeraerts 2006). As far as understanding and explaining grammar goes, the biology of language has an advantage over the traditional theoretical frameworks inasmuch as it fully meets the standard criteria for theory adequacy formulated by Kuhn (1977) – accuracy, consistency, scope, simplicity, and fruitfulness. As an example, the use of the observer as a point of reference in analyzing the cognitive underpinnings of various linguistic “structures” as traditional objects of linguistic analysis—such as the grammatical categories of tense, aspect, and voice, nominal gender, pronominal reference, etc.—allows perceptually grounded, and thus much more accurate and coherent, accounts of their meaning and function to be provided. Because of their simplicity (as compared to orthodox “semantic” accounts), such accounts possess a greater explanatory power (Kravchenko 2008).

(4) The sense-meaning problem appears in a new light; once we subscribe to the idea that language is connotational, the issue loses its crucial importance to language, on which philosophers and linguists traditionally insist. The bio-cognitive understanding of communication as orientational interactions of organisms in a consensual domain necessitates a rethinking of such notions as “information” and “knowledge,” that is, whether they are, as it is believed, objects of exchange among humans (Kravchenko 2007).

(5) As entailed by the previous inference, the biology of cognition is of great importance to semiotics as it allows for a new approach to the problem of linguistic signs: rather than artifacts used to encode “meanings” found in “objective reality,” they should be viewed as empirical phenomena (environmental components) that emerge in the process, and become part of, the observer’s cognitive activity of adapting to, and, ultimately, controlling the human environment largely constructed by and in language.

Conclusion

As observed by Thomas Kuhn (1962: 12), “the successive transition from one paradigm to another via revolution is the usual development pattern for mature science.” The time has come for the traditional science of linguistics to prove how mature it is. However, the impending change is not going to be easy. Scientists are often intolerant of new theories invented by others (Barber 1961), particularly so when such a theory lies outside the currently accepted and practiced paradigm, and “the perpetrators of innovation tend to be treated as heretics” (Glaserfeld 1988). Yet there are signs that cognitive science is in the process of working out a more comprehensive and coherent picture of language and cognition. The epistemological “lining” in the study of language provided by Maturana’s biology of cognition opens up a fascinating perspective for revived inquiries into the nature of language—not as a system of arbitrary symbols for the exchange of information—but as a manner of operation of human organisms in the praxis of the living.

One of the most important consequences of adopting the biology of language is the relational turn in approaching the mind/language problem. Much of what an organism does and experiences is centered not on the organism but on events in its relational/experiential domain, one that crosses the boundary of skin and skull. In its endeavor to answer the question “How does the brain compute the mind?” the neural theory of language overlooks the incoherence of the proposition that mind is a complex computational function of the brain. In the biology of cognition there is no such thing as “the mind” in the operation of the nervous sys-
system, and “the mind” is nothing but an explanatory notion: “language, self-consciousness and mindedness are different forms of existing in the relational domain in which a living being lives, not manners of operation of the nervous system” (Maturana, Mpodozis & Letelier 1995: 25). We as humans “happen in language,” that is, the features of our existence “pertain to our relational domain and occur in our “language.” Maturana’s concept of linguae as a relational domain allows the language sciences to depart from the outdated view of language as a system of symbols (a fixed code) to be explored by analyzing it into constitutive components such as sentences, words, morphemes, and phonemes (the “atoms” and “molecules” of language). Instead, language scientists should focus on how the relational dynamics of linguistic interactions trigger changes in the dynamics of the nervous system and the organism as a whole, and how their reciprocal causality is distinguished and described by the languages observer in terms of mind, intelligence, reason, self-consciousness, etc.

The explanatory potential of the biology of cognition and language applied to the core issues in linguistics, semiotics, and cognitive science in general – with other areas of research by no means excluded – is yet to be appraised (Kravchenko 2006), and it is going to be some time before traditionalists’ criticisms of Maturana give way to a reanalysis of basic theoretical assumptions on which exploration of humans and humanness is currently based. Hopefully, one will not have to wait too long.

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References


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