

# For a more symbiotic co-individuation with our technological avatars: how to go, with the Sciences and the Arts, beyond hybridizations?

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## Abstract

With interactive computing, the metaphorical use of biological notions of hybridization and symbiosis has become widespread. They refer to the possibilities of mixing as well as to the conditions of emergence of relationships ranging from mutual benefit to instrumentalization between technologies and humans. In order to better understand the relevance of such analogies with the living, this article draws on scientific and artistic research concerning the interactive avatar. These seem particularly instructive on our relationship to technology because this virtual being hybridises the living and the artificial, while constituting the key and the condition of access to digital spaces, to co-evolve with other users, themselves avatarised, or other autonomised agents. The article distinguishes between "cyber" avatars populating persistent universes, video games, virtual realities, i.e., cybermedia environments of simulation and interaction. The "hyper" avatars are those of the Web, online services, 2.0 platforms or socio-numerical networks that are juxtaposed in networked informational and documentary hypermedia. From then on, the challenge is to reinvest the sense and responsibility of their potential for augmentation or simulation, in particular by promoting cooperative interactions through science, art and technology, which are themselves by their very nature synergistic with each other.

## Keywords

Avatar, Cybernetics, Symbiosis, Video games, Hybridization, Hypermedia, Cooperation, Responsibility, Arts, Sciences.

## DOI

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## Introduction: symbiotic design at the origin of interactive computing

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Since the great convergence of telecommunications, computer science and miniaturized electronics, the expansion of networked digital environments has been accelerating, which never ceases to raise questions, so much so that it guides the civilizational changes underway. Digital art has been able to contribute to these developments from the outset by appropriating the different waves of inventions, software and tools: network art, code art, interactivity, Web art and Game Art, etc. However, due to a lack of recognition, these influences have remained underground and unofficial, as industrial and commercial creations dominate. After decades of intellectual and artistic, academic and cultural engagement, initiatives such as ISEA or numerous Arts & Sciences projects, have made common the idea that artists contribute to create an alternative technological culture to those stimulated by consumption, market and entertainment, in order to produce new practices and regenerative imaginaries. By choosing the theme of "Symbiosis," ISEA 2023<sup>1</sup> sends a strong signal to the communities in charge of digital cultures and electronic arts, a kind of encouragement to favour a transformation of our relationship with the digital, to move towards more responsibility and reciprocal benefits, while comfortable consensus and evidences are cracking. However, the matter is not so simple. Admittedly, the symbiotic approach has the advantage of offering a qualitative leap forward and a step back, integrating the latest scientific knowledge on cooperative interdependencies, at all scales of life and at levels previously invisible, and just which have been revealed by technical images.<sup>2</sup> However, this notion does not have the same cultural and political effects depending on whether we take it from an apparently neutral angle; with the Anglo-Saxon meaning, which considers as symbiotic all forms of interactions between species, including the most aggressive and predatory, parasitic and deadly ones; or whether we take it in its French and European meaning, which favours synergistic, mutualist or commensal symbioses, offering mutual or at least unilateral benefits.

But in a facetious and creative way, let us open our remarks with an enigma offered to the reader of this article, before he or she dives into the heart of digital systems and environments by following the path of co-evolution made possible by avatars.

From whom does this excerpt come? "The potential of the human-machine symbiosis is easily visible in the arts, where computing technologies have enabled the creation of previously unrealizable forms of expression. Computing technology has empowered a new legion of artists working in mediums such as immersive and augmented reality games, animated feature films, and music composition and performance (...) In these areas, we are beginning to see humans and machines as complete partners in artistic creation."<sup>3</sup> It is striking that an eminent researcher in computer science, having joined the most demanding military programs of the DARPA in terms of success, recognizes artistic activity as one of the best contexts for the emergence of new partnerships for the benefit of an original creation. To agree with this, it has been widely shown that artists, through their close contact with techniques and their potentialities, in their exploration of the logic and capacities implemented in their tools, which have become software with computers, constitute an avant-garde that clears out the possible and opens up new appropriations. If the works in art history have shown this, it is up to thinkers more in tune with the arts and technologies of the image, such as the Frenchman Edmond Couchot, to show it in the course of his numerous works.

But beyond the man-computer symbiosis and the place of the Arts in its advances, let's go back for a moment to the origin and the evolutions of this new paradigm of microbiological symbiosis that appeared following the work of Lynn Margulis<sup>4</sup> concerning eukaryotes in the 1960s, co-author of the "Gaia Hypothesis" with James Lovelock.<sup>5, 6</sup> This research eventually produced major scientific advances concerning plants, forest and soil, but also the intestinal microbiota in humans, emphasizing the symbiotic interdependence of living things, both inside and out their bodies.

For our purposes and references concerning the coevolution of man and his technique, we will retain the teachings of Leroi-Gourhan<sup>7</sup> and Gilbert Simondon<sup>8</sup>. The former analyzed hominization through "gesture and speech," techniques that preform both our morphology and our cognition, the latter insists on the "individuation process" and its "associated environment," which organize the individual and collective mode of existence of man, as well as that of technical objects.

But the difficulty remains in finely articulating the human and the artificial, in respecting proven frameworks of thought while going beyond them, updating them, making their complexity a little more "simplex," following the teachings of Alain Berthoz<sup>9</sup> supported by the phenomenology of Merleau-Ponty<sup>10</sup> and the enaction of

Varela.<sup>11</sup> By proposing an emerging concept, that of the symbiotic co-individuation of man and his avatar, that is to say an individuation—not to be confused with individualization—which is made joint by their common process of co-evolution, it is indeed a question of situating its context and exposing the premises of a vast site of studies and creations which remains to be undertaken through an approach seeking to create a new synergy between the Sciences and the Arts.

## I) Symbiosis and hybridization: biological metaphors in vogue in the computer and digital field, from the beginning of computing to the present day.

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### a) A novel concept of a possible partnership between humans and computers

Anyone interested in the links between symbiosis and computer science will identify the inaugural 1960 article "Man Computer symbiosis"<sup>12</sup> written by one of the acknowledged founders of modern interactive computing, J.C.R. Licklider. Both a psychologist and a computer scientist, he developed a way of thinking about the partnership with the computer, and later helped coordinate, within military programs, the transition from the first computer networks to the Internet. Such an early reference to and mobilization of a concept from the life sciences, and moreover in connection with the military-industrial complex, may surprise and even arouse suspicion. A few points need to be made here. Firstly, it bears witness to a context of technical emergence, that of computers finally operating in real time and becoming sufficiently programmable and accessible thanks to their sensitive interfaces (screen, optical pen, and keyboard) to envisage a genuine cooperative interaction that would bring together the best of the two worlds, living and artificial. Secondly, it also highlights a typically cybernetic vision of putting human and computer in parallel, becoming colleagues and partners, who, far from being reduced to each other, assert their specificities and differences, but pull their strengths and weaknesses. Thus, by associating and communicating according to the right methods, they will constitute a tandem achieving what no one alone would manage to do. Finally, this positive, even idealistic, vision must be understood as a "political move" opening up another perspective at the heart of the technocratic system to confront the promoters of the all-machine approach and of a progress leading eventually to the advent of artificial intelligences superior to humans.

However, several controversies could immediately invalidate such an idea and send it back to the side of naive approximations. In fact, symbiosis is observed in the field of the living, not the artificial. Applying it to computers would mean granting this class of logical machines the status of a species endowed with certain properties of the living, such as evolution, adaptation and reproduction. But in our western conception of the world, practising a "naturalistic ontology" as French anthropologist Philippe Descola call it,<sup>13</sup> the highest faculties are the prerogative of humanity. If we want to continue the analysis with Gilbert Simondon,<sup>14</sup> in the absence of integration with culture, technology is conceived as separate and external to man, who at best uses it, while attributing to it his own misdeeds. When in fact, technology, this human creation, has the role of mediating between nature and culture. However, the metaphorical use of symbiosis has a few merits: better respect for each stakeholder in the tandem; understanding of their interdependencies; and the establishment of a more balanced cognitive and sensitive dynamic than the sole technical and strictly functional approach, that of a mechanically extended human, "mechanically extended man" or "humanly extended machines" (quoted in <sup>12</sup>). With this approach, enlightened by the living, a perspective is developed that is neither completely anthropocentric nor technocentric. It will indeed influence a whole community of inventors and engineers to seek mutually beneficial relationships. This begins in the field of complex problems, extends to ergonomic interfaces, in connection with the interfaces and work methods invented by Engelbart <sup>15</sup> with his "mother of all demos,"<sup>16</sup> and will continue with the first technological research involving computer networks, at the origins of the premises of the Internet.

### b) Instrumentalization and hybridization: what association between the living and the artificial?

It is clear that more than 60 years later, this cooperative conception has not really governed the deployment of the "digital." The triumphant regime is that of a generalized and excessive instrumentalization of some by others. It is also based on older, naturalistic metaphors that have become dogma: the struggle for survival, selection, competition and domination, all stimulated by a misunderstood and ideologized Darwinism of Anglo-Saxon and capitalist origin that fetishizes the market and competition. This cultural overdetermination tends to reduce both humans and computers to a few utilitarian functions, rather than mutually emancipating them, or just amplifying them (Licklider<sup>12</sup>) or increasing them (Engelbart<sup>15</sup>). For example, workers turn out to be replaceable as soon as

a task can be automated, while the computer itself is devalued, becomes obsolete, as soon as a new, more powerful and "modern" generation arrives on the market. In other words, technological "progress" is based on the division and specialization of tasks to the detriment of others: models implementing interests, reconducting the existing and thus rigidifying socio-technical systems. (1) Following an instinct of conservation hiding under the imperative of innovation, it is essentially a matter of optimizing and stabilizing rather than solving and changing; of intensifying short-term productivity rather than changing the level of symbolic integration and moving towards "a better ecology of the mind."<sup>17</sup>

Another notion, also imported from biology, is proliferating in the field of new info-communication technologies, and continues to be very much in vogue on the cultural level.

It is the notion of hybridization, synonymous, depending on the context, with convergence, fusion, mixing, blending, and association, concerning both the technologies themselves and the interpenetration or interweaving of heterogeneous dimensions: the human and the artificial, or the real and the informational. It carries an enthusiastic conception of the possible crossings between various technical lineages as well as of what results from them, their offspring. It probably has a positive echo in our anthropological collective unconscious because of the reproductive experiments dating back to the Neolithic period, carried out by our species on plants and animals to make them edible, domesticate them, use them, and thus develop ever more new hybrids to improve our living conditions.

As a result, there is a tendency to explore and implement all possible configurations through clever and inspiring mixtures, according to a principle of free experimentation that does not take into account the stakes and consequences from the outset, but rather evaluates them, possibly and only after the fact. Believing himself to be the "master and possessor" of his technique (2), humans let themselves go to "hubris", to this excess of power, to this attractive vertigo that is generated by a too continuous success. The conquest of all possibilities guides our collective strategy. Most forms of exploitation, first and foremost of the living through technology, are justified, pending the next techno-solution that will correct the effects. In this vein, transhumanist conceptions assume that humanity must continue to mutate by itself thanks to Technology and Science, assisted by an Art that would become its official foil. But do they realize that the solutions obtained by a definitive hybridization (the cyborg) or by

deep environmental modifications (the geoengineering) remain prisoner of the same paradigm that caused the problems it tries to solve? Although some forms of hybridization may be viable and desirable, with lines that improve through heterosis, which is the alliance of the best of two species, we will try to think according to a higher general principle, that of an evaluation and regulation of a symbiotic nature, in the French sense of the term, and therefore mutualistic, which could frame, anticipate and therefore limit any possible deleterious effects.

## II) "Cyber" and "hyper" avatarizations: two main ways of entering the digital world

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### a) The cybernetic avatar: a body situated to experience virtual technologies

The fundamental phenomenon that networked microcomputing has made possible, but which was not immediately grasped or understood as such, concerns the "existential" entry of the human into the machine and into the heart of its software. If this is realized in many ways, the avatar is the most widespread and concrete emblematic figure, especially the one that networked video games have made known to us. Indeed, since its baptism,<sup>18</sup> the avatar has made it possible to inhabit an immersive environment with other human persons and programmed entities, and even to cooperate with artificial beings or with other "semi-living" beings, which have yet to be better qualified and understood, both scientifically and artistically.

The original symbiotic vision already mentioned had stopped at the face-to-face meeting of the human being and the computer, forming an interdependent and winning team. With the integration of networked computers, an informational, quasi-corporeal vector was needed, if only to manifest itself to other distant people, caught in the same technological constraints. In a shared place, benefiting from a system of exchanges and actions, the human invests his avatar to interact in a more complex way than with conversational interactivity based on dialogue and instruction. Collectively, the first interactivity (reactive, sequential, asymmetrical) is overcome and gives rise to the second interactivity (proactive, simultaneous, mutual). The first occurrences of avatars (3), retrospectively identified by semiologists, computer scientists and other analysts,<sup>20</sup> result from the marginal appropriations of the very first transistor computers by new adepts of creative subcultures,

looking for a way to divert and explore the capacities of new electronumerical machines, at a more human size and finally becoming more accessible.

Since then, despite their improvement and growing sophistication, playable avatars, those of the simulated worlds of video games, can still be analyzed in terms of "living-artificial complexes." Indeed, the technical part, with the programmed functioning, and the living part, with the human behaviours adjusting in real time to the action in progress, are mixed in the same virtual being. In this respect, avatars are similar to techno-human or bio-technical "hybrids," depending on the point of view adopted. In this respect, field studies in the human and social sciences show that online participants who use avatars know how to consider any "player character" they encounter in a persistent universe from both sides. They evaluate both their operational capacities and the living intentionality that drives them. In addition, the hybrid avatar has several remarkable characteristics that relate to its mode of operation and attendance. On the one hand, it results from a "soft" hybridization, because it is temporary and reversible (unlike the cyborg), which preserves the integrity of both halves, the human and the artificial. On the other hand, this humanized technical hybrid is unified and maintained by two parallel processes that can be analyzed through the symbiotic metaphor. On one side of the screen, in the ordinary world, there is a human-machine-computer coupling which, for the time being, joins the Lickliderian vision of a dynamic symbiosis. Except that here, it is even more marked because it is based on a total interdependence: the human needs a formalized avatar to evolve in a simulated world while, without its player, the avatar is only an empty shell, identifiable by its looped attitudes, as if waiting for a soul to re-function. Both interface and vehicle, it is an entity that articulates the real and the virtual. On the other side of the screen, this time in the simulated world, the avatar must compose, negotiate and build its partnerships, if possible symbiotic to last and grow, both with its fellow avatarized, and with other inhabitants fully programmed and more or less autonomous. Its survival and development often depend on relationships of co-construction and cooperation, even in a competitive context. By associating as a group, by combining their talents, by carrying out collective strategies, while benefiting from the support of artificial beings, the human beings hybridized by the avatar adapt to a place lived in common. They develop a powerful intersubjectivity, a feeling of living together that is confirmed by their decisions and actions. Unified by a particular spatio-temporality and physicality, this virtual but concrete place mobilizes their situated cognition; that is, sufficiently spatialized to transform

the environment and its components or actants into resources. As for the corporeality of their avatar, it engages a cognition here virtually embodied, but otherwise instantiated according to principles partly analogous to our human condition. Finally, through their avatars, humans enter into a very strange trade with certain autonomized agents, typical of their adventure worlds: pets, helpers and assistants, drones or robots, supernatural allies... With these, a distributed cognition develops, i.e., distributing the processing of information over these autonomized entities, for example, the tracking, surveillance or management of this or that process. All of this is linked to the ongoing cooperation with the other comrades in the game, the other avatars. In this way, many intimate and vital relationships are established and unraveled with programmed or hybrid technical beings, whose radical otherness is forgotten, by dint of being dressed up in the colors of the narrative, of the game or of simple co-existence, as within Second Life-type metaverse based on collective creativity.<sup>21</sup>

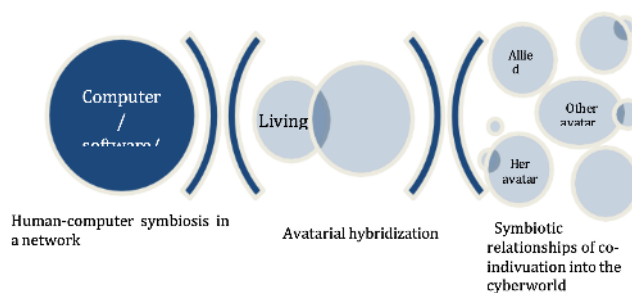


Figure 1: "Cyber" hybridization process doubly framed by symbiotic relations leading to co-individuation

This diagram visualizes the way in which an avatarial hybridization takes place, framed and framed by a double relationship that can potentially be interpreted in symbiotic terms: on the left, that of the human coupled to the nested triad computer/software/avatar; on the right, that of a cybernetic "avatar" comparable to a symbiont, as soon as it is engaged in relationships of interdependence with mutual benefit with its other congeners, or even with various entities entirely programmed and eligible for a relationship of interest. It is in these virtual worlds that symbiotic co-individuation could take place not only between the human and his avatar, but also with the empowered virtual beings that also inhabit them.

**b) The hypermedia avatar: an aggregate of data in the service of an identity model in hybrid spaces in two ways**



In contrast, we must address, even briefly, the other immeasurable domain of hypermedia, because the way in which humans must avatarize themselves in order to exchange and cooperate with their fellow human beings is quite different from the previous one.<sup>22</sup> This involves the establishment of a "profile," with oriented functionalities. This is in fact a particular identity model, a sort of explicit information sheet specifying the aspects useful for the activities specifically allowed by the platform. By filling in fields and forms, by providing qualities and quantities, by uploading media (photos, thumbnails, videos, visuals, sounds), the user explicitly creates his profile, which will then be fed more or less invisibly by the "datas," "metrics" and other "analytics" that are generated according to his activities. Because the activities are more disembodied, more informational than simulational, the participant feeds the platform where he acts by his punctual acts, by his simple consultations, requests, clicks and orders, which have become his editorial and media contributions. There are certainly some services that focus on cooperation, such as Wikipedia for collaborative writing, or GitHub for collective programming. However, most platforms, especially commercial or social ones, juxtapose hyper avatars with no common space other than a customizable interface. They offer specific functionalities, for example, for shopping or conversation, which require a simple interactivity, of command and impulse: summoning contents, pages or profiles; clicking to act; typing and sending asynchronous messages to exchange; just exciting by notes, scores or likes, or on the contrary, inhibiting by blocking and unsubscribing.

In the inaugural vision, it is within this informational, documentary and media hyperdimensionality; from Vanevar Buch's Memex to Ted Nelson's precursor "hypertext"<sup>23</sup>; that positive symbiotic relationships were supposed to unfold. But we are struggling to find them, so much so that the algorithms that model and influence behaviour encourage compulsive buying, isolation in filtered bubbles, the excitement of passions and cognitive biases. Thus, these hyperspaces have tended to reduce the human to a set of models and data,<sup>24</sup> made of functions and behaviors that integrate with software. User-consumers are thus influenced and made predictable by traceability, profiling and probabilistic anticipations. The mainly utilitarian relationships that are currently developing within the "hyper" digital environment have shown their danger, even toxicity for democracies, potentially influencing crucial voting processes. At issue is the modelling of stakeholders, which is often done without their knowledge, and the monitoring and stimulation of

behaviour guided and motivated by forms of economic, cultural and political predation that go beyond the logic of advertising or the attention economy alone.

Such extreme pressure and overkill can be explained by the doubly hybrid nature of the Web and its variations. On the one hand, "hyper" informational environments have a strong potential for intrinsic hybridization, linked to the ease of combining media and documents that are hyperlinked, enriched with information, recombined, declined, merged, diverted and replicated. They are also able to accommodate all other old (radio, television, press) and present (platforms, services, applications) media, including cybernetic virtual worlds, which a simple, well-programmed web page can display in some cases.

On the other hand, these "hyper" platforms are hybrid in the sense of devices (educational, professional) that mix real and informational spheres. Most of the time, the infosphere constitutes a duplication of the real world, which generates relationships of reciprocal influence. Human avatars, "hyper profiles" point, despite their pseudonymity, to civil identities, while online businesses or connected data visualisations drain real flows of goods and data. The result is numerous and strong power stakes and possible holdings attracting the will to power, mobilizing all sorts of stakeholders: states, hackers, companies, collectives. Conversely, cyber worlds and avatars seem to escape this extrinsic hybridity, because they remain more disconnected from the real world, at least until the promises of metaverses claim to encompass them all and link them to our real values through NFTs and other speculative crypto assets. Conversely, "hyper" universes are hybridizing both internally and externally, the latter aspect having been intensified by the multiplication of mobile computers (phones, tablets) and other connected and "smart" objects that link infosphere and biosphere, artificial and living.

### III) Discussions and critical hindsight

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#### **a) Cyber and hyper polarizations: towards which symbiotic co-individuations through the avatar?**

At this stage, we should recognize the limits of this opposition between a symbiosis that is more possible in simulated cyberworlds (immersive environments) and an unbridled hybridization in informational hyper-spaces (distributed hypermedia and other Web platforms).

In the first place, there are still some "hyper" logics within cyberworlds, for example instant teleportation, or interface parameter layers. Symmetrically, this time in hyper-spaces, some "cyber" systems act and function: predictive models, recommendation engines and other underlying simulations<sup>25</sup>. Well hidden, in the background, there is also this implicit avatar made without our knowledge, this identity avatar calculated and manipulated by the 2.0 platforms whose existence has been recognized by the repentant Silicon Valleyers and who have been described as "Digital Voodoo Dolls"<sup>26</sup> evoking the spell. This verifies the excesses that many have denounced. All the more reason to take up one of our collective challenges, which would be to endow hyperspaces with more cooperative and symbiotic properties/characteristics,<sup>25</sup> in particular by interacting through hyperspace avatars that are more transparent, temporized, situated, regulated and better controlled. As for "cyber" avatars, which are themselves driven by basic modelling or AI that may also contain obscure biases (known as dark patterns), let us beware of idealizing or valorizing them without detailed investigation. For the challenge is still to highlight, in order to cultivate and preserve them, the modalities and relational conditions of regulation (coupling, embodied, situated and distributed cognition) and of positive integration (benefits and gains, emancipation and empowerment) in order to foster mutualistic partnerships. This can only be done through reciprocal adjustments and constitutive reinforcements towards a co-individuation of all inhabitants of cyberworlds, which relies on all affordances available in these inhabitable virtual spaces.

Secondly, it should be noted that the processes of hybridization have been explored in very positive and constructive ways, and this in the field of Art. Communities of artists, technologists, experimenters, or university researchers, wanted to open other ways of convivial and regenerative co-existence with the new digital technologies of art. The international colloquium "For a digital imaginary with Edmond Couchot. Hybridizations between the arts, sciences, technologies and the human" in November 2022 was able to give an account of how the revolutionary capacities of a computer have been understood for 50 years. The latter have opened up the digital dimension by becoming universal simulators. Their interactive images constitute matrices of hybridization "squared," producing through language and gesture "the image with image power."<sup>27</sup> This has made it possible to revisit, invent and materialize our imaginations, to make our fictions or visions tangible. This conception is in line with the idea of a computer structuring a meta-technology<sup>28</sup> that can

simulate and accommodate all the others. This vast line of creations and works have also paved a way towards partnership symbiosis by endowing technical virtual beings with a certain autonomy, as shown by the interactive installations *La Funambule* (presented at ISEA 2000<sup>29</sup>) and more recently *InterACTE*<sup>30</sup>, in which a humanoid creature learns and individuates itself through contact with a participant who in turn experiments with new relationships with this autonomizing virtual being.

However, there is no spontaneously and naturally good and right approach: the artists in question have been nourished and framed from the very beginning of their "human-computer partnership" by the contributions of science and culture. This has given them the resources, knowledge and principles that enable them to escape the hubris of omnipotence in order to assume the ethical, political and scientific responsibilities related to these new demiurgic powers.

Thirdly, and lastly, the challenge is to offer intelligible and sensitive resources so that the anthropological entry of humanity into its "virtual meta-machines" (connected computers), this exo-somatisation of our own virtual double, can enrich us in return in a way that is both "technaesthetic" and conscious of everything that determines it. The innumerable lives offered by avatars of all kinds—both "hyper" informational profiles and "cyber" simulated corporeality—invite us to experience other real and imaginary worlds, dystopian or desirable, acting as initiatory gateways, instructing our relationship to artefacts, to ourselves, to the living, to our One Earth, and to this virtual sphere, to be envisaged as a "virtual common" to be healed.

## **b) What synergies between the sciences and the arts to finally assume our current responsibilities?**

The productive articulation Arts/Sciences including Technologies is justified by the interest that there would be in the creative activities taking support on the scientific knowledge and investing the big changes of paradigm which currently restructure a number of disciplines, of which precisely that of the symbiosis with the rise of ecology, of the human and social sciences, of the sciences of the complexity and its solutions, biomimetic and simplex derived from the evolution of the living. Certainly, if it should be reaffirmed that, by definition, art is a domain that escapes the principle of responsibility, thanks to the famous artistic license, it nevertheless deserves to take its full share and responsibility in today's "paradigmatic revolutions." These are achieved precisely through changes in the model of understanding of the world,<sup>31</sup> as is happening today with anthropology, the sociology of science or the

philosophy of technology: holistic approach, destitution of the subject individual king, taking into account technical relations and processes and new entities at work (non-human actors, stakeholders, resources and forces), better integrations of interdependencies and a growing consideration for subtle, invisible or microscopic dimensions, inviting temporalities and spaces incommensurable for us mere humans.

As for the problematic of avatars, it links us to the more general one of the exosomatization of the highest cognitive faculties of the human species in virtual techniques and creations. We believe that in this field, art can not only bring us alternatives, shifts, surprises, wonder, but that it constitutes with science one of the most adapted means to approach complexity and uncertainty, to synthesize even paradoxical advances. The Art-Science alliance, which is still to be built, can be based on different ways of coupling them, in order to favour a capitalization, a mutual collaboration. If art is stratified and memorized through culture, scientific advances build knowledge. Now, in view of the emergence of new technologies, there is every reason to encourage a crossing of these two systems of accumulation, so that art is a source of knowledge and science also structures and disseminates culture. In order to better understand this, let's think about how the ludic activity exploring the potentialities of computer science has finally escaped the arts and the instituted sciences for a long time, even though games and arts anticipated together and restructured the bases of the future of interactive computer science, with an intensity and a power recognized today through games studies like the *10ème art*.

This is also why recent initiatives such as issue 9 of the journal HYBRID, published at the end of 2022 in English and French,<sup>32</sup> organize a cross and cumulative dialogue between scientific studies and artistic research, in this case around the figure of technological avatars offering their practitioners media incarnations to encounter informational environments or immersive environments.

It was during one of the dialogues at the heart of this review that object-oriented transversal approaches were able to discover their complementarity on both sides of the arts and sciences, and that a difference in temporality between artist-researchers preoccupied with the future and scientist-analysts more focused on the present or the past could be better formulated. The interest in tomorrow's artificial creatures, which should be welcomed and respected, to quote Edmond Couchot,<sup>33</sup> justifies many projects and experiments. Let's take up again the parallel with Licklider, when he specified that it was necessary to deal with the

symbiotic partnership with the computer in the time interval that separated us from the arrival of "strong" AIs. In these still open times, before the promises of sentient robots or a perfect autonomized simulation of human beings are realized, there is every reason to take care of our partnerships with our avatars, by seeking together the conditions that will make us environmentally and behaviorally responsible. Hence the richness of symbiotic approaches, both in the virtual and in the real, since the two are constantly hybridizing in a way that is now inextricable.

#### IV) Conclusion in the form of programmatic questions, bias and references

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The first question, of general scope, would be to know: "in what way does the avatar belong to a case of human-technological hybridization? For as we have detailed, the technological avatar achieves the integration of the living and the artificial in real time in the same iconic programmed object, in an animated body giving access to a virtual environment and manifesting the human to his fellow creatures of the same species and other quasi-species, virtual beings in the process of empowerment. But does this result in more than a hybridization of techniques between them, a mixing, a specific mixture, producing the interpenetration of stakeholders (subject, machines, programs and human and machine intentionalities)? And how, in return, does the sensitive and embodied internalization of technical logics in the human being take place through "existential" experiences, psychosocial and individualizing experiences (Simondon), with subjective and objectifiable experiences, echoing Edmond Couchot's technesthesia to the "cyberesthesia" proposed by the French artist Yann Minh, or even McLuhan and the media extension of the senses? But also, how to go beyond symbiosis as a metaphor for the living and elaborate its factual declensions, adapted and relevant to these hybrids of flesh and calculation that are the avatars? Consequently, how to configure their habitat, these virtual cyberworlds?

And finally, how can we configure differently, with the virtual, the technical conditioning and the cultural overdetermination, both inevitable, in order to achieve a common world that is equitable, sustainable and desirable in terms of reciprocal emancipation? The construction site is vast and the construction techniques to be implemented remain to be invented and



popularized by this synergy between science and the arts that we are calling for. Let us be numerous and determined to invest ourselves in it for the benefit of all, human and non-human.

(1) In our theory, we prefer to distinguish techno-social (when living being are inside artificial construct) and socio-technical level (socialization of technical artefact).

(2) As the famous French philosopher René Descartes explains in his time in "Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Sciences", 1637.

(3) Named after the 1986 Habitat network games that referred to the inhabitants of this networked world as Avatars

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Étienne Armand Amato has been a lecturer in information and communication sciences at Gustave Eiffel University and the DICEN-IDF laboratory since 2014 ([www.dicen-idf.org](http://www.dicen-idf.org)). Since the beginning of high-rate networks, he studies interactive audiovisual forms (video games, virtual reality), ludic communication and media avatars. He also contributes to the work of IHEST (Institute of High Studies for Science and Technology), a training organization of the French Ministry of Research.

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