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ARTICLE

Process of individuation in hybrid ecologies: on the relationship between art, machines and natural systems

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Abstract

The following article proposes a relational techno-aesthetics (Simondon-Stiegler) and an onto-epistemological (Barad-Bergson) perspective of technical objects, in order to conceive them as processes of dynamic relations, open and entangled relations between the natural-cultural-social-psychic. These perspectives come together for us, as an alternative to cybernetics, in which the organization is determined by the purpose of the process. Starting from a diffractive reading of the notion of *individuation* and *organology* in Simondon-Stiegler (1958/2017) and from an onto-epistemology of the "halfway" in Barad-Bergson's thought (1907/2007), a processual and hybrid vision of technical objects is proposed in order to provide philosophical bases that go beyond the culture/nature, human/non-human and natural/artificial modern dichotomies. Using these ideas to reflect on contemporary interactive artworks, the article addresses a notion of creativity as an assemblage where the human and the non-human are produced in mutual constitution, considering the relationship between arts, machines and nature and their processes of ontogenesis (Simondon 2015) and epiphylogenesis in this becoming (Stiegler 2002).

Keywords

individuation; machines; ontogenesis; ecology; new materialism

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Proceso de individuación en ecologías híbridas: sobre la relación entre arte, máquinas y sistemas naturales

Resumen

El presente artículo propone una perspectiva relacional de la tecnoestética (Simondon-Stiegler) y una perspectiva ontoepistemológica (Barad-Bergson) de los objetos técnicos, con el fin de concebirlos como procesos de relaciones dinámicas, relaciones abiertas y enredadas entre la cultura natural-social-psíquica. Estas perspectivas se unen para nosotros, como alternativa a la cibernética, en la que la organización está determinada por el propósito del proceso. Partiendo de una lectura difractiva de la noción de individuación *y* organología *en Simondon-Stiegler (1958/2017) y de una ontoepistemológica de «a medio camino» en el pensamiento de Barad-Bergson (1907/2007), se propone una visión procesal e híbrida de los objetos técnicos, con el fin de proporcionar bases filosóficas que vayan más allá de las dicotomías modernas cultura/naturaleza, humanos/no humanos y natural/artificial. Usando estas ideas para reflexionar sobre las obras de arte interactivas contemporáneas, el artículo aborda una noción de creatividad como un ensamblaje donde el ser humano y el no humano se producen en la constitución mutua, considerando la relación entre las artes, las máquinas y la naturaleza y sus procesos de ontogénesis (Simondon, 2015) y epifilogénesis en este proceso (Stiegler, 2002).*

Palabras clave

individuación; máquinas; ontogénesis; ecología; nuevo materialismo

Introduction

Every time we link with technical objects, they qualitatively impregnate us with their sensitive logic: they act as vectors of movement and prolong a memory of coordination. Thus, in the repetitions and uses where connections germinate, openings and closings appear; potencies to create or conserve assemblages that become sensitive habits. From a techno-aesthetic perspective, the machine has the power to become and constitute itself with us. Therefore, while I adapt to the material, I can create another tendency in it.[1]

In the theoretical framework we will follow the techno-aesthetic thought of philosopher Gilbert Simondon through the field of media arts, thinking our relationship with technical objects as an assemblage of mutual constitution, where : "The machine does not relate to man as a block, but in the free plurality of its elements, or in the open series of its possible relations with other machines within a technical assemblage" (Simondon 2008, 146).

We will use the concepts of general organology, hybrid ecologies, associated media and aesthetic intuition to analyse how artistic practices can affect technology. If we follow Stiegler (2018b) in his hypothesis that we find ourselves living in a new organological epoch, some of the key epistemological questions of our time are the links between the organic and the inorganic; the hegemony of modern scientific technological thinking, the deep ecological crisis and the epistemological diversity in which we live, such as the importance of art in producing new ways of feeling. Likewise, an aesthetic object, while being coherent with a certain sensible logic, is also linked to a vanishing point in an indeterminate future (Simondon 2008, 205).

This brings us to our third objective: provide a theoretical hybrid framework to think how Latin American techno arts have thought cybernetics and its concepts of feedback and information,[2] as well as other concepts of relational onto-epistemologies, such as non-linearity, machinic becomings, asynchrony, transduction of codes and diffraction as a relational form of composition to think how art can transform technology (Hui 2021).[3] For example, in Latin America some of the key figures in the development of cybernetic art were the Argentine artist Gyula Kosice and the Chilean artist Juan Downey[4] in the 1960s.

What do we mean by *cybernetics*? Norbert Wiener (1948) coined the term "Cybernetics" to refer to the theories of control and communication that make it possible to understand how causality operates "in living and non-living organizations". In its etymological and Greek meaning, *kybernetiké* implied the modes of navigation that maintained

1. However, in our context of service economy, mass consumption of artefacts, epistemic industrialization and production of mnemonic equipment, technologies are produced on a mass scale to externalize our cognitive functions and our know-how-to-live, reducing the expressive processes of our daily life to their efficient dimension, the passage of time to its quantitative dimension and the process to its useful purpose. See more on this point in Ars Industrialis: https://arsindustrialis.org/anamnesis-and-hypomnesis
2. This article is the product of a FONDART research where we built a cartography on the relationship between art and cybernetics, from 1960 to the present. To see more about the project, go to https://www.artmachinenature.org/
3. Yuk Hui (2021) notes in this regard: "Scientific thought wants to enhance the capacity of the senses, while philosophical thought wants to develop other senses. It is in art that the two can come together. Therefore, the relationship between art and technology is not yet determined" (Hui 2021, 62).
4. He was a pioneer of video art and interactive art and studied electromagnetics and communication, describing himself as an "anthropological activator". The main concept proposed by Juan Downey is that of feedback, thought by Norbert Wiener as a way of regulating entropy (Wiener, 1958).

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the course of a ship. In this way, cybernetic systems "shape" information and at the same time recursively integrate contingencies into a structure associated with a purpose.[5] For the purposes of this theoretical framework, we will speak of a form of composition that is not necessarily goal-oriented, but is based on assemblages of relationships, where we could not define separate entities but relationships that constitute them (Barad 2007). Therefore, in a later section of this article, we will try to link Simondon-Stiegler's proposals with those of Bergson-Barad, in order to think about their distinctions on the cybernetic approach.

1. Simondon and Stiegler's process of individuation

Simondon shows us how information can be used and transformed into energy for the constitution of both a biological and psychic reality. We can suppose, therefore, that the question of language as a defining and differentiating resource of the human and the social does not interest him; at this point he allows us to observe the processes and operational relations in the media arts from an "informational transduction"[6] of the *téchnē - lógos - cosmos* as an organological process of knowledge (Stiegler 2020).

On the other hand, for Simondon the revolt of minority groups against technology in the name of culture misunderstands the role of the technological, since he sees a rationality in technology that crosses the limits of cultural difference. However, the issue is much more complicated than Simondon's optimism admits. In this process of colonization and modernization, technological differences also maintain and reinforce power differences. In this context, approaching this topic from the perspective of individuation in Gilbert Simondon (2015) shows us that the relationship between nature and technology has a moral root that has been uprooted by planetary industrialization. From there, the possibility of a renewed relationship between art, technology and nature will be considered.[7]

This article inscribes the idea of a possible techno-ecology, a political ecology of machines, indicating the need to take into account the combination and recursivity, reflexivity and continuity, at any scale, from the sciences to art, understanding that we will continue to find cycles and patterns of repetition of "the system" that addresses itself.

In order to reach this conclusion, it is necessary to observe that information, for Simondon, is an operation that activates a system, and it is in this activation that a transformation occurs (Simondon 2015). This "transformation" is, precisely, the modulation of potential energy resulting from this exchange of relations (sender-receiver). Then, information is more than pure transmission.[8] We can observe this process of informational individuation in Figure 1.

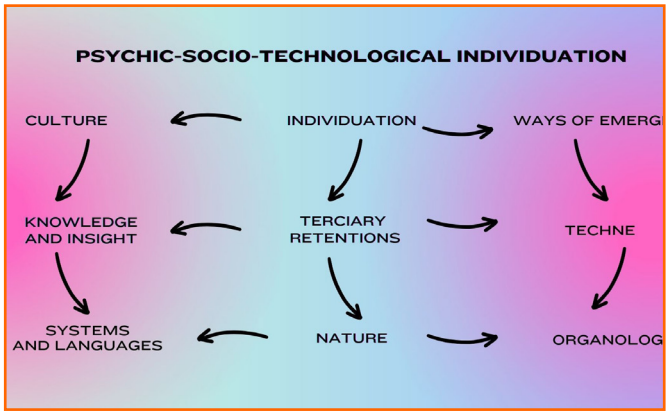

Figure 1. Processes and phases of informational and relational individuation
Source: own elaboration

Following Figure 1, an attempt to illustrate this individuation process is made: any structure (system), in order to change, must have some potential energy (information); this structure, in other words, must reproduce the state of tension that allowed it to emerge, so that, in a certain sense, it never materializes in a unity (a homogeneous entity), but in a constant tension that characterizes the processes of this equilibrium (informational relation). To maintain this tension, the individual (living or nonliving) must actively contribute to the maintenance of its constitutive conditions. It must be able to thrive in relation to itself. Its plasticity or capacity for change will depend on the presence of some margin of indeterminacy or potentiality.

In consequence, unless these individuals have reached a definite state of stability, it remains susceptible to further transformations (within the limits imposed by its constitutive conditions). However, once such a state of stability has been reached, it can again become energy if it enters into a relation of tension with another individual (natural or artificial system). These successive stages between meta-stability and stability represent the basic dynamics of information production that we are going through today, so artistic production presents itself as a good device to evidence these relations of individuation as processes of this crystallization.

5. In Wiener's words: "Cybernetics considers the structure of a machine or an organism as an index of what can be expected of it" (Wiener 1958, 54).
6. To clarify Simondon's expression, on the basis of his concept, individuation to a process of "transduction", Simondon describes transduction as "an individuation in progress". From this premise, the process of individuation is uncertain and "metastable", but the point is that for this reason, it is also inventive as is the case with processes that emerge from the contingent. In this sense, the importance of Gilbert Simondon's work insofar as a study of the articulation between physical individuation and biological individuation becomes urgent and necessary, through the encounter between the Simondonian philosophy of individuation and its ecological, aesthetic and technological condition through the arts and technical means.
7. Observing the discipline of art as the possibility of offering diversity in this relationship, proposing and reconstituting emerging modes of integration between a machine and a living being, under the focus of a technodiversity or a propositional cosmotechnical reality (Hui 2021).
8. As Simondon would put it through Norbert Wiener; it is "also that which must be received, that is to say that which must adopt a significance, have efficacy for a whole that possesses its own functioning" (Simondon 2015, 281).

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Following the steps of paleontologist André Leroi-Gourhan, Bernard Stiegler has theorized the "*différance* of the human" as "epiphylogenesis" or "the search for the evolution of the living by means other than life" (Stiegler 2002, 135). The human is constituted in correlation with the mastery of technique, that is, with culture, as a precondition for its own evolution.[9]

This original supplementation of the genetic program of the human being produces a kind of dialectic, that will drive the process of history precisely by making the evolution of the human being dependent on the sedimentation of human epigenesis in externalized forms of memorial support: "epigenetic sedimentation, a memorization of what has happened is what is called the past, what we will call epiphylogenesis of man, that is, the conservation, accumulation and sedimentation of successive epigenesis" (Stiegler 2002, 140).

One of the fundamental consequences of Stiegler's conceptualization of *différance* as life is the need to specify *différance* historically by means of the concrete technical conditions or stage of technical evolution that allow it to come into play.[10] This restriction has at least two important consequences. First, it ensures that, whatever impact it may ultimately have on human evolution, techniques must be mediated through memory: techniques, we might say, can only impact the human being indirectly, by altering the conditions for the reactivation of the past in the present, for this case interface-algorithm. Secondly, this restriction has the effect of keeping the evolution of the technique and the evolution of the human being separate from each other (interface-user), despite the original recursivity that intertwines bark and flint. As we see throughout this article, the direct consequence of this separation is a certain passivity of the human or, in other words, the priority of the technical as the driving element of the differential synthesis of the living.

And, starting from this original condition, we propose to reconstruct a different vision, one that, unlike Stiegler's culture of technically sustained (tertiary) memory, never severs its links with embodiment as the hinge that connects the body and the medium, the zoological and the technical. No matter how complex culture becomes, it will always harbour, at its very core, the symbiotic transduction of life before any further division. This is why an artistic revolution and its relationship with technological media (techno-ecological) is necessary.

Faced with a world in which the technical domain seems to confront us from the outside, whether as Stiegler's technical programming of consciousness or as the Simondonian proposal of *milieu*, we must find a way to rediscover the recursivity contained, in potentia, in our own incarnation. That is our only hope of gaining authority over the extragenic dimension, but also the extragenic capacity that makes us human. Whereas Stiegler's program for a digital decomposition of the image leaves us abjectly passive in the face of a technical exterior, and whereas Simondon's ethics of *milieu* turns its back on human culture as such, the ethics of crisis urges us to invest in (cultural) technodiversity, which would necessarily be an investment in life itself (Hui 2019).

Although Simondon's thought has mainly been read from cybernetics, the individuation of technical objects can also be analysed from a *halfway* ontoepistemology in Barad-Bergson's approach (1907/2007), where the modulation is not determined by the purpose. We believe that this new proposal can help us think about the media arts from a relational and open model focused on change itself. To do this, it is relevant to summarize this perspective and how it is linked to Simondon's *individuation* notion (2015).

2. Ontoepistemologies: the diffractive perspective of Karen Barad and Henri Bergson

If we make the effort to read Henri Bergson and Karen Barad diffractively, as the thinker Iris van der Tuin (2011) has previously done, that is, to read one over the other without homogenizing them, in both philosophical projects we will see an onto-epistemology of the "halfway", where reality is not constituted by independent entities and an environment where they coexist (Barad 2007). From this perspective, object and subject do not pre-exist their interaction and their relationship in itself, so neither can be reduced to its parts. In her 2011 article, Iris van der Tuin links Bergson's intuitive method with Karen Barad's diffractive thinking, where there is a logic of "and…and…and" always becoming and where matter is a process of materialization. In Karen Barad's agential realism, existence is not an individual matter. Individuals do not pre-exist their interactions, and matter and meaning come into existence and are iteratively reconfigured through each *intra-action*. This last concept, she proposes in order to distance herself from the idea of inter-relationship, which presupposes entities already previously separated at the encounter. It is precisely this *intra-action* that Barad will call "entanglement".

In line with Bergson's notion of a constantly changing universe (1907), Barad (2007) argues that matter is an agent and is never fully settled: matter is the process of materialization, never definitely determined. It remains profoundly open, and its materialization involves a dynamic and ongoing interplay of intra-actions and exclusions. As a result, instead of primarily focusing on defining what reality is, the

9. Stiegler seeks to take the logic of technical invention to its extreme point, the point at which the distinction between a "who" (who invents?) and a "what" (what is invented?) is not simply reversed, but dissolved, such that it must be said that it is both the human and the technical domains together that drive the evolution of the human (or, more precisely, the co-evolution of the human and the technical).

10. While this aspect of Stiegler's work is largely beyond the scope of our current discussion, one of its elements will prove particularly important here: by placing the impact of technical evolution exclusively on the side of culture, understood as a deviation from the living, by restricting or storing the past in various forms of technical memory media, Stiegler effectively drives a wedge here between the human being and its technical complement.

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more intriguing aspect is understanding how, under specific circumstances and within what particular dimensions, an agential cut is produced. The above allows us to consider technical objects from a relational perspective that no longer relies on a final cause, as in the cybernetic theory framework. From an ontoepistemology based on the thinking of Barad and Bergson, the agential cuts that produce interior and exterior are not predetermined *a priori* by a system's function, nor are they determined *a posteriori* by a specific system output.

The novelty of this perspective and of our reading is that it provides a different framework from the technological approaches coming from cybernetics, in which the process of creation is determined toward a final cause, such as the function, and from *a priori* cause, such as the structure of the system. In this case, the concept of intra-action allows us to understand that these criteria are determined in each agential cut, and each creative act is the product of intra-active relations, which also generate new exclusions. Even if this change goes against the function of the technical object or its structure, in each intra-action, there is a potential for change.

In consonance with a moving universe in Bergson (1907), for Barad (2007), matter has agency and is never resolved: it is always halfway there. It is always radically open, and its materialization entails a dynamic and iterative play of intra-actions, cuts and exclusions. Therefore, more than being important to define what reality is, what is interesting is how, under what conditions and in what dimensions an agential cut is generated, which will define the cuts of the material processes. This is why Bergson's project, halfway between matter and memory, and Barad's, allow us to think of technical objects as never completely finished relational processes, which create their own criteria from which they make the agential cuts.

The preceding statements introduce nuances and alterations to the concept of technical objects, aligning with Barad's ideas about apparatuses (2007). Drawing inspiration from and influenced by Niels Bohr, Barad argues that the lesson Bohr derives from quantum physics is profoundly insightful. It challenges the notion of small particles aimlessly existing in empty space, each possessing the complete set of properties assumed by Newtonian physics (such as position and momentum). Instead, Bohr emphasizes a fundamental aspect of measurement interactions. Depending on the specific measuring apparatus used, certain properties become precisely determined, while others are specifically excluded. What gets determined is not subject to the experiment's desires or intentions but rather to the specificity of the experimental apparatus.

If, for Simondon, individuation produces at the same time its associated medium; organism and medium cannot be separated as independent entities. In the case of an interactive work of art, net.art and the virtual technical objects produced by the Uruguayan Brian Mckern, the soundtoys and interfaces that are generated in the interaction are process-product, that is, a result that materializes through relationships: it does not pre-exist autonomously. From a techno-aesthetic perspective of the process, these works can be thought from an onto-epistemology, where "reality is not composed of things in themselves or things behind phenomena (representationalism) but things in phenomena" (Barad 2003, 817). The important question would be; when a cut that creates a limit and an exclusion is made, in what way is this cut executed and in what way matter and meaning are related in this envelope? The question is, when a cut that creates a limit and an exclusion is made, in what way is this cut executed and in what way do matter and meaning relate in this envelope?

Joining Karen Barad and Bergson in an aesthetics of process or assemblage, Van der Tuin (2011) posits that the matter/memory dichotomy does not constitute a dichotomous dualism but that for both authors knowledge proceeds from the between nature-culture, object-subject, matter-meaning:

> "The material-semiotic or 'material-discursive' implies the idea that matter envelops meaning and meaning envelops matter" (Van der Tuin 2011, 32).

If the work incorporates symbolic and cultural references, each intra-action causes these references to be diffracted with new codes, potentially creating an immanent logic that becomes more complex with each iteration. Not only does the apparatus determine the matter when measuring it, but the phenomenon itself, according to Barad (2007), is co-constituted in this relation, where the apparatus also undergoes modification in its usage. Neither the apparatuses, nor the matter, nor the technical objects are closed systems. This is what both Barad and Bergson refer to when they speak of the expression "halfway" (Van der Tuin 2011, 29) since a dynamic of between, goes beyond the dualism among "spirit" and "matter" but rather concentrates on the literalness of their entanglement. Consequently, we can think of technical objects from these authors, beyond realism and materialism centered on the thing and dogmatism or idealism centered on representation.

Put like this: we tend to see objects clearly delimited as if we could take all the boundaries of the object with our hands. But we cannot take the tendencies and potencies with our hands, can we? Nor halfway capture it. In wanting to apprehend the object, we suffer from it and it transforms us.

3. The digital: sensitive materiality

In the last thirty years, several artists have developed works with "algorithmic" and "reactive" components. That is, the form of display-operation depends on the visitor's contamination. Several of the works on artificial

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life and genetic algorithms described in recent times incorporated similar structures, for example, Qatipana, by Renzo Filinich (2021)[11] or *Ceci n'est pas un nike* by Giselle Beiguelman.[12] In these types of works, several other auspices are described that allow visitors to influence or make judgments that shape what the next visitors will see. In this section, this feature is developed as "vitality of the medium".[13]

With the help of our newly acquired knowledge of life processes at the technological level, from ecology to molecular biology, we can exercise an increasing degree of control over the manipulation of living biological systems, as the technosphere ("man-made") and the biosphere ("nature") become increasingly indistinguishable. Artists are now exploring the new ways of knowledge and tools offered by modern biology to manipulate and create living and semi-living works of art.

For Simondon, and his revolutionary contribution to the philosophy of technique, the analysis of the evolution of technical objects and the analysis of the relationship between the human and technique are not enough to understand technicity, and it is necessary to situate technical concretization within the genesis of technicity, which means relating technological thought to other thoughts.[14]

Simondon understands technological development as a constant entanglement with religious, aesthetic and philosophical thinking, oscillating between technology's demand to diverge and thought's need to converge. However, it is an "externalization" that is at the same time an "internalization". That is, it is that which, by distinguishing an outside and an inside in a movement of going outside that is also a movement of going inside, mutually establishes that inside and that outside by its transductive relation. We can argue, then, that the notion of intelligence here, whether in its "natural" or "artificial" form, or whether in its organic or organological form, is the achievement of a goal or an objective, the "predicting over intuiting". Here, a paradox arises in the human-algorithm or machine-organism operation, by a bet on the recognition of the Bergsonian élan vital (Bergson 2007) manifested in these material exchanges.

After having offered a preliminary investigation on the concept of digital mediation, mediation is presented as the underlying and insufficient problem in the so-called media arts. In this article, what is revealed are the problems and false divisions associated with the debates on new media in the field of the arts. Taking as a principle the use of Bergsonian heuristics and their relation to the technological, these problems and divisions are false not in any ontological sense related to some original idea of truth, but rather because they limit the understanding of complex and multifaceted phenomena and processes by imposing the cutting of distinctions and categories too soon (Deleuze 1991).

This process of fragmenting the world into particular categories, often organized into sets of oppositions, is not only reductive and, therefore, useless, but it also has serious political and ethical consequences for our understanding of the world, its dynamics and its power relations in the production of works with computational technologies and methods. Thinking through and against these false problems and oppositions is, thus, also a political intervention in the arts and technology, one that is different from studies of the political economy of media and communications, for example, but no less serious or important (Gary 2008, 210 and 214). In addition to false problems (which we identify in discussions of new media that focus on a singular problem, such as novelty, digitization, interactivity, convergence, or data, at the expense of all others), the field of new media in the arts and other disciplines is also marred by a number of false divisions, or what cultural theorists trained in poststructuralist thought tend to refer to as "binary oppositions". Such false divisions, which have so far shaped debates in new media studies, include determinism and constructionism, technology and use, theory and practice, structure and agency, information and materiality (i.e., an extension of the division between language and materiality), and, finally, subjectivity and objectivity.[15]

Even where these false divisions have been identified as such, and of course many researchers are aware of this, it has proved difficult to avoid them.[16] The reason for this difficulty lies, in part, in the residual

11. *Qatipana* is a hybrid ecosystem of information flow experience that offers ways to rethink the relationship between technology, human beings and nature in the contemporary world, from a South American perspective. *Qatipana* is, thus, an artificial intelligence platform that is fed in real time from a camera installed in the Peruvian jungle. By recognizing patterns in these images, *Qatipana* produces an abstract three-dimensional form that is nothing more than an accumulation of algorithmic processes, machinic information and visual patterns that originate in nature. The human being as a spectator, then, is called here to recognize (theirself) or be surprised (theirself) in front of that abstraction. The *Qatipana* work is problematized mainly through Simondon's notions of individuation, Stiegler's organology and Hui's cosmotechnics. The latter seems especially important, since it allows us to glimpse how the ancestral knowledge that still inhabits the Peruvian jungle and recognizes a superior ontological flow in nature, informs the evolution of *Qatipana* – which in Quechua means continuous movement.
12. In her 2002 work *Ceci n'est pas un nike*, the artist addresses the impasses of the online creation, around the notions of interface and surface. Inspired by Magritte's work, she reproposes the conflict between image and representation, inviting users to interact with the site, by being able to deform, drag and squash the image of a Nike sneaker. These images can be saved in a gallery where others can use them as a starting point.
13. These systems can have different scales, from a local network to a planetary system, such as the terrestrial technosphere. Now we want to ask ourselves what could be the implications of this redefinition of – de relation between – machine and ecology, opening up questions from this field such as: Is matter also the message in this exchange? How does the auratic condition of graspable materialities converge with the immaterial character of the digital or electronic signal? Are the capacities of our bodies the object or the subject of the action?
14. In this regard, he says: "In the twentieth century, a new stage opens up that treats man himself as an object of science and, consequently, in a certain sense as Nature. This man-object is the target of all the techniques of human manipulation, beginning with reflection and experimentation with work" (Simondon 2008, 190).
15. In sum, the "vitality" of the digital medium is intrinsically associated with the following questions: is it possible to consider a program that does not contemplate that the perception of reality is related to socio-economic complexity? To what extent is it more important to talk about the modifications that our brain undergoes when interacting with objects than to talk about what are the fundamental parameters in our being-in-the-world? Does orality, which certainly affects semiosis, also affect how we relate to material culture?
16. Joost Van Loon's book, *Media Technology: Critical Perspectives* (Maidenhead, UK: Open University Press, 2007), represents precisely this example of an unfulfilled promise to engage seriously and rigorously with the notion of mediation.

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effects of discipline and the associated requirement to take a set of key concepts within a given discipline and then elevate them to a transcendental position, as a result of which everything else is questioned or even dismantled. Except for these fundamental concepts (e.g., "work" and "media" in the arts, "data" and "information" in computer science, "subjectivity" in psychology and "society" in sociology).[17]

4. The digital membrane as a limit in the processes of individuation

Considering the recognition of the "visible" and "invisible" interface command levels, the notion of a unified or consistent language for digital media becomes untenable.[18] The effect of this correlation can be seen in the use of knowledge about the fundamentals of living and non-living matter, as well as in the knowledge of the physical nature of the human being. On the other hand, in the perspective of an active externalism, assuming that the human organism is linked to an external entity in a mnemonic bidirectional interaction, as postulated by Stiegler, a coupled system is created, which can be seen as a cognitive system in its own right (Clark & Chalmers 1998).

In *Cahiers Simondon*, Baptiste Morizot (2011) offers an interesting analysis of the boundary between the internal and the external in the processes of individuation,[19] something that Bernard Stiegler situated as an aporia of origin, in relation to technique, and which he interrogates through the concept of the membrane in Gilbert Simondon. It is, perhaps, interesting to think of this in relation to Simondon and Stiegler's interpretation of *transindividuation*.

Experience constitutes, in the active and processual sense of the word, a codification that is neither abstract nor neutral, that is not the ordering of a material disposition according to a homogeneous and conventional order but a vital configuration that integrates the experiences of the present – which in Simondon's terms is pure metastability – in the interpretative codifications of future experiences. This encoding is operated precisely by the membrane, as Simondon defined it: the membrane is the generic organ that connects the inside with the outside, the past and the future, under a dual mode of the capacity/interpretation of the future by the past and the future integration of past encodings. It is through this perspective that we can apply the membrane model to think of the integration of singularities in individual structures, where *a posteriori* becomes an *a priori*. The membrane is the topological place where memory reproduction and compatibility come together in the process of constituting individual structures, which are an intrinsic part of technical individuation.

Therefore, we can make explicit the horizon affected by this technical-biological development: it consists of applying nodal formulas, which Simondon develops in *Modes of Existence of Technical Objects* (2008),[20] to think of living memory to the theory of individuation. The first of these theses is formulated as follows: "the living is that which *a posteriori* becomes *a priori*" (Simondon 2015, 89-90). This formula accurately describes the modality of individuation, in which the structures of individuation are the product of chance encounters (which are not finished) that organize future random encounters by selectivity and compatibility.

From this perspective, some artists who work with AI frame these new technologies within an ecology of human-machine collaboration. In *Máquina Cóndor* (2006 - in process),[21] Chilean artist Demian Schopf,[22] composed a relational-logic model of three consecutive operations applied to 12 online newspapers and fluctuations in the values of various currencies and natural resources that replicate each other recursively.

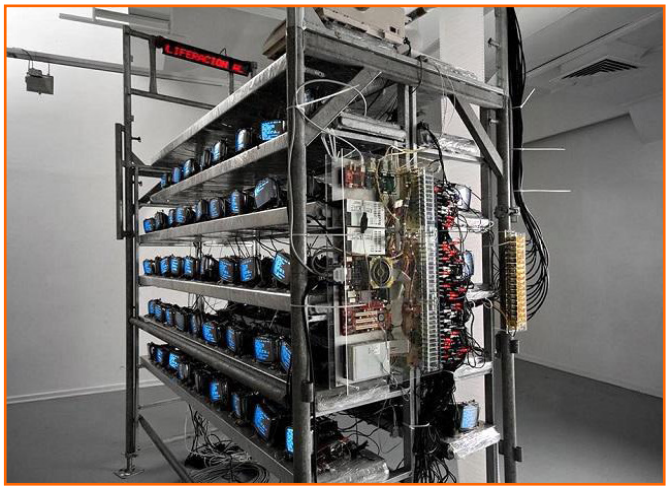

Figure 2. *Máquina Cóndor*. Scaffolding structure, 23 dismantled 5.5-inch televisions, OKI 320 continuous form printer, three LED alphanumeric panels, PC components and 19 inch monitor, 110 x 250 x 360 cm. Gabriela Mistral Gallery, Santiago, Chile
Source: Photo: Jorge Brantmayer

17. Another reason for the survival of such false divisions lies, perhaps, in the dominance of social science perspectives in media, communications and cultural studies; perspectives that are fundamentally positivist and humanist, and also that empirical claims emphasize partial "black box" perspectives (i.e., isolated, protected and simultaneously hidden processes), aspects of media and cultural design.
18. Interfaces deeply intervene in the network of durations of the body, connecting the abiotic sphere of matter with the virtual actions of a past-future through the platforms where they operate, be they physical or virtual technical objects.
19. Simondon points out in his thesis on individuation (2015) that the individuation of the living is inserted within physical individuation, not stopping it, but simply suspending it, slowing it down and preserving its pre-individual tension; biological individuation emerges in simultaneity with respect to physical individuation, intervening as a neo-neoteny amplification.
20. Originally published as a second thesis in 1958.
21. The machine generates online text based on: a) real-time search in 12 newspapers for 333 keywords related to war and economy, b) online consultation and analysis of the buying and selling values of currencies of former African colonies, of the Middle East, of the countries where Operation Condor took place and of natural resources important for the Chilean economy, and c) intercalation of 9 words – coming from the lexicon of surgery, anatomy and forensic medicine – in the first stanza of a "memento mori" by Luis de Góngora. The arrangement of these 9 words depends on the searches and economic analysis set out in a and b.
22. Demian Schopf is a Chilean visual artist, essayist and university professor, who in 2007 won the Altazor Award for his work *Máquina Cóndor* (2006- in process).

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This work puts into discussion what we will understand as expression without subject, how it is produced inside-outside and how limits can be produced without spatializing them. If a work of art composes new sensibilities by expressively actualizing itself in each repetition, what is expressed is always a contrast of relations and not a subject. From there, we could not think the machine from the properties of its elements nor of the human author, but it is the relation that produces the terms and that which transforms them. This logic of coordination is not linked to the assumptions of expression of the modern author, where there is a supposed interiority of the individual life of the artist or a voluntariness that regulates artistic expression. Unlike a view that sees reiterative expression as sublimation or expression of an already constituted subject, the internal and external are diffractively constructed in each iteration, creating their cut-off thresholds immanently.

As Massumi states, the underlying assumption has been that "any expressionism is an uncritical subjectivism" (Massumi 2002, 13). Expression tends to evoke the image of an autonomous and reflective individual whose inner life can be communicated at will to an audience of equally sovereign individuals as rational atoms of human experience.

This type of architectures allows us to observe and analyse a way to overcome the current relationship between culture-technology-nature that is nowadays fragmented. In this way, artistic practices can allow us to unveil this rupture, thus coupled in turn with the concept of individuation (Simondon 2015) and cosmotechnics[23] (Hui 2017), and provide us with an artistic-theoretical device to investigate the role of technology in relation to our understanding of a pluralistic technodiversity.

Conclusion

This article proposes a processual, neomaterialist and relational vision of technical objects, understanding them as assemblages of dynamic open relations that entangle the psychic-social-natural-cultural. It also proposes a perspective of technology beyond the culture/nature distinction and creativity beyond the expression that assumes a supposed human interiority. For this purpose, the following relevant theoretical frameworks are used: the relational techno-aesthetic perspective of Gilbert Simondon and Bernard Stiegler, Yuk Hui's lecture of this vision, as well as the ontoepistemology of the "half-way" that proposes a diffractive and non-representational vision in the philosophy of Henri Bergson and Karen Barad.

Using the case of the work of Chilean artist Demian Schopf, *Máquina Cóndor*, and other artists, we propose a type of expression without a subject as a foundation, where the work produces the limits of what is considered as interior/exterior depending on each intra-action (Barad 2007). From the notion of individuation (Simondon 2015), the article emphasizes the importance of the state of tension as a capacity for change, which keeps a system in constant change and indeterminacy.[24] On the other hand, one can read this authors as being in favour of an ethics of experimentation, openness and intuition; without necessarily requiring a goal associated with the maintenance of the rigidity of the structure. While this discussion is not developed in depth, it is necessary to understand that while they have common concepts, these approaches differ politically on issues such as utility, recursivity, and expression of systems.

As Yuk Hui suggests, in order to think about the possibilities that open up when examining the machines of our present, it is essential to ask ourselves about limits, assuming such limits as an alternative to make way for the recognition of diversity no longer only of machines but of singular sensibilities anchored to borders from which we can visualize, feel and coexist with other ways of dealing with our surrounding world: "We must advance through an ecology of machines (...) we need a different notion in parallel to biodiversity, which I call technodiversity" (Hui 2020, 63).[25] Finally, certain research questions are presented that are linked to how art can transform our sensibility and the way we think about our relationship with technique and how we understand the pluralism immersed in a technodiversity based on the concept of cosmotechnics (Yuk Hui 2021).[26]

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23. According to Hui's cosmotechnics, science and technology should be understood as means to return to life, as paths to true pluralism or "multiple cosmotechnics" (Hui 2017).
24. Thus, these successive stages between metastability and stability represent the dynamics of information production, which are relevant to think about the question of how we mutually constitute ourselves with technique. In this matter, the distinction between relational ontoepistemologies and cybernetics is presented, the latter being a discipline that is oriented to a goal and to the conditions of control of a machine in entanglement with an organism.
25. In this sense, any challenge to understand the processes of decolonization must assume that the differentiation between art and technology is an external factor, facing processes of local syncretism (transfigurations) that were not linked to the specific context of Romantic philosophy's reaction to enlightenment.
26. We hope that this article will be a point of reflection that invites to generate questions not only around the thought of Simondon, Stiegler and Hui but also serve as an interpellation at the moment of interacting with those devices and machines that are also part of an incessant search to unveil the invisible and mysterious that crosses the instant.

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