Latour and Biosemiotics. The Hybrid Notion of Life

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Abstract. This article investigates the influences of Latour's theories on the field of biosemiotics studies. Biosemioticians share common premises based on the paradigm offered by Thomas Sebeok, namely that "life and semiosis are coextensive". In current theories, the founding principle of biosemiotics is that semiosis exists in all living things and only in living things. The goal of this article is to show how Latourian theories can challenge this paradigm. The first part of the article introduced biosemiotics in its historical context. In the second part, it will be shown that Latourian theories have been rarely used by biosemioticians because: 1. the notion of life, when combined with Latour's reflection on hybrids, becomes a vague and undecidable concept; 2. the notion of agency offered by Latour proposes an extension to the inanimate as well. In this sense, the boundary between animate and inanimate becomes difficult to identify and is often transgressed. By incorporating Latour's notions of hybrid and agency into biosemiotics, it is possible to offer a new perspective in this field. Finally, it will be shown that ecosemiotics can be a valuable tool that can interact with Latour's semiotic discourse.

1. Introduction

The term biosemiotics was used, as recently argued by Kalevi Kull (2022), by Vincent Kletzinsky, professor of chemistry in Vienna, in an article in 1855. The term was used to refer to chemical substances significant for certain pathologies in animal and plant life. However, the notion took on its most influential meaning thanks to an article by the psychiatrist Friedrich Rothschild, in which he defined a certain type of meaning connecting language to life:

> This approach presupposes acceptance of our position that the history of subjectivity does not start with man, but that the human spirit was preceded by many preliminary stages in the evolution of animals. The symbol theory of psychophysical relation bridges the gulf between these disparate avenues of research and unites their methods under the name of *biosemiotic*. We speak of biophysics and biochemistry whenever methods used in the chemistry and physics of lifeless matter are applied to material structures and processes created by life. In analogy we use the term biosemiotic. It means a theory and its methods which follows the model of the semiotic of language. It investigates the communication processes of life that convey meaning in analogy to language (Rothschild 1962, p. 777).

Rothschild coined this terminology to infer three laws that contemplated the program of living beings[1] (as subjectivities built on a polarisation between self and non-self) to maintain their unity as coherent, to construct communication between organisms and objects in the world, and new intentionality emerging from previous processes. One year after, Thomas Sebeok (1963) introduced the concept of

[1] Rothschild's discourse was for a long time closed within the debate of psychiatry and therefore little exposed to the attention of semiologists. See Kull (1999).

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"zoosemiotics". It is thanks to the Hungarian-born semiologist that biosemiotics has become an autonomous field of study meant at investigating the relationship between signs and meaning in living organisms (Kull 2003). The term biosemiotics was initially used in the semiotic debate to refer to the study of signs in organic life. In the first part of his work, Sebeok saw semiosis as the basis of all life processes; but later he identified semiosis with life itself (Sebeok 1988). For this reason, the fundamental proposal of biosemiotics is to suggest semiosis as belonging not only to humans but also to animals (Sebeok 1988), plants (Krampen 1981), down to the cell as the basic minimal unit (Hoffmeyer 1996)[2].

In the 1970s, Italy also hosted an important debate on semiotic thresholds between Giorgio Prodi and Umberto Eco (Eco 1997, 2018; Cimatti 2019), which was taken up by biosemiotics to set up a new discourse on the semiotic processes of non-humans. Umberto Eco (1975) set the "lower threshold of semiotics" at the point where simple signals were not yet made meaningful by a sign correlation. He has second thoughts already in his book *I limiti dell'interpretazione* (1990), in which, discussing with scientists who study interaction processes at the cellular level, the so-called phenomena of interpretation, he states that it cannot be denied a priori that this was possible. Already in this text, he does not exclude that there can be semiosis and thus interpretation in perceptual processes[3]. However, in his book *Kant e l'ornitorinco* (1997), he substantially reformulated this idea, leading him to use the notion of "primary iconism". The latter referred to a non-semiotic *primum* (*Firstness*), insofar as it did not refer to previous premises, but rather directly to the Dynamical Object. Primary iconism seemed to resemble the notion of intuition in Peirce's terms, in which a premise is not itself a conclusion inferred from previous premises, but directly from the object of external reality. His examples concerning the coffee pot, the sheet, and DNA, moving primary iconism below the lower threshold of semiotics, recognizing a stimulus-response structure, then lead to a new questioning of the minimal threshold. Indeed, in the essay *La soglia e l'infinito* (Eco 2007) the notion of primary iconism shifts from an ontological-cosmological to an experiential realm. Inspired primarily by Peirce and by several discussions concerning his notion of icon (Maldonado 1992; Polidoro 2015), Eco feels the need to place at the centre of the encyclopedia a subject that is capable of carving out molar pertinence from a sort of molecular "wild semiosis", which represents the background of his perception of the world (Paolucci 2007). In this context, biosemiotics had the effect of moving the lower threshold of semiotics, a level where we can refer to a sign action in opposition to a non-semiotic activity (Rodriguez Higuera, Kull 2017). The broadening of thresholds, to define what to include in semiosis, has led to an enrichment and greater freedom for biosemiotics. The condition that every living form uses semiotic processes has given voice to a heterogeneous multitude of perspectives. However, even biosemiotics has had to define its lower threshold, showing how semiosis emerges exclusively within what is defined as "Life"[4]. *Life* is the lower threshold of biosemiotics.

[2] The cell is used by biosemiotics precisely as a minimal semiotic unit since it is the basic unit of life. Life, however, as we shall see, is not limited to its biological functions, but to the opportunities offered by the meaning of the objects that make up its environment. Life is produced and produces in relation to the inside and outside of what it is. In this sense, life is a hybrid process that emerges from a collective.

[3] Although Eco continues to sketch the edges of semiotics, such as that within "spazio C".

[4] Henceforth in the article, it will be pointed out when "Life" is referred to as a concept, forming part of a certain type of language and arbitrary definition, and "life" when referring to the process of living, i.e. the living and its materiality.

2. The premises of biosemiotics

Biosemiotics, together with its different branches that emerged starting from the 1960s, were brought together in 2004 thanks to a series of conferences and meetings[5]. The general idea behind such unification was the need of common premises for different fields to communicate meaningfully, combining them all under a shared viewpoint. The desire to work together set certain assumptions that had to be accepted to avoid the disruption of a field of study of biosemiotics that, if compared to the more solid and institutionalized field of cultural semiotics showed some fragilities.

The premises of biosemiotics were defined at the fourth Gathering in Biosemiotics organized by Anton Markoš in Prague. After that meeting, relevant figures such as Jesper Hoffmeyer, Claus Emmeche, Kalevi Kull, Anton Markoš and Marcello Barbieri began to set simple premises in order to reduce the complexity of the biosemiotic discourses that proliferated at the beginning of the 21st century. It was at this conjuncture and under this impetus that the boundaries of biosemiotics became more clearly and uniformly constructed (Stjernfelt 2002; Kull, *et. al.* 2009) (despite the great diversity with which it is still discussed today).

In order to unify each discourse under a certain identifying aspect the reference was the famous claim of Thomas Sebeok that "life and semiosis are coextensive". This statement was extracted from one of his speeches, but finds a much more general connotation in various writings: "[...] *semiosis* is at the heart of life" (Sebeok 1991a, p. 85); "semiosis is the criterial attribute of life" (Sebeok 1991b, p. 124); "all, and only, living entities incorporate a specie-specific model (umwelt) of their universe; signify; and communicate by [...] signs" (Sebeok 1996, p. 102); "semiosis presuppose life" (Sebeok 2001).

Thus, the criterion that unites discourses is that semiosis is identified with life (Anderson *et. al.* 1984; Hoffmeyer 1997): semiosis exists in *all and only living beings*. This identification lies at the heart of the "biosemiotics project" (Kull, Emmeche, Favareau 2008)[6]. As we shall see, however, the notion of Life is neither so obvious nor self-evident as to allow it to be confined within certain limits. This notion, hybrid in itself, shows its undecidability.

We may start from the premises that Barbieri, in a 2009 article, following considerations already set out in his 2008 book, identifies as necessary for biosemiotic discourse.

> Today there are still differences between the schools, but there is also a 'minimal unity' in the field because of two basic principles, or postulates, that are accepted by virtually all biosemioticians.
>
> (1) The first postulate is Thomas Sebeok's idea that "life and semiosis are coextensive". This implies that semiosis appeared at the origin of life, and sharply differentiates biosemiotics from 'pansemiotics' and 'physiosemiotics', the doctrines that semiosis exists also in inanimate matter and therefore everywhere in the universe. It also differentiates it from the views that semiosis exists only in animals or only in human beings.
>
> (2) The second postulate is the idea that signs, meanings and codes are *natural* entities. This sharply divides biosemiotics from the doctrine of 'intelligent design', and from all other doctrines that maintain that the origin of life on Earth was necessarily the product of a supernatural agency (Barbieri 2009a, p. 230).

[5] Biosemiotics represents a branch of the discipline that develops a particular approach that has guaranteed increasingly solid results over the years. And, although not shared by all (especially in Italy), the how and why of its foundation and existence is well known and well established. See (Emmeche, Kull 2011), especially the chapter "Why Biosemiotics? An Introduction to Our View in the Biology of Life Itself" written by Kull, Emmeche, and Hoffmeyer. There is now a consolidated literature in the field, and we can also see the implications of biosemiotics in the cultural context precisely (Cobley 2016).

[6] Unfortunately, for space reasons, the *pars construens* is not addressed here. For the reconstructive part of the biosemiotic discourse, I invite readers to refer to (Favareau 2010). I want to specify that my point of view is in perfect adherence with biosemiotics, which has great heuristic results in research (see Zengiaro 2022b). The attempt is to set in motion a critical gaze to stimulate a different view, but always within the biosemiotic field of research.

In these premises, we see terms that are used to unify a very broad heterogeneous discourse. In addition, the normative dimension of the premises emerges as they claim to orientate the entire semiotic sphere according to a model that forces one to choose between Life (unitary and specific concept) and non-Life (indeterminate, transcendental and holistic ways of representing brute facts). The premises give as solved a problem that is nevertheless unsolved, namely, to understand how far Life extends - beyond what is meant by the notion of "natural entities" and which entities remain outside this concept[7]. It means, in a certain way, that one has already figured out an answer to *what life is*. However, it is very difficult to determine where life begins, and this is currently an ongoing debate[8]. Even more complex is trying to prove that where there is the beginning of life there is the beginning of a certain kind of semiosis. What the premises of biosemiotics pose as a necessary opposition is to set limits, thresholds, that distinguish it from pan-semiotic and physiosemiotic approaches[9].

The history of biosemiotics is testimony precisely to this continuous movement of the lower threshold. The threshold that separated the semiotic from the non-semiotic has been constantly narrowing (Nöth, Kull 2001), becoming almost transparent (Thompson, Stapleton 2009). In fact, we have a kind of constant extension that follows the complexity of living systems. But what must be taken into account is that there is no such thing as zero degree of complexity; in other words, even at a minimal level such as material atomic composition, there is a certain degree of complexity (McShea, Brandon 2010). Thus, our research questions, which we do not intend to fully resolve in this article, are: from what level of complexity does semiosis emerge? Where can we mark the beginning of life? Where is the threshold that separates life from non-life?

What we will try to justify is that the notion of Life is a hybrid form emerging from a process that cannot be limited to the realm of the biological. And in this impossibility of marking a lower threshold, we will use Bruno Latour's theories, aware that it is perhaps not entirely possible to go below this threshold. The invocation by biosemiotics of Life, which was supposed to stabilize, pacify, reassure, and tune debates, seems however to have lost this capacity, by the emergence of indefinable, non-categorizable, and non-human entities that appear everywhere in the social and natural world. All these hybrids form a semiotic collective that leans beyond the biological, bringing to life actors that do not fit within the category of "living".

3. Latour in biosemiotics

Within the field of current biosemiotics debate, no relevant traces of Latour's theories can be discerned. In the journal *Biosemiotics*, we find only 14 articles where Latour is cited. The most cited work is that of the essay *We have never been modern* (1991), which is essentially used to provide justifications for integrating non-humans (understood mainly in their animal declination) into the cultural discourse. In

[7] Despite the importance of this boundary between natural entities and everything outside nature (Marrone 2011), we will not dwell on this point, focusing instead on the first premise concerning life and semiosis. However, a recent article has attempted to articulate a "xenosemiosis" in this sense (Tenti 2022), taking as its starting point what is termed "artificial xenolife".

[8] There is currently an extensive literature on the hypotheses concerning how life emerged and how we can describe it in its complexity. However, all accepted theories agree on identifying this emergence from the organization of inorganic materials. In this sense, it should be noted that a pre-biological evolution is possible, as demonstrated by Manfred Eigen, in which selection processes occur in the molecular sphere as a property of matter. Such evolution occurs through reaction systems known as "catalytic cycles" or "hypercycles". The hypercycles studied by Eigen are self-organizing, self-producing and evolving (Eigen 1971).

[9] Areas that have not yet been fully defined, but used as critical and hypothetical arguments or counter-arguments. In trying to give a more pronounced definition, especially with reference to biosemiotics, see (Zengiaro 2022a).

biosemiotics discourse, the topic of hybrids was addressed in November 2018, when the international conference entitled "Semiotic of Hybrid Natures: Anthropogenic Ecosystems, Multimodalities, Transformed Umwelts" was held in Tartu. On that occasion, the topics addressed proposed a biosemiotics reinterpretation of the relationship between humans and other biological entities, and the role of human technologies. Latourian theories, well known for their ability to give inanimate objects a "life" of their own, hybridizing semiotic attitudes in unexpected ways, were not addressed. This is because for biosemiotics there can be no agency belonging to non-living entities. Whereas for Latour, technological agents, but also inorganic agents found in nature, get delegated by other biological agents, giving rise to a variety of agencies (Latour 2021b). However, these agencies have equal value, showing a flattening of the potential to act that does not depend on being biologically alive. This activity propagates transversally without necessarily having to integrate organic instances. Hybrids, in fact, unite heterogeneous elements that must be traced case by case, on a local scale, by analyzing the details of the actantial scene. At the level of methodology, Latour shows us that there is nothing already given, ordered by taxonomies, but only events that are given by the composition of forces. And these events are impersonal, often non-living, complex and xenobiological.
Taking an even more recent corpus of analysis, we can see how a text as relevant as *Semiotic Agency*, Latour is cited only once to indicate how technology has hybridized with human cultural conditions (Sharov, Tønnessen 2021, p. 81). The same authors in 2015, writing the headword "Agent, Agency" for *The Glossary Biosemiotic Project*, state:

> As is well known, there is no consensus in the biosemiotic community on whether or not agency is co-extensive with the living realm. While practically all biosemioticians appear to think that living organisms and/or systems are agents and thus endowed with agency, the dividing issue is whether or not there are agents beyond living agents. My view in this context is, consistent with Sharov's view, that there are indeed agents beyond living agents, but that these are all subagents of living agents. In this sense all agency is arguably ultimately of a biosemiotic nature. This implies that biosemiotics taken to include the study of human semiosis is a relevant framework for the study of all agency relations whatsoever. It is in principle fully legitimate to hold an even wider notion of agency, somewhat resembling Latour's conception of an actant as anything whatsoever "to which activity is granted", but such notions cannot claim to be specifically *biosemiotic* notions of agency. Living subagents of biosemiotic agents are living systems and simultaneously semiotic systems, and these are therefore themselves defined qua biosemiotic agents. On the other hand, non-living subagents of biosemiotic agents (notably of humans) are not themselves biosemiotic agents and some may require definitions of their own (Sharov, Tønnessen 2015, p. 139).

In this sense, Latour's notion of agency, as well as hybrid theory, is rejected from the biosemiotic framework. This is evident when referring to a hierarchy between agents and sub-agents (who defines who is agent and who is below?, "Who has the right to call them sub-agents?", Derrida would ironically ask). Yet Latour is very clear on this point: "It will then become clear that to say of an actor that he/she/it is inert – in the sense of having no agency – or, conversely, that he/she/it is animated – in the sense of «endowed with a soul» – is a *secondary* and *derivative* operation" (Latour 2017, p. 50).

2.1. Material agency

Latour's view challenges this value system, where agents do not depend on the notion of Life nor on the notion of the Human; agents continue to interchange with each other depending on the activities that are demanded in a series of actantial concatenations. Indeed, according to Latour, agents are not even individuals, but always collectives acting on the basis of heterogeneous drives. We find such thinking in other materialist authors such as Judith Butler, Jane Bennett, Donna Haraway, Rosi Braidotti and Karen

Barad, when, for example, the latter challenges the arbitrary assignment of agency on the basis of capabilities or qualities:

> Agency is not aligned with human intentionality or subjectivity. Nor does it merely entail resignification or other specific kinds of moves within a social geometry of antihumanism. Agency is a matter of intra-acting; it is an enactment, not something that someone or something has. Agency cannot be designated as an attribute of «subjects» or «objects» (as they do not preexist as such). Agency is not an attribute whatsoever – it is «doing»/«being» in its intra-activity (Barad 2003, pp. 826-27).

The non-living actant can also come from the geophysical universe in which matter, made up of atoms and molecules, organizes itself. In this sense, when we speak of matter organizing itself, we mean to make explicit what John Deely (1990, 2001), with the term physiosemiosis, has indicated: the arrangement through which matter makes itself more readily available for subsequent organization. "Physiosemiosis may also be defined as that process whereby matter organizes itself (as «irrelevant» habit structures) so as to make itself more readily available for inclusion in biosemiosis and anthroposemiosis [...]" (Coletta 2016, p.77).
This means that the way in which non-living matter becomes a signifier for an organism derives from the sign disposition[10] arrangement of the matter itself (like a "natural habit"). It is a kind of feedback (an echo or rebound) of the "interpretative look" that in contact with the objects of the world returns bringing with it a meaning denoted by the type of matter. After all, if the agents that enter into relations modify each other, precisely on the basis of their encounter and influence, at the same time Latour (2012) also warns us that signification is a property of all agents because they never cease to have agency.
In this respect, we can speak of an agency of nature. By "nature's agency", we mean a pervasive property inherent in matter, different from human intentionality but capable of exerting an influence on human and non-human phenomena (Iovino, Oppermann 2014). In this sense, it is matter itself, organic and inorganic, that manifests the capacity to act in an active and transformative manner depending on the context. But agency takes many forms, all characterized by one important feature: they are material and the meanings they produce influence the existence of human and non-human nature in various ways. Agency, therefore, is not necessarily and exclusively associated with human beings and human intentionality, but is a pervasive property of matter, as an integral part of its generative dynamism. From this dynamism, reality emerges as an interwoven flow of material and discursive forces, rather than as a complex of hierarchical forces or a complex of hierarchically organized individual actors. Trying to provide a more accurate picture of reality requires a redistribution of agency.

3. The Great Modern Separation of biosemiotics

When considering whether an object is living or not, we must show how these dividing thresholds have been defined. We must situate this demarcation and separation historically, while also considering the causes and effects that produced them. No object, says Latour, whether it is considered "natural" or "social", has such a firm and stable nature that it can be unambiguously assigned to either sphere. The interaction between actants that leads to the actualization of events presupposes a competition of forces

[10] By "disposition" we mean a kind of "disposition to respond" in sign terms to a stimulation. Disposition wants to refer to Giorgio Prodi's (1977) theories in a narrow sense (and Charles Morris (1946) in a broad sense) in which two heterogeneous elements are arranged in a composition that depends on complementarity dynamics. It is a matter of identifying in the arrangement a kind of relevance (or interest) based on the relations coming from the capacities and qualities of the actors within their relationship. A theory of correspondence, built on Prodi's theories, has recently been presented (Zengiaro 2022c).

that "hybridizes" the outcomes. Biocentrism has meaningful effects on hybrid categories and agency, as well as on the production of the – often self-referential – notion of Life.
To focus on Life as a semiotic discourse is to attempt a pertinentization of a figure that is itself hybrid (Emmeche 1998). Every living entity is dependent on an ecological context that intertwines life and non-life. Every form of life is linked to the inorganic by a mutual existential intertextuality[11]. Similarly, the forms of agency that are linked to the living do not take into account a movement that is structured within the material relations of any discourse on life. There are chains that give rise to agencies that invest life, but not only. These layers, which biosemiotics tends to separate, are actually part of an interdependence that hybridizes the terms and at the same time does not allow for a deep semiotic analysis, if not structured on a highly arbitrary construction of meaning. Recognizing that the separation of life and non-life is determined by a certain type of material organization is already a first step towards understanding that there is a continuity between living and non-living.
Instead of getting used to determining principles of difference, we must rather give rise to an analysis of the continuous chains of processes that begin with the living and extend into the non-living, and vice versa (Latour 1996). In other words, the problem of life is a problem of composition (Latour 2010). Life in its construction of meaning must be rearticulated starting from an ecological analysis (as the science of relationships) and no longer strictly biological (as the science of life). The risk is to fall into Cartesian entities extracted from their context, without considering the hybrid and interdependent constitution of living systems.

3.1. The perils of Latourian thought

Latour's theories of hybrids can challenge the premises of biosemiotics because they reveal the pervasive presence of non-living entities within living systems and their organization. Life, we might say, is properly reinvented by biosemiotics, which tend to cleanse every form that stands out along the edges. This, Latour would say, is precisely part of modern thinking, a thinking that produces a "Great Separation". Hybrids, in fact, are forgotten and not thought of as semiotic agents by biosemiotics. And yet, they continue to pervade Life, Society, Culture, Nature in a layered manner. Often reflecting on biological reality, we are tempted to draw a clear line between what is life and what is not. But there are other quasi-life forms that lie at an intermediate stage between the organic and the inorganic (Nurse 2020). Consider the classic example of the virus. The virus is a hybrid that stands between the living and the non-living, modifying through its agency (the spillover) society, the economy, politics, social relations, but also the body of life forms (at the level of the pulmonary, blood, body temperature, the death of the individual). It stands halfway between the living and the non-living. On the one hand, they are alive when they are chemically active and reproduce in host cells, on the other hand, they are non-living when they exist as chemically inert entities outside the cell.
Latour's dangerousness is precisely that it reveals that fields of study such as biosemiotics only deal with those entities that have a *certain kind of agency* and within a *certain kind of semiotic threshold*. When we claim that there is, on the one hand, a living world and, on the other hand, a non-living world, we are simply suggesting that, *a posteriori*, an arbitrary portion of the actors will be deprived of all agency and that another, equally arbitrary portion of the same actors will be endowed with semiosis. By this, we wish to emphasize that, despite the widening of semiotic thresholds from the cultural world to the natural world, biosemiotics presents itself again as a semiotics that uses Life in an unmarked way: for biosemiotics, Life is not a problem and does not attract attention. Just as Umberto Eco was criticized for

[11] "Inorganic", in this work, is understood as something that does not strictly come from human technology, but neither does it exclude it. For a discussion of the semiotics of the inorganic of machines and technological apparatuses, see (AA. VV. 2020).

his notion of the lower threshold by biosemioticians (Nöth 1994, 2000), accusing him of arbitrary discrimination for other forms of life, in the same way, biosemiotics now presents itself as biocentric semiotics that does not take the non-living into account.
Life, however, does not respect these categories, constantly crossing borders. It is here that, following Latour, we can go in search of the *unthinkable of life*, that is, everything that biosemiotics does not take into account as non-life and everything that modernity places outside because it is hybrid[12]. The relational dimension of hybrids belongs to the expression of actants to function when they come into contact with other actants, giving rise to networks (Akrich, Latour 1992). Indeed, life is properly both a process, which therefore prefers continuous change, and a network, integrating and interacting with the non-life. In these properties (being a process in becoming and composing a heterogeneous network) we can read life as a *hybrid device that forms a reticular model of semiotic resonance*[13]. Semiosis, life and non-life, nature and culture, are taken inside this hybrid and reticular model in an immersive and pervasive way; what we can, in a complementary way, defined as a single, large translation system (belonging to a semio-physics). Biology, like ecology, forces us to show the instability of Life and its hybrid forms. *Bio*morphic figurations are just as unstable as *phusi*morphic ones (Latour 2017). In nature, there are no absolute categorical distinctions (not even between biological and non-biological, says Prodi), only encounters and clashes between heterogeneous elements.

4. The colligative and the collective

In attempting to rethink life as a phenomenon consisting of heterogeneous elements, living and non-living, natural and cultural, James Lovelock tells us: "Life is social. It exists in communities and collectives. There is a useful word in physics to describe the properties of collections: *colligative*" (Lovelock 1988, p. 18). The colligative is the way in which the temperature or pressure of a sufficiently large group of molecules is expressed or measured. Similarly, living organisms also exhibit properties that cannot be deduced from a single organism in the group. When a body maintains its temperature independently of that of its surroundings, it means that the body forms a whole attributable to the sum of its parts that keep it in a metastable state. Homeostasis, Lovelock explains, is a colligative property of life.
The colligative relationship derives, however, from a property of continuous material-energy translation, through which the parts of a heterogeneous group coordinate. Similarly, in a given ecosystem, the living and non-living create planes of superposition, producing biotranslation (BT, see Fig. 1) and physiotranslations[14] (PT) that coordinate co-evolution and transitions from one state to another (which is

[12] Just think of the fact that synthetic biology attempts to extract patterns from life by eliminating continuity processes. Following this reductionist strand of life, xenobiology has thought of reproducing life as an assemblage of components with different biochemistry (Budisa, Kubyshkin, Schmidt 2020).
[13] With the notion of "resonance" we refer to Rene Thom's theory (2006), in which the notion of resonance is presented as a linear oscillator subjected to an impulse of a frequency equal to its own frequency. Only when an object finds its own correspondence does the resonance branch out into a heterogeneous relationship of correspondences. In this sense, the model of the living being is interpreted as the result of interacting regulatory mechanisms.
[14] I coined this term because it seems useful to show that semiosis also exists outside the biological realm. Physiotranslation, unlike biotranslation, refers to a process of material correspondences that are established as "natural", but which are actually relationally embedded through a shared code. Every piece of information exchanged between two material entities is specific in the sense that it can give rise, through a process of correspondence development, to another specific, active, and operating structure. Physiotranslations are meaningful when they produce changes in the entities they relate to. In the case where two materials (water and oil, for example) do not mix, it is because they are fundamentally indifferent to each other, unable to translate the different information into a code. It is a kind of translation by difference, which creates a third difference through

nothing more than a retranslation that disrupts one collective by creating another). This collaboration between the parts, these metamorphic flows, have to deal with a kind of selective force that occurs according to qualities and capacities. This force produces interlocks; and these interlocks between elements can be considered as semiotic relations, where one entity coming into contact with another either becomes interlocked or remains indifferent to it[15]. It is in their collective giving that the element-actors realize the event. *The colligative is nothing other than the measurement of the collective's power to act.*
In this case, actant-collective is everything that contributes to action, sharing in the realization of a given event. It is here that Latour makes the actants proliferate, showing how not only the living has agency, but also that each entity possesses a force of action. By intertwining Lovelock and Latour, the colligative and the collective, we can re-propose an actantial perspective that belongs to an *ecology of relations* that we are able to describe with varying degrees of precision. Ecosemiotic relations come from an actantial semio-network.

4.1. The Gaia agency

In Lovelock's vision, followed with interest by Latour, Gaia is inseparable from the notion of life, but at the same time it is not just the biosphere. The living planet, Gaia, is not the biota, i.e. the set of all living organisms, but is an inseparable mixture of life and environment. Particularly interesting is that life, in this perspective, is not separable from the elements that are heterogeneous to it. On the contrary, this heterogeneity exists only in a formal way, but does not exist in the composition of what we call Life because life forms only occur in a context that is by definition not living.
In this sense, life is hybrid by definition, since it is made up of and is composed of elements that gravitate around it. It is a matter of understanding that life is a collective of inseparable living and non-living organisms. Gaia comes into existence when living organisms, rocks, atmosphere and oceans come together to form a new entity. This shows us that regardless of what is living and what is not, we can account for an intercommunication in which the exchange of forms of action and information occurs through transitions between agencies. In order to gain a more focused understanding of the forms of semiosis, we must set aside the pretence of drawing a portrait of the living against an undifferentiated background of things. Any matter in the world is not a support, but is articulated together with meaning, because materiality is discursive - matter emerges from the continuous reconfiguration of boundaries in a perpetual performance of the world. The matter of which every living and non-living entity is composed, becomes in this sense an active agent in its own continuous materialization. In this hybrid vision, semiotic processes emerge in metamorphic zones (Latour 2020). And, keep in mind, metamorphism is properly the internal process of the globe that causes the hitherto stable tissue and mineral composition to change to a solid state[16]. It is here that the metamorphic zone and the semiotic processes beyond the living become visible again. As if, beneath the lower threshold of the living, the Earth is reappearing.

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a crossing of codes and information. In this sense, there is no signification without functional differentiation or, in Gregory Bateson's (1972) terms, without "a difference that makes a difference".

[15] See the semiotic square that identifies the terms "selection", "indifference", "non-selection", "non-indifference" as a physiosemiotic theory (Zengiaro 2022b, p. 43).

[16] If we think of Gaia as an inhabited planet, a heterogeneous biosphere, differentiated life, we are completely forgetting the Earth as a material base. We are only focusing on the visible part of the world. Between Gé and Ctòn there is a systematic opposition: the former refers to the Earth as something evident i.e. clear, superficial, arranged horizontally; the latter, on the other hand, implies invisibility i.e. obscurity, the inside and not the outside, depth and verticality and not horizontality (Farinelli 2003).

Latour's discourse on the New Earth, an animate and sensitive, fragile, and unstable Earth, refers precisely to this shift in point of view: from a planet in motion to a body and its behaviour. The semiotic counter-revolution is involved in the forced introduction of non-living events into the field of semiosis. Think of complex events that resignify the social: from climate change to ocean acidification, from melting glaciers to the planetary spread of viruses (Latour 2005, 2018). To think that semiosis stops where the agency of the living exists is to miss the intervention of the inorganic in the scene of the natural and the social, the human and the non-human. And it is not a question of giving life to non-living events, or animating matter, it is not a question of adding, but of distributing agency. Just as living organisms give rise to semiotic processes for their own survival, in response to the environment, in the same way the actor-environment activates material semiotic processes that communicate in response to modification by organisms. Semiotic processes in nature are always bidirectional. Where the organism modifies the environment, it is modified in turn, lending, as it were, an ear to the communication of the non-living. After all, Latour has shown that it is currently the terrestrial, i.e. telluric, attitudes that are modifying our way of life and no longer vice versa. The living depends on the organization of the non-living: on air, water, heat etc.

> No, this time, just as happens in prescientific and nonmodern myths, we encounter an agent that takes its label, "subject," from the fact that it can be *subjected* to the whims, the bad moods, the emotions, the reactions, and even the revenge of another agent, which also takes its quality as "subject" *from the fact that it is equally subjected to the action of the other*. Being a subject does not mean acting in an autonomous fashion in relation to an objective context; rather, it means *sharing* agency with other subjects that have also lost their autonomy (Latour 2017, p. 62).

5. Ecosemiotics as hybrid biosemiotics

By identifying life with semiosis, biosemiotics arbitrarily uses premises that contain very fuzzy notions within themselves. Since life is not known precisely how far it extends as a process, we asked ourselves how it is possible to define where semiosis begins and ends. Furthermore, by emphasizing the hybrid form of all living things, we saw that semiosis itself can be extended beyond biological limits. By showing how the lower threshold can be crossed, we actually want to turn biosemiotics towards a non-biocentric view. A methodology for dealing with semiotics that does not only belong to the realm of life can be offered by ecosemiotics.

Ecosemiotics is commonly defined as "a branch of semiotics that studies sign processes as responsible for ecological phenomena" (Maran, Kull 2014, p. 41). However, what we would like to do is to give a new definition of ecosemiotics, broadening the context to include non-living or not-at-all-living entities. An ecosystem is a functional unit comprising a set of living organisms and non-living substances with which the former establish an exchange of materials and energy in a defined area. Latour's theory of hybrids shows us that there is an interweaving of inseparable heterogeneous elements that constantly resignify. Indeed, not only organisms are endowed with semiotic agency, but also everything that makes up the environment in which they are immersed. In this sense, even non-living matter establishes an exchange of substances that integrate with organisms, displaying its own agency and semiotic processes. These relationships belong to an ecosystemic complexity in which it is not possible to extract a single element from the network of life and non-living matter. Using ecosemiotics as a tool for analysis, we can highlight how all life and matter that make up the planet are intrinsically linked in a complex semiotic layering, the Ecosemiosphere (Maran 2021). Ecosemiotics, in our redefinition, allow the construction of material semiotics that extends beyond life. In other words, ecosemiotics give space to the hybrid actors that participate in the composition of semiotic processes in living systems (Zengiaro 2022a). Meaning, in

this ecological game of signifying networks, can emerge from the actors that participate in the ecosystem in its structural complexity.

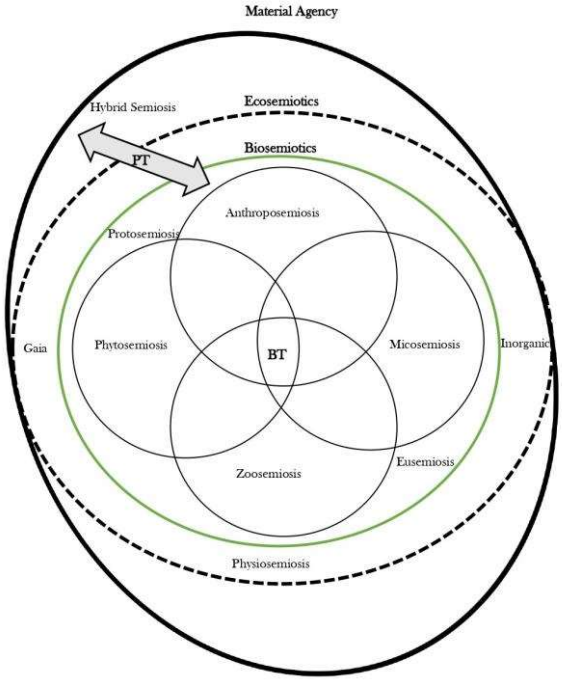

Fig. 1 – BT is the Biotranslation; PT is the Physiotranslation. The living and certain entities between living and non-living are considered in biosemiotics only if they participate in a protosemiosis or eusemiosis. Whereas ecosemiotic include the biosphere and also the non-living part. Through physiotranslation, it is possible to cross the various thresholds arriving at the material agency, where the hybrids reside.

This extension of ecosemiotics to non-living actors has also been mentioned recently by Timo Maran, in which he writes:

> Analyzing ecology from the semiotic perspective enables the identification of the integrating, regulating, and dividing effects that sign relations have in ecosystems. [...] For addressing ecological processes, ecosemiotics should instead operate by taking into account a broad field of phenomena, ranging from the semiotic potential of the material environment, up to the specific landscapes treated in culture as natural heritage symbols. In moving towards such an all-inclusive methodological stance, ecosemiotics could find guidance from so-called Actor-Network Theory (ANT) [...]. ANT aims toward a "flat ontology" incorporating social, material, and semiotic processes within the same analytical framework. [...] Ecosemiotics could take ANT as a positive example on how to work with complex and heterogeneous objects, while also taking into account critical views on ANT concerning its weak methodology and its exclusion of emic perspectives. In analyzing complex ecological problems, ecosemiotics should retain the view of the diversity of semioses involved in the ecological domain, and include the subjective perspectives of different animal umwelts (Maran 2022, p. 196).

In this sense, ecosemiotics could integrate the non-living within the *semiotics of life*, manifesting the relationships they have with it and vice versa. This is not only an extension but a mediation between the actors that make up a given environment. It is a kind of perturbation of the field of biosemiotics, which it can resist. It is not a question of taking something away from the notion of Life and living,

but rather of adding to living systems the context in which they have always been immersed. It is an operation that Latour has often carried out (Croce 2020), that of taking an entity (the organism in this case), shifting the focus around what surrounds it (the inorganic), showing the transformations induced by the entity and vice versa.
The history of the planet shows us a continuous history between non-life and life, as well as between inorganic and organic. For example, the variety of minerals on Earth is the result of the action of living organisms; in turn, the variety of minerals has contributed to the variety of organisms (Padoa-Schioppa 2021). It is a continuous cycle that creates an ecology of relationships. We must understand the planet from an ecosystemic vision of integration (Capra, Luisi 2014). A cell, a forest, a hurricane and an organism are complex systems connected in an ecological communication. Complex systems are systems that are highly connected internally and open to the environment, with which they exchange matter, energy and messages. In this sense, complex systems are non-linear, non-deterministic, self-organizing, dynamic, historical and produce novelty.
The remarkable aspect of these feedback loops of ecosemiotics, highlighted by complexity theories, is that we can no longer think of rocks, animals and plants as separate entities (Capra 1996). Reading *Gaia as a living text* through ecosemiotics allows us to bring out the close interconnection between the living parts of the planet (plants, microorganisms, animals) and the non-living parts (rocks, oceans, atmosphere). This is the procedure to be followed for an adequate science of composition - in Latour's opinion, the only path that makes it possible to dispense with the distinction between inside and outside, and therefore with that between entity and context, in order to look always and only at the chains of effects produced by the workings of the actants. This methodology finally makes it possible to dispose of the metaphor of organisms living inside an environment. For this reason, Latour sees in Lovelock, as we are articulating ecosemiotics, a confirmation of his own theoretical hypothesis: in order to account for living objects, there is no need to postulate the existence of a superior organism or structure that overlies and includes them. Full connectivity does not require any holism (as was argued by Marcello Barbieri in determining the premises of biosemiotics). Through ecosemiotics, we want to propose a breakdown of hierarchies between networks and nodes, between the environment and the organism, the non-living and the living.

6. Conclusion

In conclusion, in the first part we have seen that the history of biosemiotics was important in redefining semiotic thresholds. This field of research has opened up semiotics to living beings, with the effect of amplifying semiotic processes according to the organization of the living. By defining some basic premises and identifying semiosis with life, biosemiotics has made great advances. In recent years, the emergence of ecosemiotics has taken into account complex environments in which living beings coordinate their existences on the basis of ecosemiotic relationships. With this view, we have included Latour's theories on hybrids and agency, showing how his thinking can be useful in rethinking the premises of biosemiotics. The motivation for using this semio-material perspective is precisely to provide an account of the complexity within which living beings are embedded and from which they originate. Case studies concerning the material organization (Whitesides, Grzybowski 2003; Ilday *et. al.* 2017) and the interconnection between complex events and life are increasingly evident. Ecosystems, in fact, are made up of complex and hybrid entities. Hybrids are collectives that maintain Gaia in a state of equilibrium through constant collaboration with inorganic and quasi-living agents. Therefore, we can redefine ecosemiotics by integrating Latourian theories and showing that semiosis extends beyond life. "It is important to realize that only living beings and their inanimate extensions undergo semiosis, which thereby becomes uplifted as a necessary, if not sufficient, criterial attribute of life" (Sebeok 1994, p. 6).

Thirty years after Sebeok's statement, what we propose to do, in correspondence with the idea of advancing research in the field of biosemiotics, is precisely to investigate where these extensions arrive (Deely 2015). Holding onto the findings of biosemiotics (Deacon 2021, 2023), what interests us is understanding how signification emerges along these extensions. Thus, starting from the advances that biosemiotics has brought to the field of biology and semiotics, we wish to understand how far we can go in our investigation. However, this path is still to be explored. The idea is to reopen the debate by asking biosemiotics to question its own premises once again. I am convinced that Latour's dangerous ideas – and unused by biosemioticians – can bring something truly innovative to the debate.

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