Art in the Age of Spiritual Machines

(with apologies to Ray Kurzweil)

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ABSTRACT

Humanity is evolving towards a "post-human" society that may include enhanced human beings, hybrid humans, and artificial intelligences. As an artist working in digital media and network culture, I believe that the crucial issue of the time is to clear the path for networked art and to create the foundations for a new aesthetic discourse emerging from networked culture. In order to do this, one has to be willing to create art that may not be readily recognized as artwork. In this essay, I trace the common roots of structuralist philosophy, developmental psychology, reductivist art discourse, structural linguistics and neural nets in an attempt to create a basis for this new aesthetic discourse.

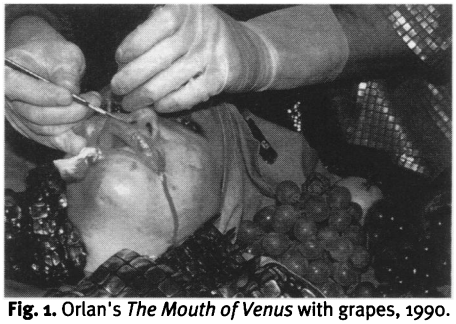

Fig. 1. Orlan's *The Mouth of Venus* with grapes, 1990.

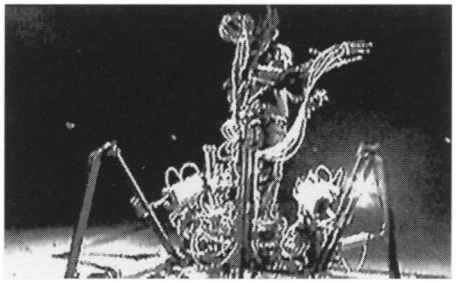

Fig. 2. Stelarc's *Exoskeleton: event for extended body and walking machine*, Kampnagel, Hamburg, 1998.

In a recent Internet Broadcast Panel discussion [1], Josh Harris, a New York Silicon Alley entrepreneur/artist, suggested that the human species will very soon evolve beyond its current form and exhorted artists to make art for that new type of human. But what form will this post-human take?

One can readily imagine a new race of genetically engineered or enhanced humans. Indeed, for the past few years, there have been a variety of programs involving nutrition and exercise to create physically enhanced humans. The human body has become the site for various manipulations. These range from beauty enhancements by means of plastic surgery to athletic enhancements through the use of performance drugs and steroids.

Artists have also begun to work in this field of human enhancement. The works of the French artist Orlan [2], for example, use the process of plastic surgery to create a procedural discourse on the performative process and the ideational location of beauty (Fig. 1). The Australian artist Stelarc takes a somewhat different approach by creating robotic extensions to the human physiology and offering his muscles up to remote stimulus (by means of electrodes) via the Internet (Fig. 2) [3]. In these examples, science and technology penetrate the human body, thereby altering its meaning. The human body is understood as having limitations that can be overcome only through external intervention. Contrary to the religious notion of the human body as a sacrosanct temple for the soul, the body is seen to be an imperfect vehicle that needs to be altered in order to bring it up to date with technological culture. Orlan, for example, uses her body as a site-specific art work that explores the language of beauty:

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"Carnal Art is self-portraiture in the classical sense, but realized through the possibility of technology. It swings between defiguration and refiguration. Its inscription in the flesh is a function of our age. The body has become a 'modified ready-made,' no longer seen as the ideal it once represented" [4].

In his latest novel, *The Elementary Particles,* the author Michel Houllebecq traces the ontological development of American post-war consumer culture and the cult of the individual: "The opposite is true of the sex-and-advertising society we live in, where desire is marshaled and blown up out of all proportion, while satisfaction is maintained in the private sphere. For society to function, for competition to continue, people have to want more and more, until desire fills their lives and finally devours them." [5]. Houllebecq posits a new type of cloned human that functions beyond sexual desire and lives forever. In his fictionalized account he writes:

> His first work, *The Topology of Meiosis, published in 2002, had a considerable impact. It established, for the first time, on the basis of irrefutable thermodynamic arguments, that the chromosomal separation at the moment of meiosis which creates haploid gametes is in itself a source of instability. In other words, all species dependent on sexual reproduction are by definition mortal. [6]

The machine intelligence side of this debate around the question "What form will this post-human take?" focuses on the field of artificial intelligence. In his book The Age of Spiritual Machines [7], Ray Kurzweil predicts that within the next 20 years—given the pace of advancement in the computer sciences and exponential growth of computing power—a functioning duplicate of the human brain with all its synaptical relays will be produced. (Indeed, he surmises that it will be able to out-think the normal human brain.) The procedure entails slicing a brain into one-cell-thick layers and mapping the synaptical relays in each layer in order to produce an exact duplicate by means of silicon chips. He further describes the method for transferring human consciousness to this machine, which requires that the actual cognitive processes of an individual are being recorded. This can be accomplished in a number of ways. The subject is hooked up to a MRI that scans his/her brain activity as he/she is stimulated through various targeted methods, such as pictures of food, music, frightening images etc. The MRI will show the areas of the brain that respond to and process this information. The activity maps can then be programmed onto a neural net, and the responses can be weighted to correspond to the individual's unique responses, so that any thought sequence or memory can be mapped onto the silicon duplicate. Another method—being currently explored with paraplegics—is a direct synaptical connection from the human cerebrum. This procedure has been described in a recent article in Wired Magazine: "As the brain cells around Ray's implant did what he asked them to do, the imagined sensation of moving his body parts gradually disappeared altogether. One day when his skill at moving the cursor seemed particularly adept, the doctors asked Ray what he was feeling. Slowly he typed "nothing" [8]. Once there is a direct connection to the brain, there is the potential to "output" the thought process to a computer and map it, the result being machine evolution and effective immortality. As if to reinforce Kurzweil's premise, I recently received the following e-mail claiming that Russian scientists have indeed created a functioning artificial human brain by programming a computer that reproduces the synaptic functions of the human brain:

> Russian scientists claim to have developed the first artificial brain with the same intellectual potential as a human. The neuro-computer is based on the workings of the human brain cell and can out-perform previous brain models. It uses pioneering findings in neurophysiology and neuromorphology to produce a truly thinking machine, scientist Vitaly Valtsev has told the Interfax news agency.
>
> He has warned of the potential of the scientific breakthrough, saying the new brain could turn into a Frankenstein monster if mistreated.
>
> The scientist said: "This machine needs to be trained like a newborn child. It is extremely important for us to make it a friend, not a criminal or an enemy."
>
> Mr. Valtsev, a member of the International Academy of Information Science, says the Russians have succeeded where others have failed because they used a model of the neurons in the brain in building the computer. He says earlier attempts to create advanced artificial intelligence have failed because scientists tried to create a machine using a model of the neuron taken from the spinal cord, developed back in the 1940s [9].

Fig. 3. The interior of the *Heartbreak Hotel* installation.

Whether true or not, one can assume it is only a matter of time before this scenario will become reality.

According to Kurzweil, there will be a gradual migration of the human spirit to all of humanity's intelligent machines, which—along with enhanced humans—will extend the definition of the human and effectively create "spiritual machines."

My own attempts to approach the issue of spiritual machines with my artistic collaborator Peter Sinclair resulted in an immersive sound environment called *Heartbreak Hotel* (Fig. 3) [10]. The piece uses a database of conversation snippets spoken by the synthetic voices of one of six characters respectively. Users who experience the piece move plaster maquettes of heads around a glass table top, creating

conversations that can occur in several ways (Fig. 4). A video camera under the glass table top registers a colored dot on the base of the character's statue; this dot identifies the character and its location within the sound space. If you place one statue next to another, a conversation is initiated. Depending on the character and its proximity to other characters, the topics vary. There is a search-and-match program written in lisp programming language that parses the database for each character and chooses the most appropriate match for each character group. The characters' voices "move" in the space because the sound is spatialized: if one moves a maquette while it is speaking, the voice will move in the space in a corresponding manner. The conversations are set up so that they do not repeat. We generated the original conversations from text dictionaries by adapting various poetry generators to our purposes. One of them, for example, scripts a poetry generator by diagramming a sentence and then creating dictionaries for the parts of the sentence. A simple sentence structure would be [subject] [verb] [object]. The generator chooses words for each category from a dictionary and assembles a sentence. The challenge was to assemble dictionaries with words that correspond to each character, thus helping to identify who is speaking. The timbre and pitch of the voice also gives viewers a clue as to who is speaking. This process is a simple reference to the notion of language games discussed by Ludwig Wittgenstein in *The Blue and the Brown Books*. The thrust of the work is to eventually create a limited Artificial Intelligence for each of the characters so that it creates its own conversations and individual responses. The work also has a multi-lingual component. We used both English and French poetry generators and synthetic voices. Viewers could toggle a switch for their preferred language. The piece is open-ended and adaptable to any language.

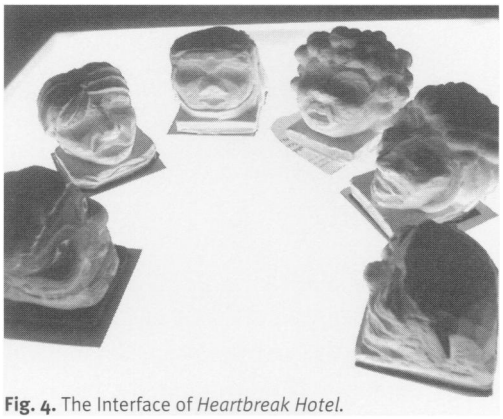

Fig. 4. The Interface of *Heartbreak Hotel*.

Exploring the issues of AI and spiritual machines raises deceptively simple but fundamental questions. What makes a human being human? Odd question. Love? Animals love. Tool-making? Animals make tools. Language? Animals have rudimentary languages. Perhaps the capacity for abstract thought. Perhaps. The question of how one can distinguish a human being from a computer was of course posited by Alan Turing with his famous Turing Test [11]. The Turing Test states that if a human interrogator asks questions of a human and a computer and the interrogator cannot tell the difference between the two of them, we can surmise that the computer can think. Given that uncomfortable assumption, abstract thought may no longer be the sole domain of humans (and perhaps their deity).

With the beginning of the 21st century, a new philosophical debate has emerged. Governments, scientists, and individuals around the world discuss the moral questions surrounding human cloning. Fundamentalist religious groups see American multinational technoculture as the devil. Environmentalists see machine culture irreparably damaging the ecosphere upon which human life depends. The new President of the United States says he believes in the fundamental sanctity of human life. Where in this debate does the artist figure in? Interestingly enough, one might say that humanism has always been at the core of any artist's project. Indeed, on an abstract level, expressing the human condition seems to be the main enterprise of any artistic pursuit. Art tends to be an externalized projection of the human condition. If one relates the activity of art-making to the creation of computer simulations one finds many affinities. Art is essentially a codified set of rules, which could be said to connect to Wittgenstein's ideas of specialized languages and language games [12]. In this sense, a computer simulation has much of the same structure as an art work. One might ask, where exactly does art intersect with or share the same logical underpinnings as a computer simulation? Another question that follows from this would be, where does human consciousness end and machine consciousness begin? What form will our replacement human beings take? Will they be a genetically engineered superhuman, a hybrid human (part machine and part flesh) or a virtual silicon life form existing in a computer simulation?

For the sake of this argument, let's assume that all of these postulates for the future of the human race will eventually come true. We can begin to envision a society of the future peopled by beings that come from us, that are our creations. Imagine the following scenario in the not too distant future: when a person reaches the age of, say, 20 years, a clone of that person is created. The clone is grown but kept in a coma for 20 years. When the person reaches the age of 40 years, his/her brain is transferred into that of the biologically exact replica. Everyone gets to be 20 years old forever. What type of art can be created for the type of being that never experiences death? How can one talk about generational differences when there are no more generations? On a more fundamental level, does the clone have a soul? Does it have a consciousness that is suppressed and destroyed?

For a number of years, computer science has focused on two main areas: the human-machine interface and artificial intelligence. The most obvious position art has in this realm is in the area of the human-machine interface. On a simplistic level, this means the creation of graphics, icons, sounds etc. that a human can understand and interact with. Data gloves and immersive environments are sophisticated iterations of the human-machine interface. Most people who work with computers know that—in order to accomplish any programming tasks—one must devote

long hours to staring at a computer screen (often suppressing many other types of human behavior such as talking to other people, socializing and so on). These types of human activities as well as the creation of art reappear on the networks that are created by hooking up computers to an Intranet or the Internet.

What becomes apparent is that the human-machine interface is evolving into a human-machine symbiosis:

> The concept of the man-machine symbiosis goes back to the research of Norbert Wiener, who believed that the digital computer had raised the question of the relationship between the human and the machine, and that it was necessary to explore that relationship in a scientific manner. [...] He postulated that the guiding principle behind life and organization is information, the information contained in messages. As a governing mechanism, messages rely on feedback; different inputs lead to different outputs, and the computer essentially is a simulating machine that processes inputs. [...] In 1960, Licklider, who had done his graduate degree in psychology, authored the paper "Man-Computer Symbiosis." According to Licklider, the main aims of this symbiosis "are 1) to let computers facilitate formulative thinking as they now facilitate the solution of formulated problems, and 2) to enable man and computers to cooperate in making decisions and controlling complex situations without inflexible dependence on predetermined programs." Licklider hoped that through its contribution to formulative thinking, the computer will help us understand the structure of ideas, the nature of intellectual processes. [...] A more organic approach to the Machine was pioneered by Marvin Minsky, who saw the machine as protoplasm which could be brought to consciousness [13].

At the end of the 20th century, the advent of the Internet was at first perceived to be an extension of mass media. After a headlong gold rush to stake out this new media terrain and the subsequent dotcom crash, people are beginning to reassess what the function of the Internet might be. On a basic level, the Internet is a global society of human beings connected to a network. It is also a global society of computers talking to each other. There is an irrevocable intertwining of the two and the connection between them is established by code.

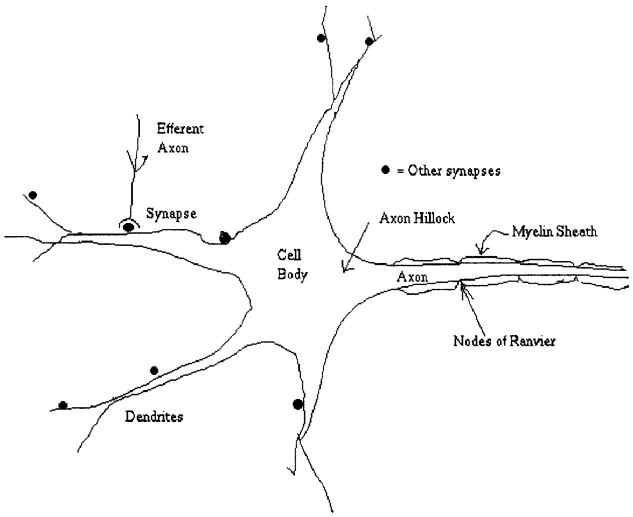

Fig. 5. Sketch of a biological neuron.

Can we begin to understand how a new hybrid society of human beings, enhanced humans, and synthetic humans is evolving? Let's start with the basic levels of the human-machine interface and the labor of creation. Writing computer programs, also known as hand-coding, is incredibly labor-intensive. Recent developments in scripting and object-oriented programming are creating the possibility of automating many repetitive tasks that human coders and people working in data entry, including artists, are now performing. One can see on the horizon the evolution of limited artificial intelligence that will take commands and then create a custom computer program, which it will execute. Advancing this scenario a step further, one might say that an artificial intelligence achieving a degree of awareness of its choices and then executing the choices that have to be made in the process, constitutes a step up to sentience. At the same time, we are witnessing a gradual end of natural social form and the rise of a mediated or networked human society as more and more of human society migrates to the networks. At some point, the artificial sentient society and the human networked society will achieve a degree of fluidity, so that the silicon sentient and the human sentient will be intermingled. Does this constitute an evolution or the end of the human race?

The most basic level of human instinct or in fact, the instinct of any living being, is to survive and reproduce. Returning to the notion of abstract thought, one could postulate that we, as humans, are entertaining the idea of sexual reproduction via scientific manipulation and of survival through preserving our identities within computer networks. Art in the age of spiritual machines needs to address these ideas and express this new human condition. How does one teach an artificial intelligence what it is like to be human? Will it understand what it is being taught or is it simply executing a collating program if it responds to you in a human-like manner? Does it matter?

Theories in the discipline of linguistics (both on the behaviorist and the structuralist side) suggest that the synapses of the human brain (Fig. 5) are chemically programmed via genetics to begin forging neural pathways that create speech and eventually a language structure. In the realm of artificial intelligence, computer scientists have been attempting to reproduce the same neural paths via the I/O paths of silicon chips. Computer programs that duplicate neural pathways are called neural nets. As the neural-net faq explains:

> The design motivation is what distinguishes neural networks from other mathematical techniques: A neural network is a processing device, either an algorithm, or actual hardware, whose design was motivated by the design and functioning of the human brain and components thereof. Most neural networks have some sort of

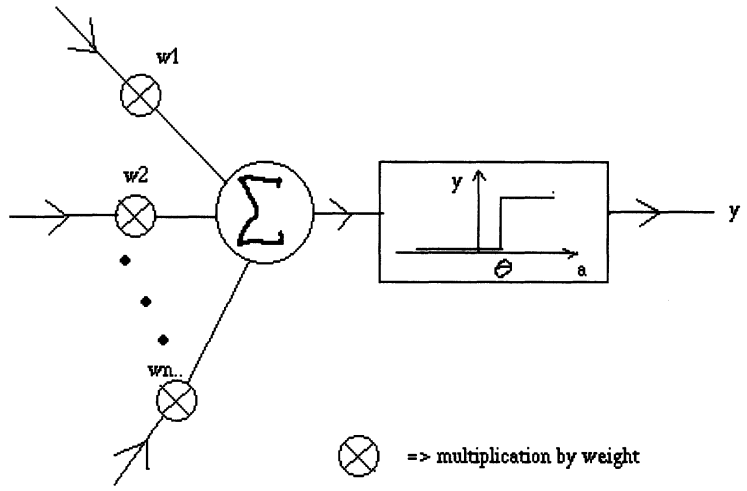

Fig. 6. A sketch of the Threshold Logic Unit (TLU). Signals (action-potentials) appear at the unit's inputs (synapses). The effect (PSP) each signal has may be approximated by multiplying the signal by some number or weight to indicate the strength of the synapse. The weighted signals are now summed to produce an overall unit activation. If this activation exceeds a certain threshold the unit produces an output response. This functionality is captured in the artificial neuron known as the Threshold Logic Unit (TLU).

> 'training' rule whereby the weights of connections are adjusted on the basis of presented patterns. In other words, neural networks 'learn' from examples, just like children learn to recognize dogs from examples of dogs, and exhibit some structural capability for generalization. Neural networks normally have great potential for parallelism, since the computations of the components are independent of each other. [14]

Neural nets are trained or taught to behave in certain ways. According to the teaching method for neural nets, a neural net's responses are weighted to respond in a certain way through the use of recursive logic (Fig. 6) [15].

Art for spiritual machines could consist of art works that stimulate an artificial intelligence to develop neural paths that create first of all, language comprehension, and later perhaps neural paths for the creation of art, music and all forms of "creativity." In this case, the artist is in some sense both a teacher and a co-creator.

How does this idea relate to the more traditional discourse of avant-garde art of past decades? In my opinion, it is a continuation of many premises put forth in the experimental art of the 1960s and 1970s. Taking a reductivist position and presenting the idea of phenomenology or process as art, artists such as Bruce Nauman and Robert Morris created artworks that used the idea of primary perception as the foundation of art. Bruce Nauman for example uses puns or language games to set up the structure for many of his pieces . His piece Waxing Hot shows a pair of hands polishing 3D red wooden letters that spell 'hot.' The work is situated outside of strictly representational art. It plays with the idea of pictorial narrative by documenting the activity of waxing the letters in a series of photographs. In other words, pictorial narrative is only an agreed upon, a-priori structure, which can be altered to create new meaning. Indeed, part of a successful art piece is precisely to change the rules of any a-priori perceptual structure. Another example would be Robert Morris, who has continually created pieces called *Blind Time drawings.* The artist dips his fingers in dry pigment and, while blindfolded, strums his fingertips across a wall. There are specific instructions such as "Lower left to upper right for 5 minutes" that create the form of the piece. These two examples can be compared to a set of instructions given to a computer for execution and/or to a deeper reading of the language of art. Many artist of that period sought to establish the root structure of the language of art.

One can see parallels to the use of algorithms and various programming languages in computer science. Indeed, the development of a human-machine GUI (graphical user interface) has its roots in the same philosophical structure of Logical Positivism, a school of thought based on the idea that "philosophical truths" and the nature of the human mind can be discovered by analyzing the structure of language. The relationship of words to ideas can be reduced to algorithmic diagrams. The beginnings of this concept can be traced to Ludwig Wittgenstein's *Tractatus Logico Philosophicus* and *Remarks on the Foundation of Mathematics* [16], as well as to the works of Jean Piaget on a child's mental development. Piaget observes that a child's cognitive development progresses through three main stages: first, the sensori-motor level, then the development of perception, and finally, the semiotic or symbolic function [17]. If one relates this to the development of the computer's GUI, these categories roughly correspond to the cursor and mouse or any other physical tool (sensori-motor level), the desktop, pixels, and wireframe 3D rendering engine (development of perception) and finally, various software programs (semiotic or symbolic function). Piaget's theories, in particular, are positioned at the intersection of cognitive development, art, and artificial intelligence. The research and investigations of Wittgenstein and Piaget illuminate the connection between thinking and the physical world, and between thought and the development of language. As Jean Piaget observes regarding a child's development,

> At the end of the sensori-motor period, at about one and a half to two years, there appears a function that is fundamental to the development of later behavior patterns. It consists in the ability to represent something (a signified something: object, event, conceptual scheme, etc.) by means of a "signifier" which is differentiated and which serves only as a representative purpose: language, mental image, symbolic gesture, and so on. [...] However, since linguists distinguish between "symbols" and "signs," we would do better to adopt their term "semiotic function" to designate the activities that relate to differentiated signifiers as a whole [18].

This concept connects to the idea of the human-machine interface if one perceives the human as being in the physical world and the computer as inanimate thinking apparatus. Piaget states, "It is a process of equilibrium, not in the sense of a simple

balance of forces, as in mechanics, or an increase of entropy, as in thermodynamics, but in the sense-which has been brought out so clearly in cybernetics-of self-regulation; that is, a series of active compensations on the part of the subject in response to external disturbances and an adjustment that is both retroactive (loop systems or feedbacks) and anticipatory, constituting a permanent system of compensations" [19]. The key to establishing connections between them is the notion of interfacing: in my opinion, the human/machine interface functions similarly to an art work in that it allows the viewer/user to access information. The art work creates a semiotic feedback loop for the viewer, which causes pleasure or inspiration or learning. This feedback loop also occurs with the human/machine interface.

Returning to the central issue of this essay, art in the age of spiritual machines, I believe that the "screenic" environment of the desktop is only a transitional phase. It is a first step into the future networked, post-human society. The screen is a convenience that allows humans to access the networks. It can be compared to the picture frame or the proscenium arch in theater. A natural evolution will occur and, as the post-human society is formed, there will be less reliance on traditional physical interfaces. Future interfaces will include neural implants for humans, voice recognition tied to artificial intelligence and interactive AI, and access to the networks via smart appliances. In this type of environment, art is one process of moving information across the networks. The result or aesthetic event is a shift in awareness that will occur for the inhabitants of network culture. The art already exists in rudimentary form on the World Wide Web. However, the art world that is connected to the Net and is net-aware is still rather small. Part of it functions through the largess of art institutions that see the networks as a publication and advertising medium.

As an artist working in digital media and network culture, I believe that the crucial issue of the time is to clear the path for networked art and to create the foundations for a new aesthetic discourse that issues from networked culture. In order to do this, one has to be willing to create art that may not be readily recognized as artwork. It may be helpful to view art-making as an ongoing process or as aesthetic research. Artists' works are now frequently discussed as their "projects," recognizing the open-ended nature of the artist's aesthetic investigations. When an artist creates a non-traditional work, it is often referred to as an "intervention." These two terms represent an intellectual shift away from simple object production and recognize the investigatory nature of creating artwork. The artists may choose to present results of their research to the public at various times when there appears to be a benchmark. The mode of presentation should be appropriate to networked culture. Furthermore, one could speculate that the presentation may become simply a courtesy to the public, similar to the nature of the Graphical User Interface; the computer does not need a GUI to function and an artist might not need to present work to the public in order to continue research. Perhaps this new type of art can only be appreciated by the post-humans who come after us. This art may not result in an object or product but might exist in an open-ended experimental form that manifests itself in a variety of materials and is forever mutable. If one imagines that this new type of art will be accessed by a transformed humanity that is effectively immortal or a sentient artificial intelligence with no awareness of the limitations of time, one can assume that the necessity for a discreet art object or "time-based" art work becomes essentially irrelevant. The existing vehicles for art belong to a human culture that continues to evolve and be transformed by its technology. In this transition phase of humanity, part of the artist's mission is to propose new ways for post-humans to redefine the human condition.

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