

Pierre Huyghe's Art, Bio-Machines, and the Question of Life

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Introduction

The work of French artist Pierre Huyghe (born 1962) engages with the question of what constitutes life by negotiating the relationships between the human and non-human, organic and inorganic, machinic and non-machinic. Huyghe's most recent creations produce intricate material settings that often bring together living matter (algae, cells, insects, a dog, an ape, humans), non-living matter (stones, sand, concrete) and technologies (generative artificial intelligence (AI), digital media, sensors). For example, *After ALife Ahead* (2021–), a project situated on a former ice rink, included bee colonies, an aquarium, a false peacock, and an algorithm-steered incubator containing living human cancer cells. Visitors could explore the work's vast, sandy indoor landscape using an interactive augmented-reality app that invited them to contemplate their own interconnectedness with both technology and biology.

Huyghe's recent works go beyond one specific aesthetic genre. They certainly could be termed installations, as they work with performative and participatory dimensions of aesthetic experience (Rebentisch, 2012; Bishop, 2005). However, I approach Huyghe's artworks more as 'aesthetic lifeworlds' than installations, as my focus in this article is on the potential generation of life in his art by means of engagement with processes of biological, machinic, and temporal evolution. Huyghe's works shape heterogeneous milieus and environments that are transitory, in flux and constantly in process, thereby raising questions about the conditions and criteria of life, and who or what is deemed to be alive. Researchers and art critics have frequently articulated the hermeneutic challenge posed by Huyghe's art, pointing to its hermetic character and interpretative complexity (Joselit, 2014; Finnegan, 2020; Flach, 2024). This article aims to decipher and decode some of Huyghe's aesthetic lifeworlds by using the concept of the bio-machine. On one hand, I deploy this concept as an epistemic lens to investigate Huyghe's art and learn more about its assumptions concerning the interconnectedness of life,

technology, humans and biology. On the other, my discussion of Huyghe's art will also sharpen our understanding of the concept of the bio-machine as such – a quest that is central to this themed issue. It is important to note that such epistemic expectations of artworks – as if artworks could deliver conceptual knowledge – are always tricky. Given the systemic autonomy of artworks, their complexity and uniqueness, any search for conceptual proofs may do them an injustice. I am aware of these pitfalls, although in this context I am following my own scholarly method of attaining more knowledge about technology by analysing art (Maurer, 2023: 13). Nevertheless, in my readings of Huyghe's artworks, I try to capture their hermeneutic multitudes, their ambivalences and their complexities.

Let me start with a question: what can be a bio-machine? I will sketch a few preliminary ideas here, which I will then elucidate during my close reading of Huyghe's artworks. On a general and perhaps technical level, one can understand bio-machines as machines that appear to be alive by virtue of their lifelike features: adeptness at human-like interactions, an apparent ability to feel emotions, and a cognitive and sensual capacity resembling that of living creatures. Examples include virtual assistants (Siri, Alexa), generative self-learning computer systems (chatbots) and adaptive robots that use AI to learn from their surroundings (robot vacuum cleaners). To a certain degree, bio-machines can be seen as belonging to the family of elaborated robots. Indeed, artistic imaginaries of robots often reveal how much we as humans are prone to anthropomorphise and animate dead machines into living creatures (Mori *et al.*, 2012), and perhaps bio-machines are just robots that are especially excellent at simulating lifelikeness. Thanks to AI and machine learning, such technologies stand out by seeming to be alive even when they are not embodied (chatbots are a familiar example). Consider the recent news story (Hill, 2025) about a woman who fell in love and had a long-term relationship with a ChatGPT avatar she named Leo, a case that recalls the AI agent Replika. Bio-machines interact with us as if they were living beings, and sometimes we treat them accordingly. In other words, bio-machines are masters of techno-mimesis, performing the experiential and cognitive features of biological life.

Many artists have engaged with the topic of intelligent and lifelike machines, even if they have not used the term 'bio-machine' *per se*. An example is the 2023 exhibition *BioMedien* at the Zentrum für Kultur und Medien in Karlsruhe, Germany. Displaying various artworks that dealt with interactive robots, generative AI and biosynthetic organisms, *BioMedien* emphasised how media systems can perform a techno-mimesis of the sensory capacities of biological organisms and life (Weibel, 2022). The exhibition therefore focused

on the ways in which biomedica – and their artistic embodiments – perform simulation, mimesis and biomimicry of biological organisms.

I do not wish to deny the simulative quality of bio-machines. A chatbot-generated text, or an image produced by generative AI, does indeed resemble and simulate human speech or human creativity. In this article, however, I attempt to add an additional perspective and pose the question of whether bio-machines can potentially generate life. This question is key to many current discussions about what constitutes life in light of AI, machine learning and planetary intelligence (Agüera y Arcas, 2025; Walker, 2023). Eugene Thacker's (2003) theory of biomedica is key here. Among other ideas, Thacker foregrounds similarities between genetic and computational coding by pointing out that one can find computational structures in biology and biological structures in computing. His discussion of life in light of computational and biological elements includes generative aspects: he sees computer codes and DNA as generative systems that produce new ways of understanding (or better, 'recoding') life via new forms of embodiment. Research on biomedica has been important for my attempt to elaborate a concept of the bio-machine, but I am less focused than Thacker on the connection between computational coding and molecular biology. Instead, I wish to engage in a broader discussion of the potential for generating life via machines by concentrating on the worldmaking powers of technology (Gilbert Simondon) as well as theories of vitalism (Henri Bergson). In this I am inspired by Sarah Kember and Joanna Zylinska's (2012) work on the 'vitality of media', as their analysis of (new) media points to generative processes beyond simulation and representation, foregrounding becoming, performativity and worldmaking. However, unlike them I do not focus on mediality as the key trope that entangles human and non-human entities (Kember & Zylinska, 2012: 1); rather, I focus on the machinic.

Inspired by Huyghe's art, I conceptualise generative processes as activities of the bio-machine that create something – that produce, develop and originate new content, narratives and ideas. Huyghe's work thus provides an experimental space in which to engage with the question of the bio-machine as generating life. In what follows, I explore three aspects of his work that together can be taken as defining qualities of the (generative) bio-machine: living materials, the machinic and presence. To engage with these aspects, I focus on some of Huyghe's major works, specifically *Zoodram 4* (2011), *Umwelt* (2019) and *Variants* (2021–). It is important to note that these three aspects of the bio-machine do not exist separately and must be seen in close connection with each other. While the following sections foreground each aspect individually, they must be thought together as

dimensions of a bio-machinic constellation. My examination of these bio-machinic aspects – which reverberate throughout all the works analysed here – then leads into a discussion of how the works negotiate with non-anthropocentric life. Finally, discussing Huyghe's *Camata* (2024), I demonstrate how the three generative bio-machinic aspects reflect on life as a process of evolutionary becoming. In this way, I consider the consequences and implications of the generative powers of bio-machines and what they might mean for the definition of life. The focus on the bio-machinic allows me to centre the intersections of humans, animals and machines in Huyghe's art, and to interrogate their dependencies, interactions and co-creations and how they negotiate perspectives on what constitutes life.

Huyghe's Bio-Machines and Living Materials

Huyghe's aesthetic lifeworlds often integrate living materials such as animals, plants, viruses and bacteria. His famous work *Untilled* (2011–2012), for example, exhibited in Karlsruhe Park during *Documenta 13* in Kassel, Germany, created an aesthetic ecosystem: a concrete cast of a reclining female nude whose face was covered by a hive of live bees. This work also included psychedelic plants, some oaks planted by Joseph Beuys, bacteria, and a white dog called Human that had a pink-dyed front leg and moved freely around the installation. Another example is Huyghe's film *Human Mask* (2014), set in the postapocalyptic wasteland of Fukushima. The film's protagonist is a chimpanzee wearing a mask of a girl's face. Roaming around inside an abandoned restaurant, the chimpanzee mimics and executes human gestures. In both artworks, aesthetic creation is steered by the unpredictable and contingent generative processes of biological agents such as insects, plants and apes. The integration of these living materials in Huyghe's art emphasises the biological aspect of the bio-machine. Huyghe's artwork literally comes to life as (for example) the bees become part of it, their swarm formations shaping its aesthetic configuration. The bees' life cycle determines the lifespan of the artwork. Thus, the artwork does not simulate life via forms of medial representation (screens, video); rather, it enacts, performs and produces life by generating biological processes.

Huyghe's art engages here in dialogue with the genre of bio art, a practice in which artists work with living organisms and biological processes. Bio art can include bacteria, fungi, plants, animals and even human cells as part of the creative process. Key examples include Eduardo Kac's *Time Capsule*, a microchip he planted in his leg in 1997, and his *GFP Bunny*, a rabbit genetically modified to glow green under blue light. Bio artists often collaborate with scientists and use

techniques from biotechnology, genetics and other life sciences to create their works, reflecting an interest in bioengineering, tissue culture and synthetic biology (Reichle *et al.*, 2009; Ginsberg *et al.*, 2017). However, bio art is not exclusively a phenomenon of the 20th and 21st centuries; it also has a historical trajectory, as Robert Mitchell (2015) has shown in his media-theoretical approach to vitalism and bio art. For example, the biologist Ernst Haeckel's (1834–1919) detailed artistic illustrations of various life forms and evolutionary processes, particularly those found in the microscopic world, can be seen as precursors of bio art. Huyghe certainly echoes such early bio artists' fascination with biological materials and evolutionary processes, as well as more recent bio artists' interest in synthetic biology. However, I am hesitant to situate Huyghe's work fully within this tradition. Although he works with living materials, and even with processes of mutation and evolution, he has neither the strong interest in bioengineering and lab work nor the ongoing interaction with scientists that are often found in bio art (Ginsberg *et al.*, 2017). Nevertheless, Huyghe's aesthetic lifeworlds are characterised by the use of biological material, and because of this material his works are not static: they are in the constant process of shaping something new, based on the contingencies of biological agency.

How might one interpret Huyghe's aesthetic bio-machines, where the biological material seems to have control over the artistic process? One possible reading is that the biological organisms decentre the human subject. Ironically, this decentring is effected through the introduction of features reminiscent of the diorama, a three-dimensional, immersive display of plants, cultures and people that had its heyday in the natural-history museums of the 19th century (Perazzini, 2024). This is ironic for two reasons: traditionally, dioramas displayed dead taxidermic objects, and they centred the human spectator. Huyghe's artworks invert both of these aspects as they display living (not dead) dioramas and no longer centre the human as agent and spectator.

Huyghe's work with aquariums particularly resonates with the diorama and gives the anthropocentric perspective an ironic twist. For example, *Zoodram 4* (2011) creates a wondrous underwater world in miniature (Figure 1). The aquarium contains a live hermit crab that carries around a replica of Constantin Brâncuși's sculpture *Sleeping Muse* (1910). The crab and the muse's head comprise a hybrid of two species, one human and the other non-human. To my eyes, the non-human has power over the human, as the human (represented by the mask) is dependent on the crab's movement and behaviour. Thus, while *Zoodram 4* retains human traces, the human actor is presented as no longer in control.



Figure 1. *Zoodram 4*, 2011. Aquarium, live marine organisms, resin shell after Constantin Brâncuși's *Sleeping Muse* (1910) ©Pierre Huyghe

The miniature world in *Zoodram 4* evokes the spectacularisation and exhibition of species in the dioramas and aquariums of natural-history museums. These modes of exhibition were often associated with a specific gaze of power that exoticised the exhibited objects, be they plants, animals or Indigenous people. Donna Haraway (2004: 186) has pointed to the colonial optics of dioramas, where the objects on exhibition were meant to reinforce the Western view of civilisation by contrast with the 'otherness' of non-Western cultures:

Dioramas are meaning machines. Machines are time slices into the social organisms that made them. Machines are maps of power, arrested moments of social relations that in turn threaten to govern the living. The owners of the great machines of monopoly capital – the so-called means of production – were, with excellent reason, at the forefront of nature work – because it was one of the means of production of race, gender and class.

Haraway is referring here to the ways in which dioramas created concepts of race and class, reaffirming Western power and enabling colonial fantasies (Zantop, 1997). In *Zoodram 4*, this Western optics of the diorama reverberates, but its scopic regime is inverted into a critical perspective. It is no longer the human (Western) gaze that exoticises the other culture or species; rather, it is the non-human actor, the crab, that directs the attention. The human as supposed pinnacle of creation is thrown into an evolving world whose conditions are uncertain and dependent on the instinctive behaviour

of animals. The crab goes its own way; it carries the human mask as it wants to; we cannot control it. It is interesting that Haraway presents the diorama as a semantic machine that creates discourses, opinions and ideologies. This idea can also be brought to bear on *Zoodram 4*. Although the spectator cannot walk (or swim) around inside Huyghe's aquarium, its three-dimensionality, its lighting technology and the sounds of the hydraulic pump all evoke a techno-sensorial experience, which in turn provokes critical reflection: *Zoodram 4* not only examines the semiotics of museal display, in which nature and cultures were spectacularised, but also questions the central position of the human in understandings of life and evolution.

Huyghe's Bio-Machines and the Machinic

Alongside their biological aspects, many of Huyghe's artworks integrate aspects of the machinic: lighting sensors and electric circuits; the hydraulic pumps in the aquariums; the heating system used to encourage the growth of living organisms on the surface of a statue (*La Dérason*, 2014). Besides these analogue machines, Huyghe also works with digital algorithms, machine learning and neural networks. For example, *UUmwelt* – which has been exhibited in different versions and different venues, including the Serpentine in London, UK in 2018 and at the retrospective *Liminal* in Venice, Italy in 2024 – creates complex lifeworlds that entwine the machinic and non-machinic, including the apparatus of screens, projectors, cameras and sound systems as well as digital images. For these exhibitions, Huyghe chose images (such as butterflies, archaic tools or artworks) and presented them to an individual person to look at and study. As the person later memorised these images, their brain activity was captured by a functional magnetic resonance imaging (fMRI) scanner, and then that data was given to a deep neural network, a form of machine learning trained on facial recognition. The deep neural network attempted to reconstruct the images from the fMRI data, collaging together elements from its own bank of images by using processes of continuous optimisation, learning and recognition. *UUmwelt* projects these machinic images onto large LED screens distributed throughout the gallery. 'The rhythms and pauses within the succession of images were endlessly modified by the conditions in the gallery; sensors detecting light, temperature and humidity levels, the presence of insects, and the gazes of visitors produced a feedback loop' (Serpentine, 2018). This co-product of human imagination and non-human cognition (machine learning) shapes a lifeworld where the machinic and the biological interact; it creates an aesthetic bio-machine. The machinic in this constellation is much more than just a technical apparatus or isolated technical entity. The machinic gains a

sensorial and experiential dimension as it engages with the imaginations of individual spectators. In doing so, the technosensoriality of the machine projects fictitious speculative narratives about potential pasts (memories), presents and futures. In other words, the machinic in this bio-machine is not just an apparatus but entails the generative power of worldmaking.

The philosopher Gilbert Simondon, who developed a general phenomenology of technical objects, also thought about technology as something that could be worldmaking. In this he was influenced by Martin Heidegger's (1977: 13) writing about technical objects as *techné* with the power to 'bring forth' a world. For Simondon (2017: 15), technical objects can become 'mediators between man and nature', and he thus posits a correlative existence between humans and machines. This means recognising machines as entities with their own existence and significance, rather than seeing them as merely tools or instruments. Simondon introduces the concept of technical individualisation whereby technical objects evolve and become more autonomous and complex over time. The process is similar to biological evolution: like biological organisms, technical objects can adapt and improve through successive iterations. However, this does not mean that technical objects and humans merge with each other. Rather, Simondon sees the machinic as something that co-creates itself, coexists and collaborates with the human agent. In this way, one could also say that the machinic develops its own autopoietic process. An important concept in cybernetic theory (Wiener, 2019; Maturana & Varela, 1980), autopoiesis refers to a system's generative ability to produce and maintain itself by creating its own components: the term 'autopoiesis' comes from the Greek words 'auto' (self) and 'poiesis' (creation or production). In essence, an autopoietic system continuously regenerates and realises the network of processes that produce its components. While Simondon's writing focuses on human correlations with the autopoietic processes of machines, we have already seen above how in Huyghe's bio-machines the human no longer plays a central role. In *UUmwelt*, as in *Zoodram 4*, the human agent is still there; traces of it remain. The images displayed on the screen sometimes remind us of human modes of perception: we think we recognise a human shape or something we know. But most of the time, the images on the screen (modified by neural networks) are estranged, and the human eye cannot make sense of them. The machinic images do not compute with our iconic and hermeneutic standards; they evoke something known (insects, eyes, tools), but they constantly change and transform shape according to their own machinic logic.

Huyghe's Bio-Machines and Presence

Scholars of Huyghe's work have often emphasised that his art engages with questions of time, in particular with the temporal mode of presence (Perazzini, 2024; Rothenberg, 2013). Amelia Barkin's (2012: 6) book *Parallel Presents: The Art of Pierre Huyghe* argues that many of his works suggest a mode of temporality other than normative, linear models of time – a mode that stresses the discontinuous, the incomplete and the momentary. Barkin (2012: 5) introduces the ideas of 'freed time' and 'open time', described (including by Huyghe himself) as conceptions of time that stand at odds with the time of leisure and the capitalist market. According to Barkin, by performing this alternative temporal model, Huyghe's artworks generate effects of presence. This mode of presence has the power to break through conventional models of time, grand narratives and chronology, and to create disruptive moments of openness and process (Haas, 2016).

This mode of presence is particularly evident in Huyghe's *Variants* (2021–), situated amid animals, plants, streams and microorganisms in a forest in Kistefos, Norway. The natural setting is part of the artwork itself, and in addition to the 'real' environment of the forest, there are large screens showing real-time lidar images of the forest as well as environmental sensors, sounds and self-steering cameras. Within this setting, biological and synthetic materials aggregate. Natural beehives with real bees are connected to pink artificial beehives hanging from a tree branch, producing the impression of a strange mutant organism. Mushroom-like objects lie on the ground and grow from the trees, combining microorganisms with artificial materials. This aesthetic world is constantly mutating and changing, and in doing so it suggests a mode of presence. But what kind of presence is this? It is not the presence of affective immediacy, nor is it a cultural form of bodily tangibility (Gumbrecht, 2004). Rather, the presence here is an ongoing process in which the aesthetic work constantly changes its own conditions of possibility. This presence-as-process is constructed through the contingencies of its own materials: the bio-materials, the weather, the waterflows are always changing in an unpredictable fashion. The work's machinic processes too – the algorithms, the imaging on the screen – can self-program. In this way, the work evokes a presence that constantly changes and is changed by evolutionary processes, mutations and environmental factors.

In light of this presence, we need to ask again whether Huyghe's work with the bio-machinic can be understood exclusively in terms of simulation. Some art critics have suggested that Huyghe is following

a postmodern aesthetics of simulation. This is particularly because of his work as a video artist and the livestreaming elements of his art, which are reminiscent of Jean Baudrillard's ideas about hyperreality and simulacra (Erickson, 2009; Van der Meulen, 2012). However, as Barkin (2012) and Chiara Vecchiarelli (2024) have shown, Huyghe does more than simulate. His work does not point to a non-existent reality through endless simulation, nor does it simply state the absence and impossibility of representation. Rather, his bio-machinic works induce and generate lifeworlds. *Variants'* bio-machinic elements – biological microorganisms in the forest, synthetic beehives, technical sensoria such as the algorithms, machine learning programs – generate a materially grounded present lifeworld that manifests and is produced by the artwork itself, before the spectator's eyes. Huyghe's bio-machines create aesthetic lifeworlds that are defined by processes of biological and synthetic-machinic evolution. Many of Huyghe's works perform biological evolution by engaging with living entities such as flies, bees and microorganisms. Even mutation (including its synthetic versions) is integrated. But technical evolution in the form of self-generating algorithms and machinic images also plays an important role: in *Umwelt*, for example, non-supervised machine learning and AI-generated images shape new 'realities'. Given these evolutionary processes, Huyghe's bio-machines do not merely simulate worlds but generate lifeworlds that adhere to their own changing rules and are involved in a constant process of evolution (Haas, 2016). These generative aspects, which I find so significant for Huyghe's aesthetic bio-machines, will be further explored in the next section's discussion of how life and evolution are negotiated in his artworks.

The Question of Life

How can we interpret these generative and evolutionary processes in Huyghe's aesthetic bio-machines with respect to the question of life? What conception of life does Huyghe's art suggest? Do his bio-machines suggest that non-human silicon-chip-based technical entities are no less alive than carbon-based organisms? To approach these questions, let us look at his 2024 film *Camata* as a final example (Figure 2). *Camata* is set in Chile's Atacama Desert, the driest desert on earth. It is currently a testing ground where Nasa researchers model planets beyond our solar system, and it has also been a site for industrial mining and global extractivism. In Huyghe's film, robots driven by machine learning software inspect the unburied skeleton of a young man, which lies on the stones and rocks next to a dried-out creek. Robotic arms rise from the ground; they reassemble and apparently investigate the objects they have picked up. The robots

seem to be performing a strange funeral rite, or an anatomical study – we cannot grasp the meaning of their gestures.

Displaying a skeleton lying in the Atacama Desert is certainly a provocation. The Atacama Desert was not only a political conflict zone for centuries but also became a site of execution and a graveyard under Pinochet during the 1970s and 1980s. Huyghe's film is ambivalent with regard to this history. On one hand, by showing the skeleton, the film certainly evokes reflections on Pinochet's dictatorship. On the other, the film remains enigmatic and hermetic; there is no direct message. Given my interest in tracing the idea of the bio-machinic, this hermetic closure and aesthetic incommensurability are significant for how I see the relationship between technical and human entities. The machines in Huyghe's film might be learning something, but we do not know what; the robotic arms 'speak' an alien language. Pale green and blue marbles the size of apples lie around the skeleton, adding to the puzzle about the meaning of it all. Huyghe has characterised the interaction between the machinic and the organic in *Camata* as follows: 'It's a symbolic and enigmatic exchange between the inexistent and what has disappeared, a game that produces nothing: neither result nor meaning' (Stenne, 2024: 16).



Figure 2. Pierre Huyghe. *Camata III*, 2024 Photograph Image: 25 1/4 x 37 3/4 in. (64 x 96 cm). Courtesy of the artist and Marian Goodman Gallery.

Camata is central to my argument about bio-machines because it manifests the three generative aspects of the bio-machinic – the biological, the machinic and presence – and connects them to the question of life. The film engages with biological materials, such as the decomposing skeleton in the desert and the microorganisms that

foster its slow decay alongside climatic factors (wind, heat). The machinic is embodied in the robotic arms and their sensors, which are steered by algorithms and machine learning. The effect of presence arises from the film's composition as a never-ending, self-programming feed steered by algorithms. By bringing these bio-machinic elements together in the apocalyptic setting of the desert, *Camata* evokes a reflection on life as a process of becoming and activating potentialities.

In this context, Bergson's discussion of the *élan vital* offers a productive trajectory to understand how Huyghe's bio-machines engage with the question of life. First published in 1907, Bergson's (1960: 24–56) *Creative Evolution* critiques mechanistic explanations of biological evolution, arguing that life evolves through a creative, intuitive and internal process that cannot be fully understood through scientific analysis alone. Bergson highlights the concept of the *élan vital*, a creative force that drives the evolution of life, pushing it towards ever-greater complexity and diversity. Unlike mechanistic forces, the *élan vital* is dynamic and unpredictable, leading to the continuous creation of new forms of life. Of course, one has to be reflective when using Bergson's theories today, as his ideas about the *élan vital* were also politically exploited in nationalist discourses during the 19th and 20th centuries (Jones, 2010). However, inspired by Kember and Zylinska's (2012: 1–28) work on Bergson and the vitality of media, I am intrigued to draw on Bergson, since his theories of evolution are conducive to a further exploration of the question of life in light of bio-machines. Bergson sees art as a privileged form of knowledge, perception and experience that allows us to see and understand the *élan vital*. Since art often speaks to the sensual, intuitive and instinctive – which for Bergson are important categories to grasp the *élan vital* – art can embody the conditions of possibility of creative evolution. The artwork can create a 'sympathetic communication' (Bergson, 1960: 11) enabled by touch, intuition and instinct. Such communication has the capacity to introduce us to 'life's own domain, which is reciprocal interpenetration, endlessly constituted creation' (Bergson, 1960: 11). Hence, the artwork can be a carrier of the *élan vital*, since it too can go beyond the mechanistic, rationalistic and logical thinking of the mind. It is notable that Bergson (1960: 249–263) does not reserve the *élan vital* exclusively to organic and animate entities; he argues that the inorganic and inanimate ('matter') in interaction with the organic and animate also has the capacity for *élan vital*.

Bergson's ideas about the *élan vital* provide us with a clue to the conception of life as becoming that might be at stake in Huyghe's *Camata*. The film reveals processes of becoming on the aesthetic level

as well as on the level of entwining organic and inorganic entities. *Camata* is a self-directing film. Although it is not wholly autonomous – it was once created by an artist – it edits itself unceasingly in real time through self-determined AI software operations. In addition, the exhibition space (at the *Liminal* exhibition, this was a large auditorium with a gigantic screen) is equipped with light and motion sensors, which in turn impact on and steer the film's AI editing process. Thus, *Camata* is not a static artwork but is constantly evolving – becoming – into new forms steered by an unpredictable and contingent process. Moreover, the film sabotages the idea of a permanent exhibition space in a museum: not only is *Camata* as aesthetic object in constant flux, but it also questions the spatial and temporal boundaries of artistic performance.

These aesthetic processes of becoming perform a further entwinement of organic and inorganic entities. The robotic arms interact with the remains of the human skeleton in an endless, self-perpetuating process. Thus, *Camata* displays an ever-evolving narrative where technology and organic elements intertwine and interact. The driving force of this process is not the rational logic of the mind, but prediscursive impulses and instincts – in short, the *élan vital*. The technical entities in *Camata* seem to have this capacity of the *élan vital*, as they appear to follow their intuition: they can sense the environment and intuitively grasp the shape, texture and material of the skeleton. In other words, the *élan vital* in this installation is restricted to neither the biological nor the human. In Huyghe's work, the *élan vital* is manifested by the machinic, the inorganic and the technical. These different entities respond to each other in a constant process of becoming where the human no longer plays the central role: traces of the human are present only as dead remains. Nor is the human audience central: visitors can affect the sensors of the AI editing software, but the artwork does not interact with them directly. Even the artist has been pushed into the background, as the film has self-generating features, and the aesthetic creative process is mostly in the hands of algorithms, sensors and contingent external stimuli. On the basis of these processes of becoming staged in Huyghe's art, one can say that the bio-machinic features suggest a Bergsonian view of life as a process of constant change, becoming and evolving, driven by a vital force that goes beyond biological functions and extends a form of vitalism to the inorganic, technical and inanimate.

There are many current debates about the extension of our notion of life beyond the biological paradigm of living organisms with the ability to metabolise. For example, Blaise Agüera y Arcas's (2025) *What Is Life? Evolution as Computation* argues that life is based on computational as well as biological coding, thereby offering a notion

of life that stretches back to the time before the evolution of carbon organisms in water. The physicist and astrobiologist Sara Walker (2023) states that since technology and nature alike are based on evolution, selection and innovation, technological entities should arguably be included in the 'spectrum of life'. Walker's (2023) approach explicitly blurs technology and biology: 'Technology is not artificially replacing life – it is life'. These perspectives are similar to Rosi Braidotti's (2008: 12–26) definition of *bios* as the life of the human being, compared with *zoe* as the life force of all matter. In her post-human take on life, Braidotti merges living and non-living entities, arguing for an egalitarian attribution of life status to the animate and the inanimate – a form of ontological monism that connects with the theories of new materialism (Chistyakova, 2020).

These debates are important. They offer necessary reflections on the notions and limits of human intelligence and AI, and they ask whether we need to extend our notion of life to chip-based entities in light of their advancing cognitive and sensorial evolution. However, although bio-machines are becoming increasingly active agents in our lifeworlds, we must remain careful about the ontological blurring of the machinic and the biological. There is the danger of creating an ontological 'soup' implying that the different elements – the technical, the organic and the inorganic – are made from the same substance and can potentially have the same agency to communicate with each other. While we can certainly communicate with machines and animals, I would argue that our understanding of them – and even more so, their understanding of us – is limited. There are aspects of the machinic – such as certain aspects of machine learning – that remain a black box for us humans. Although we need to broaden our understanding of life to acknowledge how the machinic and the inorganic shape and co-create our lifeworlds, we still need to keep in mind the ontological distinctions between organic and inorganic, human and non-human.

I consider Huyghe's work to be a unique aesthetic contribution to these debates. His art invites us to reflect on the question of life in light of machinic and biological interactions. His artworks have transformative power because they make machinic and biological entities respond to each other. However, his bio-machinic lifeworlds do not demonstrate that the machinic is alive and intelligent like us – in fact, quite the opposite. Although they reveal life as a process where the organic and inorganic are interrelated, they also perform the differences in the ontological modalities of the machinic, the biological and the human, and in doing so they point to the otherness of non-human life forms. Huyghe's artworks do not suggest an ontological monism but rather keep the distinctions in place.

Although the different entities are constantly interacting in a process of becoming, they remain distinct and other to each other. Whether they be biological organisms or machine learning programs, Huyghe's work displays the ultimate otherness of such entities. Life, then, is not a spectrum that merges humans, animals and machines into one convergent unity. Rather, life is a constant, differentiated process of becoming in which the ontological entities remain separate. *Camata* does not try to make sense to us; indeed, the film does not care whether a human spectator watches it or not. We are literally no longer at the centre of the picture. *Camata* embodies a world that might have become uninhabitable for humans, but where life goes on. Microorganisms, machines, bacteria, light and wind are still responding to each other, shaping a process of becoming.

Art critics have often pointed to the idea of relational aesthetics as a way to characterise Huyghe, especially his earlier work based on TV and film performances (Cooper, 2009). Coined by Nicolas Bourriaud (2002), the notion of relational aesthetics stands for interactive art that creates communicative situations of exchange. Bourriaud (2002: 14) describes such art as a 'social interstice' where people interact with each other and share social experiences. In recent years, both scholars and Huyghe himself have emphasised that this notion of relational aesthetics is not adequate to account for his work (Barkin, 2012: 76–80). His recent works – especially those discussed in this article – do not foreground social interaction or intersubjective (or even interspecies) understanding. Rather, the bio-machinic aspects of his speculative aesthetic lifeworlds foreground the *difficulties* of understanding in relation to the worlds of animals, plants and technology. This does not mean a complete absence of relationships – the artworks still present processes of interaction – but the different agencies remain separate, and no ontological entity can fully grasp any other's horizon of understanding. Hence, Huyghe's work stages the production of realities (lifeworlds) that remain unintelligible to human hermeneutics. This not only decentres the exclusivity of the human mode of understanding the world but also gives a glimpse of the plurality of life forms that escape human-centric norms of what we see as life.

This article has attempted to demonstrate how Huyghe's art can lead into a discussion about bio-machines and sharpen our understanding of them. As mentioned in the introduction, bio-machines can be seen as machines that are very good at simulating life. From interactive chatbots to robotic smart vacuum cleaners, they make us believe that they are living creatures. I still maintain that simulation is a key aspect to understand bio-machines. However, via the analysis of Huyghe's art, my goal was also to emphasise bio-machines' generative abilities.

Bio-machines do not only mimic human ways of being. They also have an autopoietic capacity to evolve, shape and construct themselves beyond human parameters of sensing, behaviour and intelligence, as I have tried to show through my focus on biological, machinic and temporal evolution in Huyghe's aesthetic bio-machines. I consider this generative aspect of bio-machines to be important in light of current debates about synthetic intelligence (intelligence that can no longer be traced back to human-produced data) as well as general AI (Kurzweil, 2024). Moreover, the generative aspect of the bio-machine is also vital for thinking about life today. Huyghe's art reflects a notion of life that is not exclusive to organic entities but – thanks to processes of evolution – can also encompass technical entities. However, his art does not suggest the fusing of these different entities into one all-inclusive notion of life that merges the different ontological modes of the technical, the human and the biological. The rhetoric of blurring is frequently found in discussions of life in respect to AI technology. What makes Huyghe's work so interesting and relevant today is that by opening up the notion of life to include the inorganic and the technical, it also reintroduces the distinction between the human and the non-human. Huyghe reminds us that we do not become the machine, and it does not become us. However, highlighting the alterity between humans and machines still allows for co-performances. We can co-create and co-construct new forms of knowledge and communication with them, and although the machinic is not alive, it can impact on and profoundly shape life on earth.

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