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Organism-Oriented Ontology Beyond the Anthropocene

Abstract: This article explores different approaches to the notion of the Anthropocene, understood as a state associated with the increase of entropy and the destruction of biodiversity and habitats. Bernard Stiegler (2018; 2021) challenges such an approach with his own proposition – the Neganthropocene, claiming that while the Anthropocene is the time of entropy, the Neganthropocene should give rise to a new form of life, namely, negentropy. Yet the notion of negative entropy, or negentropy, derived from physics, is insufficient to explain the specificity of life and different orders of causality. An alternative approach can be found in Humberto Maturana and Francisco Varela's theory of autopoiesis, which allows us to explain living beings both with respect to self-organisation and self-maintenance, and interaction with the environment. The notion of autopoiesis can help to explain the functioning of living beings at different orders of complexity, from cells to Gaia. Gaia theory is seen as a more appropriate model to think both life's self-maintenance and the potential for change. This means that to define life, we need a new theoretical framework and new concepts to account for the specificity of living beings. Therefore, my article proposes the theory of organism-oriented ontology, which defines the specific modes of existence of living beings.

Keywords: entropy, negentropy, anti-entropy, Neganthropocene, autopoiesis, organism-oriented ontology

1. Introduction

The notion of the Anthropocene is very controversial and triggers heated discussions. Apart from the fact that it has not yet been officially recognised as a geological epoch, many other questions arise. Who is this *Anthropos* at the centre of the Anthropocene? Is all humanity complicit in the disastrous effects of the Anthropocene? What is the social and political role that such factors as class, gender, and race play in engendering the Anthropocene and in taking its destructive effects upon itself? Besides these important questions, we can raise epistemological and ontological issues. If we agree that what is destroyed consists primarily of diverse forms of life, including human life, we must ask why life seems so expendable

In this article, I want to discuss such attempts to describe life in terms of negative entropy, or negentropy. Following this tradition, Bernard Stiegler (2018; 2021) challenges the Anthropocene with his notion of the Neganthropocene: the Anthropocene is the time of entropy, whereas the Neganthropocene should give rise to a new form of life, namely, negentropy. However, the notion of negative entropy, or negentropy, coming from physics, is not sufficient to explain the specificity of life and to provide alternatives to the Anthropocene. To define life, we need new epistemological terms and a new epistemological framework, which could grasp the specificity of organic development and being. Although Stiegler argues for the need to move from a physical to a biological framework, he never addresses biological theories, such as the notion of autopoiesis. This notion examines organisms as self-maintaining and self-sufficient beings which can support their organisation and also interact with the environment. Contemporary philosophy and theory of science have successfully adopted these biological notions and ideas to tackle the conceptual ambiguities and disastrous effects of the Anthropocene. What follows will introduce the notion of autopoiesis and its development in Gaia theory as an alternative to the Anthropocene. I will conclude by summarising these different trends from the theory of autopoiesis, contemporary philosophy, and the philosophy of biology by introducing my notion of organism-oriented ontology.

2. Life as Negative Entropy and the Entropocene

For many years discussions about life have appeared in the form of a controversy between vitalism and mechanism: mechanism explains living beings according to the laws of physics and chemistry, whereas vitalists argue that to understand living beings we have to presume the existence of some nonphysical, vital force, such as Henri Bergson's *élan vital* or Hans Driesch's *entelechy*. By contrast, Immanuel Kant suggested that organisms are self-organised and self-determined because an organism is "cause and effect of itself" (199). It can maintain itself in three ways: as a specimen of its species; as an individual; and as that which can also keep the balance between the whole and its parts. A living being can generate, organise and maintain itself, and this capacity of self-organisation distinguishes it from physical entities. If not supported by external forces, physical entities simply disintegrate, whereas living entities avoid decay by using their metabolism. Thus, physical entities are subjected to the law of entropy, whereas living beings can resist it. This is why, in *What Is Life*, Erwin Schrödinger defines living beings in terms of "positive entropy":

> Thus, a living organism continually increases its entropy – or, as you may say, produces negative entropy – and thus tends to approach the dangerous state of maximum entropy, which is death. It can only keep aloof from it, i.e. alive, by continually drawing from its environment negative entropy – which is something very positive […] What an organism feeds upon is negative entropy. (71)

As Anne Alombert points out, Schrödinger does not maintain that life *is* negative entropy but that living entities *feed* upon negative entropy in order to survive (Alombert 6). Living beings constantly consume energy, which they take from their environment, and, in this sense, produce entropy. At the same time, they accumulate energy, continue to evolve and create new forms, and in this respect, they resist entropy. Bergson claimed that this counter-tendency to entropy (negative entropy) is the distinctive character of living organisms, and he named it "creative evolution".

The notion of entropy has been complicated in recent discourses in theoretical biology, such as the works of Giuseppe Longo and Francis Bailly. As Alombert points out, they

> complicated Schrödinger's work, adding to the notion of negative entropy or negentropy the notion of anti-entropy, in order to give a more precise account of 'biological organisations in their historicity' and of the functional novelties generated by living organisms. […] The notion of anti-entropy thus makes it possible to consider the irreducible nature of living systems. (7)

In contrast to the terms negative entropy or negentropy, which apply to the field of physics, the concept of anti-entropy has the same physical dimension but is applied to measure the organisational complexity of life phenomena: living beings are increasing their complexity in the course of ontogenetic development (internal to the organism and dependent on genetic determinations) and in the phylogenetic processes of development (dependent on random phenomena and the external environment) (Bailly and Longo 5). In this respect, the authors do not intend to change the laws of any physical theory but simply extend them by new principles which they consider proper to the phenomenality of life (Bailly and Longo 4, 27). However, these new principles also signal the need to find new theoretical approaches to explain the complexity of living beings. As Alombert has it,

> living organisms need to be considered in ways that are not explainable simply by invoking physical laws, not only because living organisms exchange matter and energy with the environments, but also because life involves an accumulation and expenditure of energy, along with a conservation of memory and the production of unpredictable functional novelties. Through this memory and these novelties, living organisms introduce the possibility of bifurcation in entropic becoming, even if this bifurcation is always local and temporary. (8)

It is this element of unpredictable functional novelty that can be seen as a distinctive feature of living organisms and which lacks a proper theoretical conceptualisation.

The concepts of entropy, negative entropy and negentropy became very important in Bernard Stiegler's book *The Neganthropocene* (2018) and a collective volume *Bifurcate: There Is No Alternative* (2021). Stiegler makes a direct connection between the Anthropocene and the massive increase of entropy rates at all possible levels: physical (dissipation of energy), biological (destruction of biodiversity), informational (reduction of knowledge to information) and psycho-social (destruction of cultural and social diversity) (Stiegler et al. 305). For Stiegler, the Anthropocene has to be characterised as the Entropocene insofar as it refers to the recent tendency to destroy the conditions of possibility of human existence – both in the biological domain (destroying organisms and ecosystems) and in the domain of knowledge (destroying the capacity to think). Recognizing that this destruction is generated by humans, namely, the *Anthropos*, Stiegler introduces the neologism "anthropy", denoting the specifically human production of entropy. According to Stiegler, humans have endosomatic organs (like other living beings) and exosomatic organs (technical organs and technologies). In contrast to endosomatic organs, which invariably generate negentropy, exosomatic organs are inherently ambivalent:

> On the one hand, they can accelerate the production of entropy (through the process of combustion and energy dissipation that technological production involves, and through industrial standardization that homogenizes and standardizes behaviour). On the other hand, exosomatic organs can produce new, improbable, and singular (social, artistic, cultural and technical) forms of organization and diversification, provided that these are successfully adopted by humans, through collectives that share and practice knowledge. (Stiegler et al. 307–8)

This means that exosomatic organs, in other words, technical objects and technologies, can provide the means to resist entropic tendencies.

Here, Stiegler introduces a difference between anti-entropic tendencies that are characteristic of biological entities and anti-entropic activities expressed by humans. Biological entities fight against entropy by increasing and complicating their biological organisation. By contrast, humans fight against entropy by producing anti-entropy, which can take the form of new knowledge or new social organisation. In other words, humans are not only organic but also organological beings, meaning that their biological organisation co-evolves with technological organisation in such a way that this co-evolution of humans and technologies is crucial for creating new social organisations. Organology, or the use of techniques, helps humans fight entropy by creating new forms of knowledge and forcing social organisations to change and evolve: "Technics is an *accentuation of negentropy*, since it brings *increased differentiation*" (Stiegler 2018, 41, original emphasis).

Human beings have to organise their work and knowledge so as to preserve the anti-entropic, or negentropic, tendencies of life could ultimately lead to a new epoch of the Neganthropocene.

Stiegler relates the Neganthropocene to his project of "general organology," meaning that technology is an extension and exteriorisation of the human organism. In his book *For A New Critique of Political Economy*, Stiegler asserts that general organology is "a theory of the articulation of bodily organs (brain, hand, eyes, touch, tongue, genital organs, viscera, neuro-vegetative system, etc.), artificial organs (tools, instruments and technical supports of grammatization) and social organs (human groupings […], political institutions and societies, businesses and economic organizations, and social systems in general)" (2019, 34).

In other words, general organology designates a connection between technical objects, the human psyche, and social systems. Organology examines living beings and technical objects as being integrated into an associated milieu through which they adapt and attune to each other. This approach to technology differs from that of cybernetics because it examines technical objects according to those features which they share with organic beings, such as development (genesis, epigenesis, epiphylogenesis), recursivity and contingency, multiplicity, and the potentiality for change. Interpreting technical objects in this "organological" way, Stiegler inscribes technical objects into the evolution of living beings.

In this respect, organology can be seen as the "becoming organic" of technologies, and, at the same time, as the "becoming technological" of life. As Stiegler points out, organology is a negentropy – a fight against entropy and disintegration of life – and a pursuit of life by other means than life:

> Technics consists in the reorganization of inorganic matter, leading in return to the organological reorganization of cerebral organic matter, which in its turn organologically modifies the play of the somatic organs, giving rise to a new form of life, that is, a new form of negentropy, which is nevertheless also, as technics, an accelerator of entropy on every cosmic level (2018, 42)

This means that technology for Stiegler is a *pharmakon*: it is a cure as far as it enhances life and creates negentropy, and it is poison as far as the technology necessary leads to entropy. In this respect, the notion of the Negantropocene can be considered a temporary solution because it cannot get away from the dialectics between entropy and negentropy. The Negantropocene can be seen as an alternative to the Anthropocene, which is discussed in merely technological terms and leads to entropy. In contrast to this, the Negantropocene as a "general organology" suggests an interaction between an organism and a machine, and yet, this interaction is two-sided, producing entropy and negentropy at the same time.

However, even if the notion of the Negantropocene remains ambivalent and contradictory, Stiegler and the Internation Collective tackle some important epistemological problems. Even being organological entities, human beings can still learn a lot from living organisms in their attempts to create counter-entropic tendencies. Counter-entropic processes are possible only at the biological and noetic levels (Stiegler et al. 266). In other words, only organisms and brains (that is, thinking) are capable of producing counter-entropic tendencies. Entropic processes tend to exhaust the potential for renewal and eliminate the improbable for the sake of the probable. By contrast, anti-entropic processes refer to the tendency towards change, reorganisation, differentiation and the production of novelty or improbability. As a generalised concept, anti-entropy tends to create difference, choice or novelty – everything in the development of a system that tends towards self-conservation, renewal or transformation to attain improvement (Stiegler et al. 311–12). This means that a living system maintains its anti-entropy by constantly creating and renewing its organisation and generating organisational novelty.[1] What is important here is that these counter-entropic tendencies are local and temporal. No living being can escape the global entropic tendency, namely, death. However, as Norbert Wiener pointed out, living organisms are "local and temporary islands of decreasing entropy in a world in which the entropy as a whole tends to increase" (36).

And yet, the local and temporary nature of living organisms can be seen as a source of their renewal. Living organisms have memory and history that allow them to accumulate innovations and project them towards the future. Stiegler et al. write that

> Current life-forms maintain themselves both through the activation of functional innovations that appeared in the past (anti-entropy) and through the production of functional innovations (production of anti-entropy) arising from the individual or the group (population, ecosystem and so on). Not only are such innovations unpredictable, but their very nature cannot be predicted. As a result, probability theory is insufficient for describing life and its evolution. (55)

The production of anti-entropy arising in an ecosystem can be imagined as a niche construction. For example, beavers make dams to change their environment and create conditions that are most suitable to them. Functional innovation could be unpredictable, such as, for example, the capacity of radiotrophic fungi found near the Chernobyl Nuclear Power Plant to include ionising radiation into their metabolism and use them as an energy source. These innovations produced (evolutionary) by beavers and (recently) by fungi are improbable and unpredictable. Another example of anti-entropy is taken from the technological sphere: Maël Montévil describes Google Translate as a statistical machine that provides the most probable translation based on statistical data at its disposal. However, the most probable translation is not the same as the best translation: the translator, if necessary, can invent a new word or clarify the meaning without offering a word-to-word translation (Montévil; Stiegler et al. 185). Creative and innovative translation is a production of novelty similar to the production of biological novelty as anti-entropic activity. In a footnote, Stiegler et al. argue that "anti-entropy constitutes the open (in the sense of Reiner Maria Rilke as well as Gilles Deleuze) – the open that arises from a negentropy struggling against anthropy" (61, f 24). Here, the open means improbable and the unprogrammable change, full of bifurcations that cannot be reduced to algorithmic calculations.

3. Do We Need the Notion of Entropy at All?

At this point, I want to take a step back and ask whether the discussion about entropic and counter-entropic tendencies is locked up within the epistemological framework inherited from physics. If we agree that to fight the effects of the Anthropocene, we must consider biological creativity and inventiveness, do we need the notion of entropy at all? Be it entropy, negative entropy, negentropy, or anti-entropy, all these notions still refer to physical laws which are not sufficient to explain the existence of biological entities. Seen from this perspective, living beings are local and temporary; in other words, they are more of an exception than a rule. In this respect, even Stiegler's proposal to oppose the Anthropocene with the notion of the Neganthropocene, which is supposed to enhance life by other means than life, namely, technology, does not seem convincing. It appears that we need biological notions and terms that could conceptualise maintenance, evolution and change in living organisms.

What is at stake here is a more general epistemological problem: for a scientific approach to be recognised as credible, it needs to rely on universal laws. And we presume that the laws of physics meet these criteria of credibility. However, while examining the notion of anti-entropy, it should be acknowledged that it refers not to physical phenomena but to biological processes. The universe is changing because of the unpredictable behaviour of biological entities, and these behaviours have to be explained and accounted for. As theoretical biologist Stuart A. Kauffman points out, "at least part of why the universe has become complex is due to an easy-to-understand, but not well-recognised 'antientropic process' that does not vitiate the second law [of thermodynamics]" (41). The biosphere presents us with an entirely different worldview, which cannot be pre-stated, or calculated, and is not "governed" by universal laws. These are so-called "Kantian wholes" or "autopoietic systems" (Maturana and Varela) that define biological entities capable of inventing new functions, constructing new niches and behaving unpredictably.

These biological entities have a different form of causality, or, more precisely, they have *functions* as a subset of causal consequences. As Kauffman explains,

> this capacity to define a function as a subset of causal consequences that can be improved in evolution further separates biology from physics, which cannot make

> the distinction among all causal consequences into a subset which are functions. Biology, by this, is beyond physics, and […] because we cannot prestate the evolution of ever-new functions, we can have no entailing laws for the evolution of the biosphere. (67–68)

Biological entities do not follow physical laws because they imply different forms of causality, such as upward causation, downward causation, reticulate causation or self-causation. Biological entities also interact between themselves and with their environment, thus giving way to emergent properties that cannot be predicted in advance. As Kauffman points out,

> we cannot prestate the evolution of new functions in the biosphere, hence cannot prestate the ever-changing phase space of biological evolution which includes precisely the functions of organisms and their myriad parts and processes evolving in their worlds. But these ever-new functions constitute the ever-changing *phase space* of biological evolution. Then if we cannot know ahead of time what new functions will arise, we cannot write differential equations of motion for the evolving biosphere… Thus, we cannot integrate the differential equations we cannot write for biological evolution. Thus, we can have *no entailing laws* at all for biological evolution. Furthermore, […] we cannot noncircularly prestate the niche of an organism in its world, hence, we lack both the laws of motion and the boundary conditions, that is, the niche that would allow integration to yield entailing laws. No laws entail evolution. (70)

Life for Kauffman is "nonergodic," which means it will not follow standard statistical mechanisms. If the universe employed standard statistical mechanisms, it would make calculable quantities of proteins, cells, organisms, etc., but the universe will not make them because life is not a mathematical entity but an occurrence, a contingency, that may or may not happen.

A good example of this unpredictability is the new functions developed by organisms through random genetic mutations called "Darwinian pre-adaptations" or "exaptations." For example, birds' feathers used to have a thermoregulatory function, but they subsequently "seized" a new function – that of flight. Another of Kauffman's favourite examples is related to fish. Some fish have lungs that allow them to hop from puddle to puddle. Paleontologists believe that water filled the lungs of some fish, so they became a sack with water and air in it, which eventually evolved into a swim bladder. A swim bladder provides a new function – that of neutral buoyancy in the water column; and this new function changed the evolution of the biosphere, because a new species of fish appeared. But something more appeared as well. As Kauffman observes,

> The swim bladder now constitutes a new, empty but Adjacent Possible niche, or opportunity for evolution. For example, a species of worm or bacteria could evolve

> to live, say exclusively, in the swim bladder. The Adjacent-Possible opportunities for evolution, given the new swim bladder, do not include all possibilities. For example, a *T. rex*, or giraffe could not evolve to live in the swim bladder. (72)

Thus, the biosphere creates this Adjacent Possible niche, this empty opportunity, which might be seized by other species, but might not. "The swim bladder *enables, but does not cause, bacterial or worm species to evolve to live in it*. […] A new concept, not in physics, has entered: enablement" (Kauffman 73, original emphasis). In other words, the biosphere evolves in such a way that it opens the spaces of potentiality but not all of them are seized or taken: "the phase space of living organisms is non-linear and constantly changing, in contrast to those of physics" (Longo and Montévil 225).

In Kauffman's terms, the Adjacent Possible creates opportunities for something new to arrive at this point, e.g. a swim bladder. A swim bladder becomes a new Actual, a new reality that creates new adjacent-possible opportunities for further evolution. A new Adjacent-Possible is not prestated or predicted but appears as an emergent property of evolution. As Kauffman explains, before the emergence of these new potentialities "not only do we not know that *will* happen, we do not even know that *can* happen. […] We cannot reason about possibilities we do not even know" (77, original emphasis). Thus, the universe is creative in the sense that it opens many new unpredictable opportunities, but these opportunities are beyond the entailing laws. The biosphere is the most complex and, at the same time, the most difficult phenomenon for explanation, because it has no foundations in the sense of entailing laws. Perhaps the biosphere is foundationless? However, as Kauffman observes, we have to question "whether and, if so, when and why we need foundations" (196). Or, to put it in another way, we need not a theory of entailing laws but of emergent contingencies. Cary Wolfe in his article, "Jagged Ontologies in the Anthropocene, or, the Five C's," proposed the theory of five C's to explain the evolution of living beings: "When the Contingency of Constraint Closure in autopoiesis meets environmental Complexity, it becomes a source of Creativity in the biosphere" (2023, 215). This formula implies the interaction between self-referential organisms and their environments that is contingent and recursive. This interaction is radically contingent in the sense that it encompasses different temporalities (organisms and environments change throughout time), and different scales (at the level of cell, organism, or species). Biological entities evolve in temporality and scalability that are far beyond the Newtonian framework of time and space.

4. Autopoietic Systems: from Cells to Gaia

One of the theories that allows us to conceptualise life is the notion of autopoiesis. The concept of autopoiesis was coined by Humberto Maturana and Francisco Varela in the 1970s, and it refers to the minimal organisation of life, such as a cell (*auto* meaning "self" and *poiesis* meaning "making" or "creating"). Autopoiesis refers to the organisation of a living system, which is capable of maintaining itself in a closed circular process of self-production, and also is capable of interacting with its environment in order to get nutrients and energy. In this respect, an autopoietic organisation is defined by several features. First, it is defined by self-maintenance, which means that the cell's main function is to maintain its individuality despite the many chemical reactions taking place in it. It also means that an autopoietic entity is autonomous, capable of reproducing itself from within. In this sense, an autopoietic organisation is operationally closed. Second, an autopoietic unity interacts with the environment and gains information or energy from it. What distinguishes living systems from non-living systems is that the interaction between a living system and its environment creates a "structural coupling": "a living system relates to its environment *structurally* – that is, through recurrent interactions, each of which triggers structural changes in the system. For example, a cell membrane continually incorporates substances from its environment; an organism's nervous system changes its connectivity with every sensory perception" (Capra and Luisi 135). In other words, every encounter with the environment produces a structural change in the system which subsequently becomes autonomous. In this sense autopoietic entities are "structurally determined," that is, they are determined not by external forces (as in the case of non-living systems) but by their own internal structure. This leads to the third characteristic of living entities – life is an emergent property which cannot be reduced to the properties of the components (Capra and Luisi 133). Emergence can be seen as the necessary condition of self-organisation.

Thus, an autopoietic entity is self-maintaining and autonomous, it is structurally coupled with its environment and is constantly creating emergent properties that change its internal structure. As Evan Thompson observes,

> The self-transcending movement of life is none other than metabolism, and metabolism is none other than the biochemical instantiation of the autopoietic organization. That organization must remain invariant – otherwise the organism dies – but the only way autopoiesis can stay in place is through the incessant material flux of metabolism. In other words, the operational *closure* of autopoiesis demands that the organism be an *open system*. (85)

Consequently, the main feature of autopoietic systems is that they have to change in order to be alive – a total closure or homeostasis would lead to death. As Cary Wolfe points out, "all autopoietic entities are *closed* [...] on the level of *organization*, but *open* to environmental perturbations on the level of *structure*" (Wolfe 1995, 53, original emphasis). In this sense, autopoietic systems are structurally open and organisationally closed at the same time.

The notion of structural coupling allows one to distinguish between living and non-living systems and define different orders of causation. If a non-living entity is disturbed by the environment, it will react according to a linear line of cause and effect, which is more or less predictable; if a living being is disturbed, it will respond with structural changes which are unpredictable (Capra and Luisi 136). As Wolfe argues, the relationships in biological systems are radically different from what we find in physical systems: even if some physical systems show emergent self-organisation (dust devils, tornadoes, Bénard cells), these changes are initiated by external agents or circumstances, whereas in autopoietic systems these changes are introduced and maintained by the system itself (2023, 202). This means that emergent properties cannot be predicted or prestated in advance. However, a living being interacts with an environment both in a contingent and in a recursive way: not only adapting to the environment but also actively influencing it. In this sense, Maturana and Varela argue that the interactions between a living system and its environment are cognitive interactions, and the structural changes that a living being undergoes are acts of cognition. Maturana and Varela assert that the process of cognition, or the process of knowing and learning, is coextensive with the process of life. "*Living systems are cognitive systems, and living as a process is a process of cognition*. This statement is valid for all organisms, with and without a nervous system" (Maturana and Varela 13, original emphasis). In other words, the capacity of interaction is seen as a cognitive activity which can be discerned at all levels of life, from cells to human and non-human animals. "The interactions of a living organism – plant, animal, or human – with its environment are cognitive interactions. Thus life and cognition are inseparably connected. Mind – or, more accurately, mental activity – is immanent in matter at all levels of life" (Capra and Luisi 254). In this sense, cognition is a characteristic not only of animals with reflective consciousness, such as humans, but also of other living beings with or without nervous systems and brains.

In this respect, Maturana and Varela's theory of autopoiesis can be seen as a universal methodology applicable to different orders of organisation, such as ecosystems or social domains. For example, sociologist and system theorist Niklas Luhmann interpreted autopoiesis as a general form of system building by using a self-referential closure, and argued that general principles of autopoietic organisation can be applied to social systems (2). But the most important application was made by Varela, who persuaded James Lovelock and Lynn Margulis to redefine their Gaia theory in terms of autopoiesis. Gaia understood as an autopoietic system not only merges her cybernetic and biological origins but also helps to explain the Earth's maintenance during times of unpredictable changes. As Margulis points out,

> The simplest, smallest known autopoietic entity is a single bacterial cell. The largest is probably Gaia – life and its environment-regulating behavior at the Earth's surface. Cells and Gaia display a general property of autopoietic entities: as their surroundings

> change unpredictably, they maintain their structural integrity and internal organization, at the expense of solar energy, by remaking and interchanging their parts. (267)

Defined in this way, Gaia as an autopoietic system incorporates both biotic and abiotic, or living and non-living elements, and allows us to explain the structural couplings between living autopoietic systems and non-living non-autopoietic milieus. In this respect, the theory of autopoietic Gaia is a better theoretical tool to reflect our climatic condition than the notion of the Anthropocene. The Anthropocene (and Entropocene) deals with measurable, or quantitative effects which are mostly irreversible. By contrast, Gaia theory reflects qualitative connections between a living being and its environment. It also allows us to explain qualitative changes (new functions and new biological forms) in positive terms: not as an exception or disruption but as a different form of causality. Gaia theory implies the planetary cognition which organises different living and non-living (geological or technological) systems in such a way that they could attain more favourable conditions for life.

5. Toward an Organism-Oriented Ontology

The theory of autopoiesis and its successful application at different orders of complexity – from the cellular level to Gaia – demonstrates that we need new epistemological approaches to tackle our recent condition. The Anthropocene should be examined not as a technological or economic phenomenon but as a condition of knowledge, as an epistemological deficit, a lack of concepts and methodologies suitable to defining living systems. Living beings never became the main focus of philosophical considerations because of their temporary, contingent and insubstantial character. However, recent anthropogenic destruction and the extinction of species and natural habitats make this task urgent. Philosopher Yuk Hui expresses this idea as a thesis that "for any philosophy to be, it has to be organic" (2021, 16). By this "organic condition," he means two things: first, recursivity, or circular logic that goes back to itself to determine itself; second, contingency that opens this circularity for deformation and transformation, in other words, for change (Hui 2021, 14). These are the same features that define autopoietic systems – self-maintenance (operational closure) and change (structural openness). Hui suggests that not only living beings, such as cells, humans, and Gaia, but also technical objects and technologies can be defined as autopoietic entities. Although in many respects following Stiegler's doctrine, Hui introduces a different approach to technology: instead of interpreting technology as an extension of the human body and mind (exosomatisation), he argues that technologies become organic in the sense that they integrate recursivity and contingency – the features that characterise living beings. Stiegler's organology examines technical objects in terms of the organised inorganic, whereas Hui suggests that organology should rethink technical objects in their organising capacity: "What we are witnessing today is a shift from the *organised inorganic* to the *organising inorganic*, meaning that machines are no longer simply tools or instruments but rather gigantic organisms in which we live" (Hui 2019, 28, original emphasis). In this respect, Hui incorporates Stiegler's project into his own organology, and yet, the ontological weight is balanced differently: for Stiegler, a human being creates technology to extend and expand its own subjectivity; for Hui, both human beings and technologies co-exist inside of a general cybernetic organism which can be imagined as a smart home, smart city, or the Anthropocene as a technological project: "The inorganic is no longer organised by the human body as was the case with simple tools, but rather constitutes an enormous technical system we can only live inside of, while submitting to its rules" (Hui 2021, 224). This approach supports Gaia theory, which allows us to see the Earth as a self-regulating system incorporating both organic and inorganic sub-systems into an organised whole.

And yet, what does it mean that philosophy has to become organic? Hui writes that

> The organic constitutes a new *condition* of philosophizing, for the reason that the organism provides an exit for philosophy, enabling it to move out of the systemic determination by *a priori* laws, which surrender freedom to mechanical laws and finalism. …[T]he organic imposes on philosophy a new condition and method of thinking. (2019, 47)

As was indicated earlier, in the *Critique of Judgement* Kant defines an organism as a natural purpose, as the "cause and effect of itself" (199). He gives the example of a tree, which can be considered as a natural purpose in three respects (199–200). First, the tree generates another tree according to a natural law, but the tree it produces is of the same species. This feature can be related to self-maintenance in autopoietic systems. Second, the tree also generates itself as an individual by taking matter from the outside and converting it into a substance of which it is made. This is nothing other than interaction with the environment and potential for qualitative change. Third, one part of the tree generates itself in such a way that the preservation of one part is reciprocally dependent on the preservation of the other part: one part helps to preserve another part and the whole. This feature can be seen as an emergent property. Thus, Kant's description of the organism already anticipates the notion of autopoiesis and also raises questions about different orders of causality and different methods of thinking.

At this point, I want to introduce the need to create a concept of organism-oriented ontology that recognises the ontological status of living beings. Contemporary philosophy provides many theoretical models to explain both self-organisation and the unpredictable development in living beings. As was discussed earlier, Kauffman introduces the distinction between Adjacent Possible, which opens new opportunities in niche construction and Actuals that seize these opportunities successfully. In *Difference and Repetition,* Gilles Deleuze creates a similar dynamic model by proposing a theory of double differentiation. He refers to the virtual mode of differentiation, charged with internal differences, and the actual process of morphogenesis, which incarnates these differential traits into actual beings. Thus, the virtual mode of differentiation – called differen*t*iation – can be defined as a differential relation taking place in a structure, where elements are in their "embryonic" form. The actual mode of differentiation – called differen*c*iation – can be imagined as a process, or morphogenesis, creating a series of biological qualities and extensions. As Deleuze writes, "Whereas differentiation determines the virtual content of the Idea as problem, differenciation expresses the actualisation of this virtual and the constitution of solutions (by local integrations)" (261). Thus, for Deleuze, the double model of differentiation combines the two aspects of biological individuation: a virtual structure of potentialities and an actual process of morphogenesis which seizes some of these potentialities. For Deleuze, "the actualization of the virtual […] always takes place by difference, divergence or differentiation" (264). In other words, the process of morphological differentiation, which is a distinctive feature of living organisms, is interpreted by Deleuze as an ontological principle that helps to define reality.

In *Difference and Repetition*, Deleuze examines morphological development, whereas in *A Thousand Plateaus* (2004), Deleuze and Félix Guattari discuss the notions of organism and the body without organs. The concept of the body without organs questions the conventional understanding of an organism as an organised whole (as defined by Kant) and conceptualises it in terms of an assemblage. As Bennett and Posteraro observe,

> The organism might be understood as an assemblage in just this sense: it consists of a coordination among various parts sourced from elsewhere, acquired both vertically, by heredity, and horizontally, through its integration in an environmental haecceity; and it is structured on the basis of an abstract diagram that outlines possible parts and the functions that would enlist them. (12)

Redefined in this way, the organism as an assemblage opens many productive ways to examine biological contingency in such phenomena as symbiosis or the holobiont and helps to contextualise the philosophical notion of an organism within recent developments in biology, such as complexity theory, developmental systems theory, or the theory of symbiosis.

Thus, Deleuze's and Guattari's concept of the body without organs expresses the very vitality of life, whereas the organism as such is understood as still life, devoid of change and potentiality. As Daniel Smith points out, "The body without organs is the model of Life itself, a powerful non-organic and intensive vitality that traverses the organism; by contrast, the organism, with its forms and functions, is not life, but rather that which imprisons life" (209). Accordingly, the notion of the body without organs can be interpreted as the model of Life, a certain organic potentiality, which is liberated from the constraints of determination and programming. Deleuze and Guattari suggest the novel notion of "involution," which implies that an organism might develop not according to the lines of filiation but in creative and non-predetermined ways:

> It is thus a plane of proliferation, peopling, contagion; but this proliferation of material has nothing to do with an evolution, the development of a form or the filiation of forms. Still less is it a regression leading back to a principle. It is on the contrary an *involution*, in which form is constantly being dissolved, freeing times and speeds. (Deleuze and Guattari 294)

Accordingly, involution does not mean a regression or a desire to vanish in an undifferentiated primordial soup. Rather, it means that the relationships between organic forms are established not according to lines of descent or filiation but through contingent and assemblage-like connections between heterogeneous elements.

The "organic condition of philosophizing" is also important in the philosophy of Catherine Malabou, who argues that the biological notion of epigenesis is much more informative than any laws of mathematics and physics. Malabou writes about the "biologisation of reason," or "epigenesis of reason," which can fundamentally change "the laws" of reasoning by relinquishing necessity and embracing contingency. In contrast to Quentin Meillassoux, who asserted in *After Finitude* (2008) that contingency can be explained only mathematically, Malabou argues that contingency can be explained biologically:

> Kant allows us, from finitude, to discover a meaning of contingency that is more innovative and radical than the one that Meillassoux proposes […] The epigenetic transformation of necessity and causality, starting from reason itself, reveals that contingency derives less from a possible modification of the laws of physics than from the existence of different levels of necessity. (2016, 173)

The epigenesis of reason not only allows us to embrace the contingency characteristic of the organic world but also clarifies the durational, gradual, and processual nature of reason: we can observe and follow "the gestation and embryogenesis of reason itself" (Malabou 2016, 173). As Jennifer Mensch argues in *Kant's Organicism* (2013), "Kant found epigenesis to be attractive for thinking about reason because it opened up possibilities for thinking about reason as an organic system, as something that was self-developing and operating according to an organic logic" (144). The theory of epigenesis allows Malabou (and Kant) to think of reason as "cause and effect of itself," as a self-organising entity open for change and contingency.

The organic logic is also exemplified in Malabou's notion of plasticity. Plasticity refers to biological creativity and a living being's capacity to receive form and give form, to change and evolve. Living beings are not predetermined in advance but are self-organised systems interacting with their environments. As Malabou notes,

> Plasticity is in a way genetically programmed to develop and operate without program, plan, determinism, schedule, design, or preschematization. Neural plasticity allows the shaping, repairing, and remodelling of connections and in consequence a certain amount of self-transformation of the living being. (2015, 43–44)

In this sense, biological entities are not predetermined by any laws and can develop according to their immanent potentiality. Biological plasticity allows us to imagine different forms of biological life and subjectivity, free to take any shape or form and to avoid the pressure of normativity.

Thus, contemporary philosophy provides many theoretical notions to conceptualise the "organic condition," such as differentiation, the body without organs, involution, epigenesis, and plasticity. Philosophy gives us a glimpse into this "creative universe" without constraining it to any "entailing laws." Therefore, the concept of organism-oriented ontology, as described elsewhere (Žukauskaitė 2023), allows us to rethink potentiality and contingency as a capacity for qualitative change, such as random mutation, pre-adaptation, niche construction, epigenesis, etc. The universe is "creative" but it is also persistent: it tends to maintains itself and its organisation. Living beings are open to contingency and change, but this contingency is incorporated into their regular functioning. Living systems are cognitive systems in the sense that they change their environment to make it more suitable for living. For example, photosynthetic organisms create an oxygen-rich environment. Likewise, spiders and beavers, not to mention humans, create their environments. All living beings cognitively interact with their milieus and tend to create preferable conditions for their being. This statement is valid for organisms at different levels of complexity: for example, a cell interacts with its environment by incorporating substances and making some internal changes; a nervous system interacts with its environment through perception, and every sensory perception initiates internal changes within it. Thus, instead of thinking about our universe in terms of entropy, negentropy, or anti-entropy, which frames us into a physical worldview, it is more productive to think about the biosphere in terms of cognition operating at all levels of life.

Organism-oriented ontology allows us to reformulate the question of the Anthropocene in different terms. The Anthropocene (and Entropocene) is an entropic phenomenon, emerging together with industrial reorganisation (and the invention of the steam engine) and leaving its destructive, irreversible effects everywhere. Therefore, I would argue that we cannot resist the effects of the Anthropocene if we stay within the same conceptual framework that caused it and try to overcome it with the help of concepts we inherited from physics, such as entropy, negentropy, necessity, linear causality, probability, etc. It is precisely this conceptuality which leads us to (probable) extinction. To stay alive and keep our ability to reason, we have to embrace a new conceptuality and examine the ontological modes of existence of living organisms. It is not enough to state that the universe is creative; it is important to define the specific modes of interaction between a living being and the environment, to understand different forms of causality and the potential for change and novelty.

6. Conclusion

Therefore, I argue that the Anthropocene is not a technological or economic phenomenon, but a situation which imposes the epistemological question "What is life?" Attempts to extend physical laws to biological phenomena (and to convert entropy into negative entropy) cannot be seen as successful strategies because they interpret the living being as local and temporary, in other words, as more an exception than a rule. In this respect, Stiegler's notion of the Neganthropocene does not seem convincing because it cannot explain maintenance, evolution and change in living organisms. What is at stake here is a more general epistemological problem: as Kauffman points out, the biosphere presents us with an entirely different worldview, which cannot be pre-stated or calculated, and is not "governed" by universal laws. Biological entities are capable of inventing new functions, constructing new niches and behaving unpredictably. This is why the notion of the Anthropocene should be tackled by introducing a theoretical approach which can explain biological specificity. By accepting Maturana and Varela's theory of autopoiesis, we can explain living beings at different orders of complexity, such as a cell, a human, or Gaia. Gaia as an autopoietic system incorporates both biotic and abiotic or living and non-living elements, and allows us to explain the structural couplings between living autopoietic systems and non-living non-autopoietic milieus. In this respect, the theory of autopoietic Gaia is a better theoretical tool to reflect our climatic condition than the notion of the Anthropocene. The Anthropocene deals with measurable, or quantitative effects, whereas Gaia theory reflects qualitative connections between a living being and its environment. It also allows us to grasp qualitative changes (new functions and new biological forms) in positive terms: not as an exception or disruption but as a different form of causality. However, the notion of autopoiesis cannot embrace all the complexity of the biological world; therefore, I argue for the need to create organism-oriented ontology that would allow us to reflect the ontological status of living beings. Contemporary philosophy provides many theoretical tools to conceptualise the "organic condition," such as differentiation, the body without organs, involution, epigenesis, and plasticity. These notions are important not only because they allow us to think of potentiality and contingency as a capacity for qualitative change, but also because they could help us to face the forthcoming changes and create our new "pre-adaptations."

Notes

1 Stiegler and Internation Collective made attempts to test these ideas by creating alternative forms of production, research, education, and creation. They proposed a model of economy of contribution, which is based on contributory income allowing the participants to explore their capabilities (Stiegler et al. 2021, 100–107). They also created models of contributory research, contributory technology, contributory design, and even redesigned the world wide web to create a new structure of algorithms based on qualitative analysis. As far as these attempts are experiments functioning in specific time and space, I am not discussing them in this article.

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