


Semiosis as Individuation: Integration of Multiple Orders of Magnitude

Vefa Karatay¹ · Yagmur Denizhan²  · Mehmet Ozansoy³

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Abstract This paper proposes Gilbert Simondon’s ontogenetic theory of individuation as an overarching framework for multilevel semiosis. What renders this theory suitable for this role is the fact that it shares a significant part of its heritage with biosemiotics, which provides compatibility between them. Unlike many philosophers who have worked on individuation, Simondon envisages a general process of individuation that starts with a metastable preindividual. This process ultimately constitutes an axiomatisation of ontogenesis and manifests itself in three basic modes: physical, vital and psycho-collective. In any of these modes a transductive operation is at work resolving the disparities of the preindividual whereby new structures emerge. Depending on the mode of individuation, the emerging structures can create new disparities that ask for further individuation. Simondon refers to such conversion of structure to operation and vice versa as allagmatics. He also extends his theory to scientific methodology establishing a healthy balance between reductionism and holism. His theory can be used to amend Peircean metaphysics to improve its compatibility with contemporary scientific discourse.

Keywords Individuation · Transduction · Ontogenesis · Allagmatics · Semiosis

✉ Yagmur Denizhan
denizhan@boun.edu.tr

Vefa Karatay
vefakaratay@gmail.com

Mehmet Ozansoy
mozansoy@medipol.edu.tr

¹ Independent Researcher, Istanbul, Turkey

² Electrical and Electronics Engineering Department, Bogazici University, Istanbul, Turkey

³ Department of Physiology, Faculty of Medicine, Istanbul Medipol University, Istanbul, Turkey

Introduction

In its rather short history analytic-reductionist-mechanicist-positivist science had amazingly immense effects in both changing the world and shaping humanity. In fact, the increasingly dominant trend towards specialisation in sciences has given rise to marvellous achievements but also has driven many tracks of scientific endeavour to dead ends. This has led in the past decades to a growing quest for cross-, multi-, inter- and trans-disciplinary alternatives.

Biosemiotics with its roots in the strong cosmogonic philosophical framework of C. S. Peirce, constitutes a significant project in this direction; and multi-level semiosis can be regarded as a further move in the integrative agenda of sciences. At this point we want to refer to the theory of individuation of Gilbert Simondon (1924–1989), a French philosopher who died rather early and remained forgotten until his gradual revival from 2000 onwards. His theory of individuation, which offers an all-encompassing ontogenetic framework, is a very promising candidate for this task, particularly because it is not only compatible with biosemiotics in many respects but also has the potential of improving its metaphysical grounds via possible amendments to the Peircean schema.

Heritage of Simondonian Philosophy from a Biosemiotic Perspective

Simondon's philosophical heritage, as investigated in great detail in Simon Mills' PhD thesis (Mills 2014) which is extensively made use of in this section, seems to have noteworthy commonalities with biosemiotics. For instance, though Simondon did not directly cite it, he was probably influenced by Uexküll's theory of *Umwelt* through Merleau-Ponty who was his doctoral thesis supervisor.

Maurice Merleau-Ponty, whom biosemioticians are already familiar with (e.g. through Jesper Hoffmeyer's writings (Hoffmeyer 1996, 2008)), developed a growing interest in biology, and his later work can be viewed as an engagement between biology and phenomenology. What is less known is that his student Gilbert Simondon extended his work and came up with very important ideas that we think are significant for biosemiotics. Merleau-Ponty is better known via his earlier work "Phenomenology of Perception" (Merleau-Ponty (2002 [1945])) as a phenomenologist. But he had the urge to turn to biology and ontology in hope for overcoming the consciousness-object duality.

"The problems posed in Ph.P. [Phenomenology of Perception] are insoluble because I start there from the 'consciousness'-'object' distinction." (Merleau-Ponty 1968: 200, as cited in Mills 2014, p. 163)

While shifting his interest from phenomenology to ontology, Merleau-Ponty considers "nature" as ontologically primordial to the consciousness-object duality, and one of his key ideas is that "consciousness emerges from embodiment as a behaviour". Mark Hansen provides an important argument as to how Merleau-Ponty overcomes the two dichotomies simultaneously:

"[the fundamental correlation of behaviour and morphogenesis] overcomes the dichotomy between mind and body on one side and world and environment on the other..." (Hansen 2005: 86, as cited in Mills 2014, p. 164)

With his shift of focus Merleau-Ponty also shows that the aforementioned duality is a construction rather than being foundational, and that it constitutes a necessary condition for life. It should not surprise us that at this stage of his career Merleau-Ponty turned to Jacob von Uexküll and his concept of *Umwelt* as that which.

“marks the difference between the world such as it exists in itself, and the world as the world of a living being. It is an intermediary reality between the world such as it exists for an absolute observer and a purely subjective domain.” (Merleau-Ponty 2003: 167, as cited in Mills 2014, p. 165)

Merleau-Ponty, focusing on behaviour to understand the emergence of consciousness, makes use of the notion *Umwelt* as the site where meaning is constructed between the organism and its environment. In his rather detailed work related to von Uexküll he uses biological examples, makes distinctions between lower and higher animals according to their *Umwelten*, and employs von Uexküll’s terminology like *Merkwelt*, *Wirkwelt*, and even the less well known *Gegenwelt*, an important notion that is applicable only to higher animals and enables truly open sign systems like language.

Fóti’s rather recent research on Merleau-Ponty’s work (Fóti 2013) states that according to Merleau-Ponty, as the *Gegenwelt*, a “mirror of the world”, appears in higher animals, “the *Umwelt* is no longer a closing off, but rather an opening,” and thereby “the world is possessed by the animal” (ibid p. 75). Fóti points out that the formation of a *Gegenwelt* introduces “absolute novelty”, with the consequence that stimuli cease functioning as causal factors and attain the value of *signs*.

From a biosemiotic perspective it would be legitimate to ask whether the notion of *Gegenwelt* “enables” or “is enabled by” truly open sign systems like language. The following passage by Fóti sheds light on Merleau-Ponty’s view (which coincides with our own) that the *Gegenwelt* enables truly open sign systems, and not vice versa:

“The conditions of possibility of the elaboration of a world of encounter are, according to Merleau-Ponty, to be sought in sensory-motor organization, as well as in the abilities to regulate physiological position and to achieve proprioception.” (Fóti 2013, p. 76)

Merleau-Ponty’s extensive study on the works of von Uexküll and a number of other biologists in his philosophical attempt to overcome the subject-object duality takes him to a position to make ontological conclusions about life with important implications such as,

- a shift from considering fully individuated beings towards emphasising their ontogenesis,
- a consequent shift from taking the organism’s subjectivity as a given, to considering its emergence, implying the co-emergence of both the organism and its sensibility, and
- a move away from a Newtonian-Euclidean view of time and space, which is restricted to fully individuated beings, and thus is not suitable for understanding emergence.

We will see that due to similar reasons, Simondon has undertaken an even further move from the foundations of logic theory.

Basic Notions in Simondonian Philosophy

Gilbert Simondon's point of departure was the ontogenetic perspective of late Merleau-Ponty, who was particularly inspired by von Uexküll. Simondon's entire project can be interpreted as an attempt towards an intelligible and all-embracing model of ontogenesis that is proposed to proceed via the axiomatic operation of transduction. In that respect, his endeavour can be compared to the Peircean cosmogony. Furthermore, extending his doctoral advisor's dictum that "consciousness emerges from embodiment as a behaviour", Simondon suggested an epistemological methodology that is compatible with science and is analogous to his ontogenetic framework.

The Theory of Individuation

The theory of individuation, which Simondon developed in his main doctoral thesis, can be regarded as the core of his grand project of providing a unified understanding of the genesis of all things (Mills 2014 p. 224, footnote 33). His very original approach to this very old issue of philosophy is an attempt towards a cosmogony (Toscano 2006) and is thus meant to be applicable virtually to all possible domains.

Simondon's critique of earlier philosophers who elaborated on the same issue is based on the argument that they assume entities pre-existing the process of individuation: Substantialist atomism leaves the emergence of atoms as an unquestioned issue while reducing the rest of individuation to the formation of complex conglomerates of them. Conversely, the hylemorphic theory, which can be traced back to Aristotle, assumes a pre-existing principle of individuation that brings together a matter (*hyle*) and a form (*morphe*). However, as Simondon objects, since any principle itself is already an individuated being it cannot be placed before the onset of the process of individuation.

Simondon's solution to the problem of individuation is a processual one that allows for the creation of grounds rather than assuming the pre-existence of a specific substantive ground level. He places an unstructured state of being at the beginning and lets an axiomatic process unfold its potential. The initial **preindividual being**, i.e. *ontos* in a state of pure potentiality, is laden with tension and ready to unfold and bear new dimensions. Simondon calls this highly pregnant quality of the preindividual being **metastability**. What temporarily keeps the preindividual at this very fragile state is the lack of interactive communication between disparate orders of magnitude. Once such communication is initiated by a triggering event, metastable tensions start being resolved leading to generation of local structures, which in turn, serve as a principle and model for structuration in neighbouring domains. This progressively expanding structuring activity, the so-called **transductive operation**, has an axiomatic character in Simondon's philosophy as a method of ontogenesis. The reader may rightly notice here a parallelism with the Peircean metaphysics, specifically his notion of habit. This subject will be addressed in subsection [Critique and Amendments to the Philosophical Foundations of Biosemiotics](#).

Simondon proposes a universal process which has three different modes of operation: *physical*, *vital* and *psycho-collective*. Before going into the detail of these modes it is worth indicating Simondon's specific terminology: the term *individual* is reserved for those that are presently undergoing individuation, while entities that have completed and terminated the process of individuation are referred to as *individuated beings*.

Physical Mode of Individuation

Crystal growth in super-cooled water¹ can serve as an illustrative example for explaining the notions underlying the *physical mode of individuation*, then can also be adopted as a metaphor for the other modes. Super-cooled water within a uniform container constitutes a *metastable* domain waiting for a perturbation that will break the symmetry and unleash the chain reaction of crystallisation. In that state, even a single ice crystal is enough as a seed -or in Simondonian terminology as a *germ of structure*- to initiate the actualisation of the potential in the metastable domain. Once this happens the process will be repeated across the frontier where the growing ice crystal faces the super-cooled water.

This iterative molecular process not only constitutes a basic example of Simondon's *transductive operation*, but also allows for an insight into his processual interpretation of information. We can describe this process as "the information of the metastable domain by the germ of structure". It is worth noting that here the *process of information* that takes place at the interface is quite different than the transmitted and received entity, the amount of which can be expressed by Claude Shannon's famous mathematical formula in a communication system. The crystal formation starting around a seed and proceeding to the whole container cannot be translated into the language of the information-technological model. Neither can the crystal seed be interpreted as the transmitter of information nor the super-cooled water as its receiver, because the knowledge about the resulting structure is latent in both the seed and the metastable domain. It should be kept in mind that there exist different types of ice crystals with different geometrical and physical properties. Hence, using a different type of ice crystal as a germ of structure one can induce the formation of a different crystal out of the same metastable domain. In other words; the metastable domain harbours a rich repertoire of potentials and a germ of structure simply invokes the actualisation of the matching potential. In any case, at the end of the physical individuation process what remains is a system deprived of its metastable potential.

As a matter of fact, even during the growth of the crystal its inside is an *individuated being*. In Simondon's own words, it is "dead and gone", is "radically past", or as Mills puts it "is an inert historical record of previous individuating activity" (Mills 2014, p.143), while the active boundary layer constitutes the physical *individual*. We may add that the external metastable domain, which will eventually be transformed, corresponds to the future. As stated above, the process ends with the exhaustion of the metastable potential and the disappearance of the physical individual.

It is worth remembering that the process of individuation starts and continues via the establishment of an interactive communication between disparate orders of magnitude

¹ The term "super-cooled water" refers to water cautiously cooled below its freezing point without freezing due to the lack of a nucleus around which the crystallisation process could have been initiated.

(i.e. in this example, at the molecular level and at the level of the flask). This communication creates congruence between these orders and thus shapes both the **topology** and the **chronology** of the emerging physical individual. Simondon calls this congruence **internal resonance**.

Vital Mode of Individuation

As opposed to what one would naively expect, the vital mode of individuation comes into play not upon the completion of a physical individuation process, but by suspending it before the preindividual metastability is completely exhausted. Simondon explains this point as follows:

“An individuation is relative, just like a structural change in a physical system; a certain level of potential remains, and further individuations are still possible. This preindividual nature that remains linked to the individual is a source for future metastable states from which new individuations can emerge. [...] The relation does not spring up from between two terms that would already be individuals; it is an aspect of the *internal resonance of a system of individuation*, it is part of a system state. This living [being], which is both more and less than unity, carries an *inner problematic and can enter as an element into a problematic that is larger than its own being*.” (Simondon 2009a, p. 8)

The sustenance of metastability characterises the **vital mode of individuation**, and implies that new disparities are generated asking for transductive resolution, while the old ones are being resolved. This can occur only under what Simondon calls the **topological condition of life**: generation and maintenance of the so-called **medial interiorities**, i.e. regions of interiority and exteriority within the organism, both separated and connected via selectively permeable and asymmetrically polarised surfaces. This asymmetric polarisation provides a topological reference distinguishing the inward and outward directions, while their selective permeability allows the generation of new disparities.

At the most fundamental level the separating/connecting surface corresponds to the cell membrane. More complex organisms have even further levels of organised enfolding of such separating/connecting surfaces, which are both generated by the vital individuation process, and serve the maintenance of the metastable tension. For example, vertebrates have more complex and interacting **medial interiorities** such as the digestive, nervous or endocrine system. Simondon’s discussion of the intestine is illuminating:

“Depending on the topology of the living organism, the interior of the intestine is in fact exterior to the organism, although it accomplishes in this space a certain number of transformations conditioned and controlled by organic functions; this space is an annexed exteriority.” (Simondon 1964: 260, as cited in Mills 2014, p. 145)

Within the living individual all medial interiorities at different orders of magnitude steadily communicate with and are attuned to each other such that all elements are

contemporary with the whole. Thus, there exists a much stronger correlation between the topology and chronology of the living being, and a much more complete regime of *internal resonance* as compared to the physical individual.

The above stated topological condition of life entails at the most fundamental level the selectively permeable and asymmetrically polarised cell membrane, which necessarily consists of macro-molecules. Consequently, Simondon considers the macro-molecular order of magnitude as the lower threshold for the possibility of vital individuation. Entities below that threshold cannot be regarded as physical or biological, but only pre-physical or pre-biological.

A living individual, by virtue of its ability to adjust the selectivity of its separating/connecting surfaces, can keep up its internal resonance in spite of the disparity with the non-resonating milieu. This capacity is the essence of *agency* which Simondon observes in its most rudimentary form in unicellular organisms.

At a closer look, the cell's encounter with the disparity causes a *sensation* that leads to the perturbation and subsequent re-establishment of the internal resonance. In Simondon's terminology this shift of internal resonance is called *affect* (not necessarily in concord with the ordinary usage in psychology). Thus, the cell's rudimentary agency can be said to be based on *affectivity*, a coupling between *sensation* of a disparity and the corresponding *affect*. As organisms become more complex, *sensation* gradually evolves into *perception*, and *affect* into *emotion*, leading to more complex manifestations of agency, as well as to a different mode of individuation.

Psycho-Collective Mode of Individuation

The need for a new mode of individuation emerges when the organism's affectivity fails to resolve or even aggravates the disparity between itself and the milieu. Under such conditions a resolution is sought via the development of more complex internal structures that will constitute the substructure of the *psychic* domain.

“The psychic is the continuation of the vital individuation in a being that, in order to resolve its own problematic, must itself intervene as an element of the problem by its action, as a subject. [...] The vital problems are not closed upon themselves; their open axiomatique² can only be saturated by an undefined series of successive individuations that engage ever more of the preindividual reality and that incorporate it into the relation to the environment.” (Simondon 2009a, p. 8)

The psychic being cannot resolve its own problematic by itself and has to make use of its remaining preindividual potential to co-evolve with other psychic individuals and use the collective as an *axiomatique* for the resolution of its problematic. Therefore, the psychic mode of individuation is inseparably coupled to the individuation of the collective, and we have to think of a unified *psycho-collective mode of individuation*,

² All English translators of Simondon's works have translated his usage of the noun “axiomatique” as “axiomatic”. However, in English it sounds like an adjective and could better be replaced by “axiomatics”. Nevertheless, we prefer to keep the original French word as a specialised term of art because Simondon apparently employs this concept to refer to an evolving system of *ontic* relations (which includes as a special case also systems of epistemic principles) as opposed to the common usage of axiomatics that typically evokes an *epistemic* system of first principles.

which transforms psychic individuals into subjects and the collective into the transindividual:

“But the psychic cannot resolve itself at only the level of the individuated being alone; it is the foundation for the participation in a greater individuation, that of the collective; the individual being alone, putting itself into question, cannot go beyond the limits of anxiety, which is an operation that has no action, a permanent emotion that is not able to resolve the affectivity, a test by which the individuated being explores its dimensions of being without being able to go beyond them. *To the notion of the collective, taken as an axiomatique that resolves a psychic problematic, corresponds the notion of the transindividual.*” (Simondon 2009a, p. 9)

Simondon discusses collective individuation mainly in connection with the psychic one and refers to it as psycho-collective individuation (indeed he does not make a strict distinction between them and even says that the psychic should also be understood as the ‘nascent’ transindividual). Although he usually focuses on human collectives, he does not reserve psychic activity to humans alone. His general attitude is that psychism is the development of new types of specialised vital functionality (i.e. behaviour) under appropriate conditions. For instance he states that (non-human) animals might “find themselves in psychical situations, only those situations which lead to acts of thinking are less frequent in [non-human] animals” (Simondon 1989: p. 152 footnote, as cited in Mills 2014, p. 182). In a speculative manner one could even make an attempt of extending his conception to populations of less complex organisms and suggest the notion of “affective-collective individuation” for further investigation.

On the other hand, there certainly is a continuum between Simondon’s three main modes of individuation as the psycho-collective mode presupposes the existence of the vital mode, and the vital one emerges from the physical. But one should not make the error of interpreting the modes as distinct phases within the process of individuation. The physical, vital and psycho-collective modes do not constitute a chain of events where one occurs upon the completion of the other. Just the contrary, one emerges by slowing down and suspending the completion of the other (i.e. vital mode suspends the physical mode, and psycho-collective mode the vital one). Such an emergence of a new mode corresponds to a qualitative change in the way metastability is exploited.

On Analogy, Allagmatics and Methodological Foundations

What happens during the process of individuation is the generation of structures out of an unstructured preindividual metastable domain via transductive operations. Depending on the mode of individuation, the emerging structures may generate further transductive operations, altogether resulting in ongoing cycles of ontogenesis. This explains how structures emerge and can be converted into other structures via transductive operations. Simondon calls this convertibility between structures and operations *allagmatics*, i.e. “the theory of operations”. It should be noted that in spite of the complementarity of structure and operation within such conversions, Simondon assigns a primordial status to operation because it is the transductive operation of the preindividual that leads to the apparition of the structures in the first place.

Classical science has long concentrated on the analysis of (already individuated) *structures and their similarities* (e.g. anatomic approach and taxonomy in biology) thus falling short of capturing the dynamic aspect of the process. An approach based on structural similarities can lead to false analogies. Simondon, in his essay “Technical Mentality” (Simondon 2009b) makes a warning about unjustified generalisation of the implications of technological paradigms via false analogies, particularly analogies between the operation of human thought on one side and that of technical mechanisms (be they simple mechanisms as considered by Cartesian logic or feedback-based self-regulating automata as considered by the cybernetic paradigm) on the other side. One should note that in this example the similarity is on basis of behavioural structures.

Simondon contrasts this approach of *analytical thought* to what he calls *analogical thought*:

“[A]nalogical thought is that which observes *identities of relations, not relations of identity* but it must clarify that these identities of relation are the identities of operative relations, not the identities of structural relationships. By itself it discovers the opposition between resemblance and analogy: resemblance is given from structural relationships. Pseudoscientific thought makes substantial use of resemblance, sometimes even the resemblance of vocabulary, but it does not make use of analogy.” (Simondon 2005: 563, as cited in Mills 2014 p. 62, italics ours)

Then Simondon expands these notions to the epistemological dimension:

“The duty of the *allagmatic epistemology* is to determine the true relationship between the structure and operation in being, and thus to organize the rigorous and valuable relationship between structural knowledge and the knowledge of the operation of being, between *analytical science* and *analogical science*.” (Simondon 2005: 565, as cited in Mills 2014, p.132, italics ours)

Simondon emphasises that analytical science alone gives a reductionistic approach where “the whole is equal to the sum of its parts”, while analogical science alone corresponds to a holistic view where the functional whole is taken for granted and no further analysis is possible. So, in order to be able to produce scientific accounts of particularly complex phenomena one needs a healthy balance of analytical and analogical science.

He also criticises sole reliance on classical logic of excluded middle (*tertium non datur*) which would be applicable only to fully individuated beings but not to individuals, i.e. beings undergoing the process of individuation:

“[...] classical logic cannot be used to think the individuation, because it requires that the operation of individuation be thought using concepts and relationships between concepts that only apply to the results of the operation of individuation, considered in a partial manner.” (Simondon 2009a, p. 10)

The Simondonian Philosophy in Comparison to the Biosemiotic Perspective

Parallelisms

As must have been noted by the reader, there exist various similarities between the Simondonian philosophy and the biosemiotic approach, partially originating from their common heritage. First of all, they share most of their targets of critique such as Cartesian-Newtonian reductionism or cybernetic interpretation of information.

But they also share some notions and interpretations. For example, one can easily recognise in Simondon's notion of milieu the influence of von Uexküll's notion of *Umwelt*, though with an extension to the psycho-collective domain.

Also the gradual emergence of agency, psychism and consciousness from embodiment is in line with the general position of biosemiotics. Furthermore, Simondon's observation of the lower threshold (the macro-molecular level) for the possibility of vital individuation, and for the emergence of meaning is compatible with the general biosemiotic acceptance of the cell as the lower bound for both life and semiotic activity.

The intricate topology of the vital individual as described by Simondon is reminiscent of Hoffmeyer's description of "surfaces inside surfaces"; nevertheless the latter can be easily misunderstood as implying a topology that consists of concentric surfaces. In that respect, Simondon's topological description has the virtue of accommodating not only concentric surfaces but also more complex enfoldings.

There also exist more subtle similarities between the two approaches. For example, we can interpret the Simondonian notion of *transductive operation* as "scaffolding" in a generalised sense. And from vital individuation onwards the transductive operation can be more specifically construed as "semiotic scaffolding". Similarly, a system of transductive operations that integrates progressively further aspects of the milieu into the internal resonance of the vital or psychic individual can be interpreted as semiosis.

Critique and Amendments to the Philosophical Foundations of Biosemiotics

In spite of many points of agreement Peircean semiotics, one of the most fundamental pillars of biosemiotics, can be partially criticised from a Simondonian perspective. Obviously far ahead of his time, very inspiring and without doubt processual in nature, Peircean semiotics nevertheless carries rather static elements that seem to be remnants of hylemorphism and atomism: C. S. Peirce, in his 1904 essay "New Elements" (which Max Fisch described as "his best statement so far of his general theory of signs"), outlines his description of how a sign is connected with "Truth". He starts the discussion by dismissing a status of reality for the sign (representamen):

"In the first place, a sign is not a real thing [...] The being of a sign is merely *being represented*. Now *really being* and *being represented* are very different."

Then he goes on to assert,

"But so far as the "Truth" is merely the *object* of a sign, it is merely the Aristotelian *Matter* of it that is so", and "Every sign signifies the "Truth." But

it is only the Aristotelian *Form* of the universe that it signifies.” (Peirce 1998, p. 303-304, italics in the original)

Peirce’s reference to Truth and Matter on one hand, and to the somewhat unreal sign (representamen) on the other reveal a remnant of Aristotelian hylemorphism, at least in his formulation of semiotics. Whereas for Simondon all elements have an ontic status right from the beginning:

“The [needed] method consists of not attempting to compose the essence of a reality using a conceptual relation between two pre-existing extreme terms, and of considering all veritable relations as having the rank of being. The relation is a modality of being; it is simultaneous to the terms for which it ensures the existence. A relation must be understood as relation in being, as a relation of being, a manner of being and not a simple relation between two terms that could be adequately known using concepts because they would have a separate and prior existence.” (Simondon 2009a, p. 10)

Additionally, there is also some difficulty with the idea of “chains of triads” in sufficiently accounting for semiotic dynamics because it only allows for the concatenation of “atomic” units. Instead, if one wants to regard semiosis as a fundamental universal process co-extensive with life where signs grow and the semiosphere unfolds, it may be a good idea to heed Simondon’s recommendation:

“[...] *instead of understanding individuation starting from the individuated being, the individuated being must be understood starting from individuation, and individuation from preindividual being [...]*” (Simondon 2009a, p. 10)

In our view, even a single triad should be seen not as an abstract logical schema but as a dynamic ontogenetic process -no matter how well-established or “inveterate” it may be- because it can only be realised as the “(re-)invention of the sign object by an interpreter” who puts it into its proper context, analogous to the Simondonian invention of mental structures, which necessarily implies incessant transductive operations.

Anyway, despite such differences we think that there still remains a remarkable similarity between the two philosophers’ models of cosmogony. Let us clarify our own perspective through a comparison between the models of Peirce and Simondon: A popular Peirce quote is his statement that “[...] matter is effete mind, inveterate habits becoming physical laws.” (Peirce 1992 [1891], p. 293). In the same paper “The Architecture of Theories” Peirce also assigns firstness to Mind, secondness to Matter, thirdness to Evolution (p. 297). So it can be inferred that matter (second) is effete mind (first) *in the process of* evolution (third). Now, turning to Simondon, we could rephrase this as: ***structure of individuated being (second) is effete preindividual potential (first) in the process of individuation (third)***. In the Simondonian framework, individuation can basically be defined as the production (invention) of a new relation integrating (not just *linking*) previously unrelated phenomena (disparate orders of magnitude, not *organisational levels*). Similarly, the Peircean Sign can be described as the constitution of a new relation through the mediation of a sign (representamen)

between an object and an interpretant, which can roughly be apprehended as a process of individuation (or the spatio-temporal venue of such a process, thus an individual).

It seems likely that for Peirce matter is the end-product of the *once and for all* interpretation of the quasi-mind of nature/evolution at a very broad, cosmic scale. This view bears great resemblance to the Simondonian physical individuation, which ends with the exhaustion of the preindividual potential, illustrated by his classical example of crystallisation discussed in subsection [The Theory of Individuation](#). Indeed, Peirce himself is rather unambiguous about it:

“Thus, the tendency to habit would be started; and from this with the other principles of evolution all the regularities of the universe would be evolved. At any time, however, an element of pure chance survives and will remain until the world becomes an absolutely perfect, rational, and symmetrical system, in which mind is at last crystallised in the infinitely distant future.” (Peirce 1992 [1891], p. 297)

Such a perspective also gives a hint at the possibility of pansemiotics, or more accurately, the extent to which we can speak about semiotic activity at the level of inert matter. We will further discuss this issue below, but suffice it to say here that even if one could metaphorically interpret a physical individuation activity as semiotic, such an activity is obviously not a sustainable one.

As seen in the last row of Table 1, which shows an analogy with Simondonian concepts, in the Peircean framework there is no exact equivalent of the Simondonian

Table 1 Some examples given by Peirce for his categories (contents taken from *The Architecture of Theories* (Peirce 1992 [1891] p. 296–297 and from *Sundry Logical Conceptions* (Peirce 1998 [1903] p. 272) – the row on semiotics), and a comparison with Simondonian concepts

	First	Second	Third
Cosmogony	Mind	Matter	Evolution
	Chance	Law	Tendency to take habits
Biology	Idea of arbitrary sporting (random variation)	Heredity	The process whereby the accidental characters become fixed (Natural selection)
Psychology	Feeling	Sense of reaction	General conception (mediation)
Semiotics	Sign	Object	Interpretant
General	Being or existing independent of anything else	Being relative to/ reaction with something else	Mediation, whereby a first and second are brought into relation
	Origin of things	End of things	Process mediating between them
Simondonian philosophy	Preindividual (potentiality)	Individuated (stable structure)	Individuation (process)

individual, which is the active centre and the true agent of mediation. Therefore, the individual generally cannot be completely squeezed into any one of the three categories due to its preserved preindividual potential that implies non-identity with itself. In Simondon's own words;

“[...] reality, in itself, is primitively like the supersaturated solution and even more completely so in the preindividual regime, where it is *more than unity and more than identity*” (Simondon 2009a, p. 6)

At the cosmogonic scale, where matter is effete mind or physical laws emerge from a chance-medley – or “a chaos of unpersonalised feeling” - via nature's tendency to take habits, it is a matter of choice for the observer to decide if this can be acknowledged as some kind of interpretation, or where it really occurs, or by whom it is undertaken. The key point here is that evolution did not - and does not proceed solely at such universal scale and we are currently confronted with a myriad of deeply semiotic phenomena from bacteria to human cultures all of which entail certain levels of *locality*. At this point Simondon's theory of individuation becomes relevant because instead of assuming one big universe as Mind progressively crystallising into Matter it admits the reality of the individual, thereby offering an explanation for how countless forms of agents in their spatio-temporal locality might have evolved out of an initially vast and unoccupied cosmos.

For Simondon, from the vital mode onwards “the individual is a theatre of individuation”, to the extent that it develops a veritable interiority where preindividual potentials and metastability are maintained (contrast to the omni-present Peircean element of pure chance). Moving in this direction from the physical towards the vital and psycho-collective regimes of individuation, where one can also start to talk about semiosis proper, it becomes increasingly difficult to think the semiotic processes in terms of discrete Peircean categories and relationships between them with hylemorphic repercussions, leaving not much room for the genuine role of the *individual* together with its increasing charge of the preindividual. Alberto Toscano makes a clarifying remark on this subject by referring to the eminent Peirce scholar Karl Otto Apel:

“Apel has noted that Peirce borrows from Aristotelianism the notion of matter as pure potentiality, translating it into his own concept of Firstness. Whilst this is faithful to Peirce's self-presentation, it fails to emphasize sufficiently the hostility of ‘habitual’ evolution to any view of matter as passive, as well as to any hylemorphism concomitant with this conception.” (Toscano 2006, p. 222, endnote 51)

Nature's tendency to take habits as the *axiomatique* of Peirce's cosmogony is quite reminiscent of Simondon's transduction, especially within the physical mode of individuation. But there are also some significant points of divergence between the two philosophers. For instance, the character of the Simondonian preindividual is functionally analogous to, but ontologically different from the notion of chance (*Tyche*) in the Peircean metaphysics. Also Simondon's notion of the individual and its changing nature through different modes of individuation particularly with respect to its relationship with the preindividual has no counterpart in Peirce.

In conclusion we can say that insofar as the Peircean schema can be rescued from the remnants of hylemorphism and atomism, and enriched by amendments from the

Simondonian philosophy of individuation with the prospective outcome of “a more developed sign”, it would be easier to say that *the sign (triad) is the theatre of semiosis* starting with biology and unfolding further.

As indicated in (Mills 2014), similar criticisms can also be raised against the theories of contemporary thinkers like Stuart Kauffman where we see claims of strong emergence but also terms like “state-space”, “adjacent possible”, “non-ergodicity” etc. which entail already existing entities, structures and principles. Thus, Kauffman seems to be making claims of strong (ontic) emergence although he bases his arguments on epistemic ones (functional changes due to context). As a matter of fact, Kauffman’s attitude can be regarded as a contemporary extension of the Aristotelian remnant which we have already observed in Peirce.

Multi-Level Semiosis

In our opinion, Simondonian philosophy can have a significant contribution to the issue of multi-level semiosis because it offers both an authentic perspective to what can be meant by “level” on one hand, and also a wider framework into which “semiosis” can be embedded. From a very general perspective the notion of “level” seems to imply a reference to the ranking within a hierarchy, which (by definition) exhibits a discrete nature. What the hierarchy is based upon is often left unstated because it can be inferred from the context. A reference to “multi-levels” in a biosemiotic context usually associates organisational levels –a habit inherited from the systemic/cybernetic perspective which envisages systems as composed of subsystems at a lower organisational level, which in turn consist of even lower level subsystems etc. Although there is nothing wrong with this approach from analysis point of view, it bears a potential risk of creating the illusion that the genesis of these (individuated) systems must have occurred in the opposite direction of analysis, i.e. via a bottom up construction. However, in Simondon’s ontogenetic framework higher-level structures need not to have emerged after those at lower levels. As pointed out in (Denizhan 2014, p. 414), the role of the emerging individual in the Simondonian scheme is quite different than in Systemics:

“The individual is an open system that emerges at an intermediate order of magnitude as a *mediator* between a lower and a higher order of magnitude. So, unlike the common usage of mediation in Systemics to indicate a hub in a network, in other words a subsystem that facilitates fruitful interaction among other subsystems at the same organisational level, mediation in the Simondonian framework occurs between disparate orders of magnitude, thus typically between different organisational levels, and is connected with the emergence of an intermediate level.” (Denizhan 2014, p. 414)

As a matter of fact, Simondon’s theory of individuation provides a description of how levels (and the *entities* at these levels) emerge instead of taking them for granted. At the beginning, the notion of disparate orders of magnitude is the closest thing to that of “different levels”. As the process of individuation continues individuals emerge at intermediate orders of magnitude (realising the interactive communication of the disparate orders of magnitude) and start creating the “levels” of the emerging

hierarchical organisation. It should be noted that this hierarchical structure becomes more complex not by addition on the top-most level but via the emergence of intermediate levels. According to Simondon's theory the *integrity is sustained* via *internal resonance* and *evolvability* via *metastability and transduction*. We could try to reformulate this view employing concepts which are more common in biosemiotics: "integrity is sustained via downward causation and evolvability via the self-organising potential in nature". However, one should note that the original formulation in Simondonian terms provides a more penetrating account.

Here it may be helpful to give a concrete example of multi-level semiosis. An interesting one is found in an area that has only recently started to be better understood: the gut-brain axis (GBA). GBA denotes the communicative relationship between the digestive process and brain function and development. Insights into the gut-brain crosstalk have revealed a complex communication system that not only ensures the proper maintenance of gastrointestinal homeostasis, but is likely to have multiple effects on affect, motivation, and higher cognitive functions. The role of GBA is to monitor and integrate gut functions as well as to link emotional and cognitive centres of the brain with peripheral intestinal functions and mechanisms such as immune activation, intestinal permeability, enteric reflex, and entero-endocrine signalling. The mechanisms underlying GBA communications involve neuro-immuno-endocrine mediators. Advances in this field reveal the stunning span of disparate levels that are kept in interactive communication via GBA, as a recent publication titled "Collective unconscious: How gut microbes shape human behavior" in the Journal of Psychiatric Research demonstrates:

"The evolutionary formation of a complex gut microbiota in mammals has played an important role in enabling brain development and perhaps sophisticated social interaction. Genes within the human gut microbiota, termed the microbiome, significantly outnumber human genes in the body, and are capable of producing a myriad of neuroactive compounds. Gut microbes are part of the unconscious system regulating behavior. Recent investigations indicate that these microbes majorly impact on cognitive function and fundamental behavior patterns, such as social interaction and stress management." (Dinan et al. 2015, p. 1)

Thinking of the biological, ecological, psychological and cultural dimensions involved, GBA seems to constitute a perfect example for multi-level semiosis. Although a (bio)semiotic framework may suffice for the analysis of this very complex system as it is, only the Simondonian theory of individuation offers a framework that is capable of accounting for its genesis.

Another importance of Simondonian philosophy for multi-level dynamic systems is indicated by Mark Hansen. His discussion of the "System-Environment Hybrid" emphasises the broader understanding of *openness* Simondon provides by including the preindividual in the picture:

"For Simondon, in short, it is not simply the global perspective of *the organism* - a perspective tied to the organism's specification of a world - that informs the bootstrapping of identity from level to level; rather, the upward spiral of individuation is driven by two important conditions: the nonidentification of individuation with any form of individual (physical, biological, psychic or, collective) and

the coupling of individuation with the entire environment as a source of “preindividual”, “metastable” potential.” (Hansen 2009:134, as cited in Mills 2014, p. 148)

Conclusion

In this paper we have introduced the basic notions of Gilbert Simondon’s philosophy of individuation and tried to demonstrate the advantages it offers in accounting for the genesis as well as functioning of the subjects of interest of biosemiotics. In parallel with this accomplishment Simondon also provides a methodology for understanding this very generic process.

Besides providing as a philosopher a firm metaphysical ground on which further scientific explorations can be built, Simondon has extensively delved into various branches of modern science. In that respect, his profile can be compared to that of Peirce, a polymath of his time. But Simondon had the obvious advantage of being nourished by more recent developments of science, like quantum mechanics, cybernetics, modern biology etc. Yet it is also noteworthy that Simondon wrote all his contributions in the fifties and early sixties, well before the rise of complexity and chaos theories, second order cybernetics, developmental systems theory and biosemiotics.

In addition to providing a healthy balance between reductionistic (as in analytical thinking) and holistic (as in analogical thinking) positions and offering a link between human thought and its biological roots (which are shared incentives by biosemiotics as well), his use of *analogy* and the development of the *allagmatic theory* also pave the way for his ultimate goal of defining a single fundamental operation of being, which turns out to be “the transductive operation as the *axiomatique* of ontogenesis”.

Simondon’s overarching ontogenetic theory allows for a novel perspective on scientific disciplines. It suggests that instead of classifying them in terms of somewhat historically defined domains, one should better rely on the mode of individuation that governs their subjects of interest. The way these modes are defined in relation to what happens to metastability and internal resonance in the course of individuation creates new opportunities for rethinking the dynamics under consideration.

Last but not the least, Simondon’s philosophy bestows a methodological justification to the biosemiotic endeavour: the biosemiotic expansion of (initially human) semiotics constitutes a perfect example for what Simondon calls a “valid analogy”, which observes identities of relations, in this case the relation being the semiotic one.

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