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Communication, Semiosis, and Living Systems

La comunicación, la semiosis y los sistemas vivos

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In this paper, I analyze the process of semiosis emergence from the semiotic point of view to clarify the implications it may have for the field of communication studies regarding the extension of its anthropocentric boundaries. The research is based on Peirce's semiotics and the theoretical framework of cybersemiotics, a transdisciplinary theory of communication, cognition, information, and signification.

KEYWORDS: semiosis, emergence, communication, biosemiotics, cybersemiotics.

En este trabajo analizo el proceso de la emergencia de la semiosis desde el punto de vista de la semiótica con la intención de explorar las implicaciones que podría tener para el campo de estudios de la comunicación respecto a la extensión de sus fronteras antropocéntricas. La investigación se encuentra fundamentada en la semiótica peirceana y en la cibersemiótica, una teoría transdisciplinar de la comunicación, la cognición, la información y la significación.

PALABRAS CLAVE: semiosis, emergencia, comunicación, biosemiótica, cibersemiótica.

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Introduction

Communication studies have defined its object of study as the social process of meaning production, and that definition has created some kind of academic consensus. However, some problems arise when we begin to ask what meaning is, how it is produced, what elements are involved in its emergence; how is it possible to consider that, in some particular process, meaning is produced and not something else; why meaning is considered to be an exclusively human feature; or why meaning is a feature that defines a particular academic field. The conceptual ground of that definition is based on interpretative approaches, theoretical frameworks such as hermeneutics, symbolic interactionism, social psychology, phenomenology, cultural studies among others. However, none of them has functioned as a general conceptual ground for defining communication as the social production of meaning, producing a consensus about the definition, but leaving it without a clear conceptual explanation (Vidales, 2013). Meaning is a complicated concept to define and it will depend on the theory selected to explain the type, scale, and level of abstraction that it will have. In addition, some authors use it as synonymous of signification, another important concept that seems to have similar problems when trying to define it. Then, my interest in this paper is focused on the conceptual and theoretical exploration of the relationship between communication and semiosis from the point of view of semiotics. But, what is the conceptual difference between communication and meaning or between communication and semiotics? What are their conceptual limits or boundaries?

The clarification of the conceptual distinction between meaning and communication is an analytical and formal need for also distinguishing two academic fields and their conceptual specificity: communication studies and semiotics. The central argument that I am developing here is that, in defining communication from the point of view of semiotics, its conceptual and empirical expression immediately expands from one centered in humans to one focused on all kinds of living organisms. But this is not a new idea, Eco (1976), in the 1970s when proposing a theory of general semiotics, established a clear difference between a theory of codes (signification systems) and a theory of sign production

(communication systems). Since then, some contemporary discussions have complicated that distinction. Meaning is materialized in semiosis or signs action from the semiotic point of view, a concept that synthesizes a whole field of knowledge and, at the same time, it describes a fundamental process of every living system (Sebeok, 2001). Based on this concept, some preliminary definitions have been developed about the particularities that define a communication phenomenon.

In the *Encyclopedic Dictionary of Semiotics, Media, and Communications*, Danesi (2000) defines communication as the "production and exchange by means of signals, facial expressions, talk, gestures, or writing" (p. 58). It is also related to the art of expressing ideas, particularly in speech and writing. In addition, in the *Encyclopedia of Semiotics* coordinated by Bouissac (1998) in the late 1990s, communication is defined as something that indicates a certain form of transfer in a reciprocal or unidirectional mode, and that can be applied to both the selective and general circulation of messages and to their technological means of conveyance.

However, the Encyclopedia also recovers one of the fundamental problems we face when differentiating communication and semiotics, since both seem to share the same object of knowledge. As stated in the Encyclopedia, communication studies are in some sense equivalent to semiotic studies and the history of both allows us to recognize that there are superpositions and discrepancies between them. Communication theory can be used to refer to alternative branches of semiotics, or semiosis can be understood as a specific group of theories of communication: "For instance, communication markedly emphasizes agency and processes, while semiotics usually focuses on the signs and their relations" (p. 132).

Nöth (2014) also recognizes a fundamental problem in the relationship between communication and semiotics, because if semiotics is the study of sign processes (semioses) in nature and culture, then it necessarily includes the study of communication, since communication is undoubtedly a sign process. However, Nöth asked, "is the reverse also true? Are all processes of semiosis processes of communication?" (p. 97). For Eco (1976) the answer is no. There can be systems of signification without systems of communication

but not in the opposite relation. Then, for Nöth (2014), to demarcate the research fields, semiotics has been divided into two sub-domains: semiotics of communication and semiotics of signification, considering the second a broader domain that implies the study of signs not used for communicative purposes (unintentional signs, natural signs, symptoms of disease, and the like). But in the end, Nöth also recognizes that the dividing line between these two fields of semiotic research remains fuzzy.

Another problem that is important to mention lies in the models that semiotics itself has proposed to explain the communicative phenomenon (Cobley, 2013; Nöth, 2014; Vidales, 2013) which are generally based on Claude Shannon's mathematical theory, largely because of the influence of Umberto Eco and Roman Jakobson. In this sense, for Sonesson (1999), the problem of having based the idea of communication on Shannon's model is the fact that this model has been used in semiotics as the model of all forms of communication, all signification, and of all kinds of semiosis, which has produced some symmetrical, equally negative consequences: a) in reducing all kinds of semiosis to the mass media kind, we become unable to understand the particularities of more direct forms of communication (interpersonal); b) "by treating all semiosis as being on a par, we deprive ourselves of the means to understand the intricacies added to direct communication by means of different varieties of technological mediation" (p. 89) which also implies that we cannot explain the effect of the multiple mediations having accrued to our immediately given world of experience in the last century; and c) "by projecting the communication model onto each and every form for conveying meaning, we lose sight of that which is really common to all kinds of semiosis" (p. 89).

In addition, for Sonesson (1999), another problem is the fact that the mathematical model relies on a spatial metaphor that emphasizes the analogy with communication in the sense of trains, cars, or the like, construing all meaning as some kind of object traveling from one point in the space to another, an idea also related with that of "transport", another metaphor that will rapidly be associated with the proposal of messages moving from one point to another. For the author, these ideas tend to obliterate the fact that, in many cases, the other instances of the communication situation have to accomplish the movement or to

be active in another way such as the source (sender), the destination (receiver), and the code (interpretation). In the end, the basic problem of the semiotic model of communication for Sonesson (1999) is that it is about re-codification or original semiosis, which means that it is not about meaning emergence but meaning transformation.

Therefore, in this paper, I will analyze precisely the process of meaning emergence or the emergence of semiosis to clarify the implications it may have for the field of communication studies regarding the extension of its anthropocentric limits. I will base this research on the theoretical framework of cybersemiotics, a transdisciplinary theory of communication, cognition, information, and signification (Brier, 2008, 2013; Vidales, 2017, 2020; Vidales & Brier, 2021). My intention is not only to recover an old debate about the relationship between communication and signification, but to explore the process of semiosis emergence from a semiotic point of view and the implications it may have for the expansion of the academic boundaries of the field of communication studies. If communication is the social process of meaning production, then we have to answer first how does that meaning emerge in the first place. And that is precisely what this research is about.

The question for semiosis emergence

Some time ago, Sebeok (2001) developed one of the most important hypotheses about semiotics and communication, the fact that not only humans, but all living entities on the planet modulate their environment by means of signs; however, only a handful grow up to be professional semioticians. As stated by Petrilli and Ponzio (2007), semiosis is a process already present in the world, and just after that we reflect on its nature, both semiosis and its formal construction are then semiotic matter. For the authors:

> In the world of life, which coincides with semiosis..., human semiosis is characterized as metasemiosis, that is, as the capacity to reflect on signs. This means to make signs not only the object of interpretation understood in terms of immediate response, but also as reflection on signs, as suspension of response and possibility of deliberation (p. 33).

Then, both the sign action and the specific human capacity for metasemiosis may also be called "semiotics".

Influenced by its contact with Ray Birdwhistell (Kinesics) at Chicago, Sebeok paid special attention to the universe that we commonly associated with non-verbal communication, recognizing that it is a phenomenon much more complex than it seemed and that its detailed study could lead us to transit the long path that goes from the most elemental levels of living organisms, such as cells and bacteria, to the more complex levels characterized by cultural structures, consciousness, and intelligence. This path could be done following the same conceptual basis and could be grounded on a central premise about our nature, namely, *that life and semiosis converge, that they are coextensive*. This means that semiosis is not an exclusive sign activity of humans but a process of every living system, including animals and plants. This assumption is important because it expanded the semiotic thresholds (Eco, 1976) and, as a consequence, the communication thresholds as well, functioning also as a foundation of biosemiotics, an interdisciplinary project that considers that life is fundamentally grounded on semiotic processes (Hoffmeyer, 2008).

Semiotic processes are sign processes and could be found in every living system. For authors like Kull (2015), while physical reality is limited by the laws of physics and mathematics are based on formal logic creating the necessity to avoid contradictions, the realm of imagination and meaning-making has no such limits, thus we have to ask whether semiotics, the science of signs, can tell us anything general at all about this vast variety. We have to explore how is that semiotics among all theories and fields of signification could help us understanding meaning-making processes, the emergence of semiosis, and in the particular case of the human realm, the social and cultural production of meaning. Mainly because signification and interpretation seem to be two concepts that are not only associated to humans but all living organisms in the planet. If we take Sebeok's axiom seriously, then we have to ask, what are the differences, similarities, or complementarities of semiosis processes in cells, organs, the human body, culture, and society? How do we go from semiosis in a cell to cultural semiosis?

Following Kull (2015), semiotics can be defined as the study of sign processes and systems in which the aspect of modelling of meaning-making is explicitly presented. "The modelling of semiosis (and communication, in a broad sense) is thus the theoretical core of semiotics" (p. 256). In the end, for Kull, "understanding how semiotic logic as meaning-making works would contribute substantially to the functioning of semiotics as the general theory and methodology of the humanities, and the cultural and life sciences" (p. 255).

From the stated above, semiotics moved from the Saussurean structural antecedent to the pre-linguist world of signification in the 1980s expanding its conceptual interest to all living systems on the planet, something that can be considered as the "organic turn" in semiotics (Kull, 2015). Since this turn is grounded on Peircean semiotics, that is the conceptual framework I will follow in this article. Then, by extending semiosis processes as a way to understand all forms of life, the question for the emergence of semiosis and signification processes was also extended from the most fundamental levels of life, such as organs and cells, to the highest levels characterized by the emergence of consciousness and language. This would also raise one of the fundamental questions proposed in the 1990s by Hoffmeyer (1996) and that would also be considered as the basis for biosemiotics, that is, "how can signification arise out of something that signifies nothing?" (p. 3). In addition, what is that "nothingness" or that pre-semiotic moment? What does it mean that something emerges from nothingness? Is semiosis an emergent process? If semiosis is considered to be an emergent process, then so is communication. But, how can we differentiate between them?

For Bunge (2003), emergence is an important concept that must be clearly defined and that has a close relationship with the concept of *combination*. For the author (Bunge, 2003), the combination of two or more modules of the same or different kinds results in a radically novel thing, that is, one characterized by properties that its constituents lack. They are not mere aggregates because the original elements or items alter in the process, they are precursors rather than constituents of the whole. Combinations (such as chemical compounds, bodily organs, or

social systems) are more stable than aggregates because they are more cohesive, and "consequently, combination takes more energy, longer time, or rarer circumstances, as the case may be… Typically, the wholes resulting from combinations of lower-level units have properties that their parts of precursors lack" (p. 23). It is this type of phenomenon that is associated with the concept of emergence, which takes place every time something qualitatively new arises. According to Bunge (2003), when the resulting wholes of combinations of elements from lower levels possess properties that their parts lack, then such global properties are said to be emergent. The author also considers that the properties of the whole are not distributive but global. In addition, Bunge considers that there are no properties in themselves since each one is possessed by some individual or n-tuple of individuals. From this, Bunge (2003) defines emergence as follows:

> To say that P is an emergent property of systems of kind K is short for "P is a global [or collective or non-distributive] property of a system of kind K, none of whose components or precursors possesses P". No things, no properties thereof. Hence, to ask properly how properties emerge amounts to asking how things with emergent properties arise (p. 25).

But again, what are those "things" from which semiosis emerges? Is semiosis an emergent property of semiotic systems? What class of systems are semiotic systems? These are the kind of questions that will be addressed here. However, it is important to mention that I am not proposing a reflection about the relationship between semiotics and communication, but a reflection about semiosis as an emergent property of living systems and, as a consequence, of communicative systems. This is an important turn that opens new conceptual horizons for both semiotics and communication studies, mainly because it is interested in the question of the emergence of semiosis and its social and biological production-reproduction processes, a different approach from those previously developed within communication studies more interested in the social conditions of its production.

In this sense, "nothingness" from which semiosis emerges, an idea referred to previously, is something Merrel reflects on based on Peirce's

philosophy, mainly in his proposals of synechism and hylozoism. For Peirce, synechism is the tendency to regard everything as continuous, is "the doctrine so far as to maintain that continuity governs the whole domain of experience in every element of it" (EP2: 1). On the other hand, hylozoism is a philosophical point of view that considers that matter is, in some sense, alive. Then, Merrel (1996) considers that from this absolute nothingness or *zero degree*, "Firstness arises as if out of nowhere. It is a bound from sheer possibility (Firstness) to actuality (Secondness)… which is now capable of becoming an actual ('real', detectable) sign-vehicle *for* someone *in* some respect or capacity (Thirdness)" (pp. 5-6, emphasis in the original). Then, this zero degree or nothingness seems to precede signification and Firstness, which locate us in the previous stages of significations, in the initial condition of the emergence of semiosis.

Brier (2008, 2013) also recovers Peirce's philosophy in his proposal of the ontological levels of cybersemiotics as a way to understand the emergence of semiosis, a proposal that also takes into account this zero-degree idea, but from the point of view of the five heterarchical levels of evolutionary cybersemiotics emergence. The first level recognized by Brier is physical and is described as quantum vacuum fields entangled by causality, but it is not considered to be physically dead as in classic physics, on the contrary, based on Peirce's view, it is part of Firstness, that zero degree of semiosis emergence. The second level is related to Peirce's Secondness and it is ontologically dominated by physics (kinematics and thermodynamics). The third level is a protosemiotic one, and it is ontologically characterized by chemical sciences and concepts of pattern fitting. The fourth level is related to Peirce's Thirdness and it is where life is self-organized and where semiotic interactions emerge, initiating internally in multi-cellular organisms in what has been called endosemiosis and between organisms as sign games. Finally, the fifth level is where the human self-consciousness emerges through syntactic language games, bringing along rationality, logical thinking, and creative inferences (intelligence). We have then five heterarchical levels related by causal relationships, but we have to ask again, is semiosis and communication emerging phenomena? What do we mean by semiosis emergence?

For Rodríguez (2016), if we want to study the origins of semiosis, we have to address its diachronic dimension (the original conditions for its emergence) and its theoretical dimension (the ahistorical conditions needed for its existence). Emergence is important for biosemiotics because it makes some important ideas about semiosis and the origin of sign action explicit. Since we have to address it conceptually, some metaphysical assumptions are made in doing that regarding the constitution of signs or their role in biological systems. However, semiosis emergence has been taken for granted in biosemiotics research. In this sense, Rodríguez (2016) recovers Frederik Stjernfelt's notion of emergence, who considered it as "new properties" showing up in systems of sufficient complexity, an idea closely related to Bunge's proposal revised above. For the author, the relevance of the concept to biosemiotics becomes apparent when considering Sebeok's axiom that life and semiosis are coextensive, as the origin of one will yield information about the other. Then, for Rodríguez (2016), the question is if semiosis can be regarded as an emergent phenomenon or if we should, on the contrary, focus on the particulars of a semiotic relation as individually emergent. In any case, emergence should inform our views on what semiosis is and how it comes to be. In addition, previous definitions of semiosis will also have an important role in how we begin to frame emergence within biosemiotics and, in the particular case of this research, within communication studies.

Based on Peirce's semiotics, Rodríguez (2016) considers that the semiotic endeavor is based on the study of the nature of semiosis and its varieties, and that semiosis is the equivalent of the triadic action of the sign, but if this is true, then we have to analyze what elements of the sign would exactly be emergent and to what extent, ontologically speaking. The idea of a semiotic emergent may have to do with the elements of the sign relation being emergent to some degree in one hand, or with some conception of meaning as emerging from sign action on the other. If we consider the triadic relation of the sign as a general account for meaning, then:

> Strong emergence may reformulate it in such terms as to state that the terms of a sign relation may supervene on a lower domain, that is, objects (in the sign relation) would supervene on some (possibly physical) properties without itself being derivable from them (p. 5).

However, from the point of view of weak emergence, our approach will depend on whether we consider that meaning emerges from sign relations (object-representamen-interpretant) or "that sign relations *qua* meaning weakly emerge from a lower level domain and that we are missing some possibly physical details about how the terms of the sign relation come to form a relation in the first place" (p. 5). In any case, for Rodríguez (2016), a theory of emergence may help us explain how either a relation or the objects of the relation come to be, whether they can be explained independently and if they form a domain of their own.

But if the sign elements are those things that allow us to explain meaning as an emergent property, we have to ask then whether semiosis can be considered as part of a semiotic system or, on the contrary, it should be considered as an emergent property of a semiotic system. These are the type of questions addressed by El-Hani and his colleagues in their proposal of a multi-level approach for the emergence of semiosis in living systems, a proposal on which I will focus my attention in the next section.

A multi-level approach to the emergence of semiosis

In studying processes involved in the genetic information system, El-Hani et al. (2009) proposed a multi-level approach to the emergence of semiosis in semiotic systems. Based on Salthe's (1985) work and particularly in his "basic triadic system" which was clearly influenced by Peirce, the authors analyze semiotic processes in three levels at a time. According to the basic triadic system, in order to describe the fundamental interactions of a given entity or process in a hierarchy, we have first to consider it at the level where we observe it (focal level). In the second place, we have to investigate it in terms of its relations with the parts described in the lower levels; and third, we have to take into account entities or processes at a higher level in which the

entities or processes observed at the focal level are embedded. As can be expected, the lower and higher levels have constraining influences over the dynamics of the entities or processes at the focal level, which allow us to explain their emergence at the focal level such as semiosis. The choice of lower, focal, or higher levels depends on the research goals, on the researcher's interests (observer). According to the authors (El-Hani et al., 2009).

> At the lower level, the constraining conditions amount to the "possibilities" or "initiating conditions" for the emergent process, while constrains at the higher level are related to the role of a selective environment played by the entities at this level, establishing the boundary conditions that coordinate or regulate the dynamics at the focal level (p. 140).

Then, an emergent process at the focal level is explained as the product of the interaction among processes taking place at lower and higher levels. In this sense, the higher-level functions as a context whereas the lower level contain the initiating conditions (potentialities). With the temporal evolution of the systems at the focal level, the context or environment will select among the states potentially engendered by the components at the lower level, those that will be effectively actualized, an argument closely related with that of emergence explained in previous sections and with the ontological levels proposed by Brier (2013). But if semiosis can be seen as an emergent process at the focal level, then we have to ask, is semiosis an emergent process? What does emergence mean in this context?

For the authors (El-Hani et al., 2009), although the debate on the emergence ceased for some time, by the mid-1990s the debate had been reactivated by its constant use in fields such as cognitive sciences, evolutionary biology, in self-organization theories, philosophy of mind, in dynamic systems theories and, much more specifically, in fields based on computational simulation such as artificial life, cognitive robotics, and synthetic ethology. Despite that in many of those fields, the use of the concept is still imprecise or simply vague, the truth is that the debate had already recovered at the beginning of the 21st century. For that reason, the authors take a step back in the discussion

about the relationship between semiosis and emergence, since their intention is not to explain when or how semiosis emerged in the universe, but rather to discuss the conditions that must be fulfilled for semiosis to be characterized as an emergent process, which necessarily implies presupposing the existence of semiotic systems in which semiosis is instantiated, without this clearly implying that semiosis has produced those systems in any way.

Based on Stephan's (1998) work, El-Hani and his colleagues (2009) consider that the concept of emergence is often employed in an intuitive and ordinary way referring to the idea of "creation of new properties" (p. 140). However, this definition is associated with a particular type of emergentism, namely, diachronic emergentism. Then, in a technical sense, "emergent" properties can be understood "as *a certain class* of higher-level properties related in *a certain way* to the microstructure of *a class of systems*" (p. 148, emphasis on the original), a definition broader enough to make possible to apply the concept of emergence to a great variety of fields. Then, when applying a theory of emergence to a particular research field, that theory must explain what properties of a given class of systems should be regarded as "emergent", and at the same time, it should offer an explanation of the relationship between these properties and the microstructure of the system in which they are instantiated. And, finally, it should establish which systems exhibit a certain class of emergent properties. From these premises, the authors propose a first question, namely, "what is a semiotic system?" (p. 149).

Even when it is not possible to talk about a unified vision of the theories of emergence, the authors consider that it is possible to identify certain general features that are synthesized in nine questions. First of all, there is some kind of naturalism since only natural factors play a causal role in the evolution of the universe, this implies that all entities consist or are composed of physical parts (physical monism), which lead us to ask, "are semiotic systems physical constituted?" (El-Hani et al., 2009, p. 149). Second, the notion of "novelty" must be considered, that means, the idea that new systems, structures, processes, entities, and dispositions are formed in the course of evolution, which also leads us to ask, "do semiotic systems constitute a new class of systems, instantiating new structures, processes, properties, dispositions,

etc.?" (p. 149). Third, it is necessary to make a distinction between systemic and non-systemic properties, since a property is considered to be systemic if and only it is at the level of the system as a whole and not at the level of its parts. This raises the next question, "can semiosis be considered as a systemic process?" (p. 149). Fourth, since El-Hani et al. (2009) consider the idea of a hierarchy of levels of existence, then it is necessary to ask, "how should we describe levels in semiotic systems and, moreover, how do these levels relate to the emergence of semiosis?" (p. 150). Fifth, it is also necessary to take into account the thesis of the "synchronic determination" which considers that the properties and behavioral dispositions of a system depend on its microstructure, which means that there can be no difference in systemic properties without there being some differences in the properties of the system's parts and/or in their arrangement. This raises the next question: "In what sense can we say (and explain) that semiosis, as an emergent process in semiotic systems, is synchronically determined by the properties and arrangement of their parts?" (p. 150).

Sixth, some theories argue about "diachronic determination" which means that the coming into existence of new structures would be a deterministic process governed by natural laws. This, according to the authors (El-Hani et al., 2009), seems incompatible with Peircean semiotics, since Peirce clearly rejected the belief in a deterministic universe. However, they also consider that this does not preclude the treatment of emergence in relation to Peirce's view on semiosis, as there are also theories of emergence committed to indeterminism. Seventh, for the stated above, it is also important to take into account the idea of the irreducibility of a systemic property designated as "emergent" which is also related to the eighth important notion of unpredictability. From here, two more questions arise, "in what sense can we say that semiosis, as observed in semiotic systems, is irreducible? In what sense can we claim that the instantiation of semiosis in semiotic systems is unpredictable in principle?" (p. 150). Finally, the nine characteristics of emergentism is the idea of downward causation: new structures or new kinds of states of "relatedness" of preexisting objects manifest downward causal efficacy, determining the behavior of the system's parts. Form here, the last question is proposed: "is some sort of downward causation involved in semiosis?" (pp. 150-151).

For each of the questions posed above, the authors (El-Hani et al., 2009) elaborate a series of responses to each of them that I consider important to recover. In the first place, in defining what a semiotic system is, we first need to define what a system is, and for the authors, a system has been usually defined as a set of elements that maintain relations with one another. Elements are considered to be primitive entities that are found at each instant in one among several possible states and is considered that an element establishes relations when the state of one of them depends on the state of another one. From the theory of dynamical systems, systems are seen as a set of independent variables, that means, entities that can change, that can be different states at different times. From here, it is possible to see that the notion of variable and the notion of an element are very similar. Then, for the authors, the state of a system is simply the state or value of all its variables at a particular time, and from here it is possible to define also what a semiotic system is. A semiotics system is a "system that produces, transmits, receives, and interprets Signs of different kinds" (p. 163).

> Fetzer argues that what makes a system "semiotic" is the fact that its behavior is… causally affected by the presence of a sign because that sign stands for something else iconically, indexically, or symbolically, for that system. Those things for which signs stand, moreover, may include abstract, theoretical, non-observable, or non-existent objects and properties, which may be incapable of exerting any causal influence on a system themselves (Fetzer in El-Hani et al., 2009, p. 163).

From the stated above, semiosis can be defined from Peircean semiotics as a self-corrective process that involves the cooperative interaction between three components: the Sign (Representamen), the Object, and the Interpretant (S-O-I), and from here it is also possible to consider that semiotic systems show a self-corrective behavior or a goal-directed activity that depends on the system's capability of using signs as media for the communication of forms from the Object to the Interpretant. Emphasis is placed in processes rather than elements which imply at the same time that sign processes (semiosis) are considered as relationally extended within the spatiotemporal dimension in which

something physical has to instantiate or realize them. Thus, semiotic systems should be physically embodied, which answers the second question proposed by El-Hani et al. (2009). However, we have to keep in mind this idea of the embodied of semiosis since it is fundamental to understand semiosis emergence.

In addition, the third question is related to novelty since it asks whether semiotic systems can be regarded as forming a new class of systems with new structures, instantiating new properties, processes, behaviors, dispositions, and the like. For the authors (El-Hani et al., 2009), it is important to consider that there was a period in the history of the universe in which systems capable of using signs did not exist, and therefore, those systems (semiotic systems) arose in the course of evolution. Before that, only reactive systems exist that were incapable of interpreting and using signs, in other words, they were not capable of using signs as media for communication of forms, in short, they were not interpreters. El-Hani et al. (2009) consider "semiotic systems as a new class of systems, with a new type of structure, capable of producing and interpreting Signs, and, thus, of realizing semiosis, as a new kind of (emergent) process" (p. 166). As a result, "the emergence of the competence of handle Signs change the dynamics of the evolution of natural systems. After all, we can claim that semiotic systems show modes of evolution not found among merely reactive systems" (p. 166). However, after the emergence of the competence of handle signs and the emergence of semiosis, the evolution of semiotic systems did not cease, but on the contrary, new systems of this kind emerged operating with different classes of signs and evolving in different manners.

Grounded in Morgan's (1923) theory of emergent evolution, El-Hani et al. (2009) proposed three basic criteria to consider properties and processes as emergent. First, these properties and processes must be genuinely new, and mainly "unpredictable". Second, they must be closely connected to the appearance of a new kind of relatedness and a new organizational principle among entities and processes already present, "entailing a modification in the way lower-level events run their course, and, consequently, some sort of downward determination" (p. 168). The novelty in emergent evolution appears in the form of new organizationally principles so that primacy is given to the emergence

of structured processes and entities. And, third, the emergence of properties and processes in a new class of systems should change the mode of the system's evolution. As a result, the competence of handle signs appeared in the evolution of systems as the product of a continuous process, a process that also allowed the emergence of semiotics systems which were now different from reactive systems. Semiotic systems can "go beyond a mere coupling to their circumstances, being able to interpret them" (El-Hani et al., 2009, p. 169). Semiotic systems are the evidence of a qualitative change in the course of evolution since they develop the capacity of interpreting the world through sign mediation. Signs perform functions that favor the survival and/or reproduction of semiotic systems. As it has been argued previously, semiosis is the product of the interaction between the micro and macro levels of the semiotic system which is then observed at the focal level. For this reason, semiosis can be considered as a systemic process, which answers the fourth and fifth questions mentioned before.

The sixth question implies asking in what sense it is possible to affirm that semiosis, as an emergent process, is synchronically determinate by the properties and arrangement of the parts in a semiotic system. In order to answer this question, the authors (El-Hani et al., 2009) consider it important to remember that in their proposal of a hierarchical model of the emergence of semiosis, semiosis is located at the focal level, instantiated as a chains of triads. Individual triads are located at the lower level, and networks of chains of triads at the higher level. In this sense, if we are going to speak about synchronic determination, we have to focus our attention on the relationship between chains of triads at the focal level and individual triads at the micro-semiotic level. For the authors, "this description entails the idea that semiosis is synchronically determined by the microstructure of the individual triads composing a chain of triads, i.e., by the relational properties and arrangement of the elements S, O, and I" (p. 170). In addition, in the case of semiosis, their proposal is that the determinative relations between the elements of individual triads as well as between triads, in a chain of triads, hold with logical necessity, which means that in a substantially different world with different physical laws, i.e., a world nomologically distinct from the actual world, the logical relationships between S, O and I would

still be the same. If we are right in our arguments, then these relations hold in the set of all possible worlds, provided that the conceived world allows the existence of physical entities or processes. After all, there is an important constraint for something to be a semiotic system, namely, that it should be physically embodied (see above).

> This does not mean that the determinative relations between S, O, and I in a semiotic process might be only nomologically valid, but rather that any logically conceivable world in which semiosis can take place is a world in which natural laws allow the existence of physical entities or processes, which are a necessary condition for semiosis. In any such world, then, the determinative relations between S, O and I hold with logical necessity (El Hani et al., 2009, pp. 172-173).

Now, in the empirical domain, it is necessary to focus our attention not only on the functional role of S, O and I, but also on how these functional roles may be embodied and how the relations among them may be updated in the actual world. Then, it is important to notice that while the functional role is logically determined, the occupants of the functional roles of S, O and I are contingent.

Moving to the next question, the one that asks in what sense semiosis is irreducible, El Hani et al. (2009) consider that one of the most important properties related to semiosis is the relational irreducibility of the triad, since, for Peirce (1988), the semiotic triadic relation is irreducible, in the sense that it is not decomposable into any simpler relation. This also means that the functional role of S can only be identified in the mediative relation that it establishes between O and I, and in the same manner, the functional role of O is identified in the relation by which determines I through the mediation of S and, finally, the functional role of I is identified by the fact that it is determined by O through S. If we only consider dyadic relations (S-O, S-I, or I-O) or the elements of a triad in isolation, it would be impossible to deduce how they behave in a genuine triadic relation. “Therefore, the irreducibility of semiosis should be understood in terms of the non-deducibility of the behavior of the logical-functional elements of a triad on the grounds of their behavior in simpler relations” (p. 176). This argument responds to the above question.

Finally, in regard to the ninth question related to whether can we describe any sort of downward determinative relation in semiosis, the authors (El Hani et al., 2009) consider that, in fact, the relationship between the macro-semiotic level and semiosis located at the focal level involves determinative downward causation. For the authors, the downward determination in semiotic phenomena can be conceptualized as the boundary conditions that select, among the potentialities established by the micro-semiotic level, those semiotic processes which will be actualized at a given time. Finally, at this point, it could also be argued that the structure and processes of semiotic systems are, then, unpredictable. From the Peircean framework, semiosis is a process in which structure is in principle unpredictable due to the indeterministic nature of the evolutionary process, and idea grounded in his thesis on tychism, the metaphysical defense of "absolute chance" as a real factor in the universe. Then for the authors, their most important point is that "according to a Peircean evolutionary cosmology, *everything* should be explained as a product of an evolutionary process which has states of indetermination and chance as its starting points" (p. 178).

Up to this point, the argument followed about the emergence of semiotics has raised the idea of semiotic systems and the levels of abstraction and their role in semiosis emergence. Therefore, I will focus my attention now on the idea of the heterarchical levels of evolutionary cybersemiotics emergence in order to explain the importance it has for communication studies.

The heterarchical levels of evolutionary cybersemiotics emergence

If it is possible to think about the emergence of semiosis, then it is necessary to ask about the levels implied in this process. I have explored this condition previously (Vidales, 2017, 2019, 2020) base on Brier's cybersemiotics framework. In developing a transdisciplinary theory of signification, communication, information, and cognition in living, social, human, and technological systems, Brier (2003, 2008, 2009, 2013) considers that Peircean semiotics appears as an alternative framework for theoretical integration since it allows us to systematically analyze communication and semiosis from an evolutionary point of

view of intentional signs of the body and language. But, how to develop a transdisciplinary framework where a scientific theory of nature and a phenomenologically and hermeneutic theory of interpretation and meaning could be integrated with an evolutionary theory of the levels of semiosis? For Brier (2003), the proposal is that a biosemiotic theory of meaning and mind could integrate classical scientific thinking, functionalistic systems thinking, and first and second-order cybernetics with the evolutionary framework and the phenomenological analysis of mind. The idea is to overcome the boundaries between the so-called "two cultures", a world separated by the mechanist and interpretative views of it.

Cybersemiotics consider that Peirce's framework implies that qualia and "the inner life" potentially exist from the beginning but require a nervous system to achieve their full manifestation. The concept of *qualia* was introduced by Peirce to refer to those qualities that are accessible to people when a process of introspection is carried out, and together they form the phenomenological character of experience. According to Tye (2018), in philosophy, the concept of qualia has at least four uses: as a phenomenal character, as properties of sense data, as intrinsic non-representative properties, and qualia as intrinsic, nonphysical, ineffable properties. Now, for Brier (2008) living organisms and their nervous systems do not create qualia and mind as such, on the contrary, the quality of mind emerges from the nervous system that living bodies develop, thus creating still more self-organized manifested forms, and this occurs through the triadic semiosis following Peirce's philosophy.

However, for cybersemiotics, in the particular case of human beings, we become conscious through the semiotic development of living systems and their autopoietic semiospheres in the form of signs games for shared communication. At some point sign games eventually evolve into human language games. This is precisely the new foundation Brier (2008) is proposing, and it is "one that allows for biosemiotics and evolutionary epistemology to integrate recent developments from ethology, second-order cybernetics, cognitive semantics, and pragmatic linguistics in a fruitful way to forge a new transdisciplinary view of cognition and communication" (p. 276).

To think about communication and meaning production from cybersemiotics, is then to think in both as qualities of living systems, a position that extends the phenomenological scope of communication studies. The so-called Palo Alto School of Communication, grounded on systems thinking and cybernetics, had already noted the fact that we do not create communication, but we take part in it (Winking, 1982). However, this hypothesis was restricted to the particularities of human communication in general and the therapeutic processes in particular. Cybersemiotics moves one step forward because it considers that this is not a particular feature of human beings but of all living systems on the planet, a premise that is related to that idea propose by Sebeok (2001) some time ago: the fact that life and semiosis converge, that are co-extensive. And this is precisely one of the main arguments of this article, the need to move from defining communication as the social production of meaning towards a broader conception in which communication is understood as a transdisciplinary concept (Vidales, 2017, 2019, 2020). This is why is so important to understand the emergence of semiosis and, of course, the emergence of communication as well. But, how do communication and semiosis emerge from living systems? Do we have to consider both as emergent properties of living systems or, on the contrary, are both pre-condition for living organisms to emerge?

Based on the revision of previous research done so far, and with a special emphasis on the work done by El-Hani et al. (2009), I consider that there are three main conditions that we have to take into account to answer the previous questions. First of all, it is necessary to define a semiotics system which is considered to be a system that produces, transmits, receives, and interprets signs of different kinds. This competence to handle signs is the product of the evolution of systems as part of a continuous process, creating a difference between semiotic and reactive systems. Second, it is very important to notice that semiotic systems must be physically embodied: signs must be actualized spatiotemporally. And third, semiotic systems are the evidence of the emergence of properties and processes in a new class of systems that changed the mode of the system's evolution since they develop the capacity of interpreting the world through sign mediation. Living systems are also semiotic systems. These ideas presented, based

on the work of El-Hani et al. (2009) help us to understand semiotic systems, but what about communication systems and their emergence process? This is for now a limit in the present article since we need an equivalent explanation of what a communication system is and how does it emerge. However, we have some clues from cybersemiotics, and basically in the proposal of the heterarchical levels of evolutionary cybersemiotics emergence.

For Brier (2003), the problem is that emergence is a concept centered in qualitative shifts (phase shifts for some) and not in a causal explanation of those shifts: "For example, as far as we know, a brain is necessary to have consciousness, but we cannot show that the brain creates consciousness" (p. 89). Then, for the author, we need to combine the theory of information with a theory of the first-person experience to develop a theory of types and levels of causality. These various types of causality are grounded on Aristotle's efficient, causal, and final causalities as follows: a) efficient causality is related to the physical level's exchange of force and energy between masses and it is part of Peirce's Secondness; b) formal causality is related to the signal exchange through pattern fitting, it is a key-lock fitting with no intentionality; and c) the final causality is where Brier (2003) consider the goal is influencing the result. "At the semiotic level, it is through more or less unconscious motivation and drive (teleonomy), and on the linguistic level, it is conscious intension" (p. 92). Then Brier (2003) argues:

> I do not believe that life and mind can be adequately described by mechanistic models and communicative interaction based on energy-based efficient causality. I do not think that information science will "do the trick" either. Therefore, I think we must look a theory for allowing meaning and mind as part of foundational reality. That is why I am working with a Peircean based biosemiotics, combined with a systems and cybernetic view with ontological levels, and a concept of emergence following Emmeche et al. (1997). This whole framework looks as a good candidate to start with (p. 93).

Those levels of existence Brier is referring to are the basis of his proposal of heterarchical levels of evolutionary cybersemiotics emergence: "Levels are believed to emerge through emergent processes, when new holons appear through higher-level organization" (Brier, 2013, p. 254). The five levels proposed by him considers the following: a) the quantum vacuum fields with entangled causation; b) the physical level with its energy and force-based efficient causation; c) the informational-chemical level with its formal causation based on pattern fitting; d) the biological-semiotic level with its non-conscious final causation; and e) the social-linguistic level of self-consciousness with its conscious goal-oriented final causation (Brier, 2013).

As I mentioned in the first section, these five levels are characterized by Brier (2003, 2008, 2013) as follows. The first level is related to the quantum vacuum field and it is not considered to be physical death since it shares Peice's phaneroscopic and synechistic basis. Synechism means the "tendency to regard everything as continuous… the doctrine so far as to maintain that continuity governs the whole domain of experience in every element of it" (EP 2:1). For cybersemiotics, this level is considered to be part of Firstness, which also holds qualia and pure feeling. The second level is related to efficient causation and Secondness, and it is ontologically dominated by physics as classical kinematics and thermodynamics. "But for Peirce it is also the willpower of mind, and in modern information science it is the differences, which, when interpreted, can become significant and meaningful" (Brier, 2013, p. 255). In addition, the third level is a protosemiotic level and it is related to formal causation and objective information. This level is ontologically determined by chemical sciences and concepts of pattern fitting. The fourth level is where life is self-organized. Is the level related to Thirdness, and it is characterized by the emergence of semiotic interactions.

> First internally in multi-cellular organisms as "endosemiotics" and between organism as "sign games", this framework –based on biosemiotics– points out that the informational concept may be useful at the chemical level of analyzing life, but it is not sufficient to capture the communicative, dynamic organizational closure of living systems (p. 255).

Finally, the fifth level of human self-consciousness emerges through syntactic language games, and with that also comes rationality, logical thinking, and creative inferences (intelligence) (Brier, 2013).

> In hierarchies there is a filtering of lower-level effects rising from the bottom at each new emergent level. There is also a binding from the top, and the exclusion of alternative possibilities, once one path of emergence has stabilized (downward causation). Across levels, various forms of causation (efficient based on energy transfer, formal based on pattern recognition, signals, and information, and final based on meaningful purpose and thus semiotic) are more or less explicit (manifest). This leads to more or less explicit manifestations of information and semiotic meaning at the various levels in the world of energy and matter. The basic forms of causation can be seen at all levels. Material causation is basically grounded in the quantum vacuum fields. For each level of material-informational manifestation the lower level beneath it acts as its material basis (p. 254).

Although the five levels proposed by cybersemiotics are related to the foundation of an integral science of information, its theoretical nature can be applied to broader fields, such as communication studies as I have shown. What we have then is a multi-level integration. First, it is necessary to admit the emergent and systemic nature of semiosis as it has been explained previously, and later, it is necessary to accept the idea of heterarchical levels of semiosis in that emergent process. Therefore, if semiosis is an emergent systemic process, then communication is too, and if semiosis can be identified from the fields of the quantum vacuum to the human self-consciousness, the immediate question is, where do we locate communication? This is, for now, the second limit of this research, but it allows us to verify the extension of the field of communication studies, since we can locate it now as a central feature of all living systems.

A PRELIMINARY CONCLUSION

Following cybersemiotics, the emergence of semiosis is related to five heterarchical and ontological levels from which it is possible

to identify also the emergence of new processes and properties. However, one question that remains unsolved is where do we have to locate communication in that proposal. Is communication a process that depends on the five ontological levels, or the contrary, communication is an emergent process that must be located at the third level like protosemiosis? What are the conceptual and empirical consequences of building communication theory from cybersemiotics? In extending the scope of semiotics to the life processes, communication processes are also extended beyond the human realm, but while this reflection from semiotics has been developed systematically from the proposals of biosemiotics and cybersemiotics, the truth is that the same has not happened yet within the field of communication studies. The debt in the field of communication studies continues to be a systematic and much deeper reflection of the minimum conditions necessary for the emergence of the communicative phenomenon. Even when we find proposals in this sense (Martín-Serrano, 2007) we still have a lot of work to do.

In the end, what it is possible to affirm is that, with the advances in cybersemiotic research and systems science, it is possible to glimpse that the phenomenological scope of communication would not have to be reduced to cultural practices or the human realm, but could be extended naturally to all life forms on the planet. And indeed, it does. However, that is for now the limit of this research and those questions will remain for a future research agenda. In any case, there is already an international community that has been debating these issues for some time and of which we already have some evidence (Vidales & Brier, 2021).

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