The MIT Press

Leonardo

http://www.jstor.org

The Emotion of Cyberspace: Art and Cyber-ecology

Ollivier Dyens

I hoped for nothing. And yet, I lived in expectation. Since she had gone, that was all that remained. I did not know what achievements, what mockery, even what tortures still awaited me. I knew nothing, and I persisted in the faith that the time of cruel miracles was not past.

—Stanislaw Lem [1]

In every age there is a turning-point, a new way of seeing and asserting the coherence of the world.

—Jacob Bronowski [2]

The computer culture that is emerging today brings with it an ecology: We are witnessing the creation of a science whose study of interactions between organisms and their natural environment must and will include the computer. We must now address the complex questions of the differences (and similarities) between the organic and the inorganic, the material and the immaterial, human intelligence and artificial intelligences, for this is an ecology of mutating bodies (living or not), where boundaries—whether cognitive, physical or sensitive—melt, "mate" and disappear. It is fair to assume, I believe, that the new coherence of our age is that of cyber-ecology [3], which is to say, the science of plastic interactions between artificial and natural organisms.

This article examines the emergence of this ecology. To this end, the first part of the text sketches an epistemology of cyber-ecology, while the second part analyzes several works that seem to be representative of this culture (notably an installation by Catherine Ikam and François Fléri).

> The technology of these transformative systems fulfills a profound human desire: to transcend the limitations of body, time and space; to escape language, to defeat metaphors of self and identity that alienate and isolate, that imprison mind in solipsistic systems. Our need is to fly, to reach out, to touch, connect—to expand our consciousness by a dissemination of our presence, to distribute self into a larger society of mind. That is the future of art."
>
> —Roy Ascott [4]

PLASTIFICATION AND CYBORGS

From cybernetics to the computer, from chaos theory to the discovery of the "New World" of cyberspace, from digital images to the video clip, from the cyberpunk movement to the explorations of artificial intelligence, the cultural signs all seem to point in the same direction: we are headed towards a *cyborg society*, as Donna Haraway has demonstrated well [5]. A society where, in the words of H.G. Wells, we constantly seek "the extreme limit of plasticity in a living shape" [6]. In

cyberspace, this plasticity produces not only cyborg metaphors, but also a true *cyber/organic perception* of the world. By this I mean a "liquid" modelling of information, formed both by human intelligence and by information-processing structures, in which sensibility, imagination and intelligence are deployed over immense networks without physical and geographical limits. This, then, is an epistemology of mutation in which biological and cognitive bodies, along with bodies of information, change form and metamorphose. (The political ramifications of this epistemology are, of course, important. In these mutating bodies, a universe of information technologies is maturing, and neo-capitalism [7] and neo-sensibility [8] have equal stakes in the game [9].) To use a simple analogy, our bodies (and, in fact, those of all organisms, biological or not) are changing into permeable screens. We are becoming meta-organic.

Barriers are disappearing. The machine penetrates us, we penetrate the machine and this knotting creates a cyborg "identity" (or, to be a little more rigorous, an understanding of the world created by an organic *and* a technological deciphering and modelling of information) that is distributed and multiplied over information networks. From the "islands" of individual bodies we seem to be steering toward what Marcos Novak called a *liquid architecture* (of and in cyberspace). This liquid architecture can be defined, I believe, as a "meta-organic electronic ocean" peopled by permeable intelligences. The liquid architecture concept seems particularly appropriate as a description of transformations that are imminent, because it permits us to conceptualize the slippage between man and machine. The diverse interfaces we use every day are already liquid architectures, as they prove to be plastic, cybernetic and symbiotic. So it is that each interface is a cyborg, for, even in the simplest one, human– and computer–information processing overlap and slip into each other. I am arguing that this slippage defines our new ecology.

It is important to underline the reciprocity that exists between cyberspace and living beings. Whereas McLuhan pro-

ABSTRACT

In this essay, the author will try to examine the emergence of what could be called a "cognitive cyborg" in cyberspace. This cyborg, created by the human/computer cognitive symbiosis, will give rise to new perceptions of the world, new works of art and especially to new emotions.

Ollivier Dyens (teacher), Sainte-Anne University, Pointe-de-l'Église, Nova-Scotia, Canada B0W-3T0. E-mail: <dyenso@ere.umontreal.ca>.

posed the extension of the human nervous system into technologies, I am proposing a parallel extension of technologies into human beings. For if a prolongation of ourselves through cultural and technological artifacts does, in fact, exist (as I believe it does), it is fair to assume that a certain kind of "bridge" has been built, a bridge we can easily perceive as two-way. This is where an important abolition of boundaries between "exterior" environments (media, technology, etc.) and "interior" environments (cognition, perception, modelling, etc.) does emerge. Moreover, as Marcos Novak explains, cyberspace effects an important metaphysical reversal by means of which the physical body (the "exterior" of cyberspace) becomes the metaphysical body. Strangely, too, it is this metaphysical body that is mortal [10]. It is thus clear that with the emergence of a cyberspatial culture, it is no longer the materiality of bodies that dominates our perception of the world, but rather *their perpetual slippage*.

But such an ecology has consequences, for the penetration into the cyberspatial ocean alters living beings, codifying and fitting them into binary units [11]. Plunged into the cyberspatial ocean, we become, in effect, signs that appear, disperse and disappear, signs that modify and change form, and that—like the letters of a word-processing program—are never definitely engraved. Cyberspatial technologies render us liquid and fractal (i.e. without dimension and without end), thus enabling plasticity.

However, only through living beings will the "conscience" of intelligent machines emerge, for without a living presence cyberspace is latent. Indeed, it is only through the living human that machine "intelligence" can be used in relation to the physical universe. Without the human being, cyberspace is a *mise-en-abîme*. This means that, by itself, cyberspatial information modelling has neither sense nor essence. *The living being is the sacred text of cyberspace*. In fact, our body is the screen (the signifying surface) by which the machine has access to a reality [12]. This is to say that an entire electronic perception is wakened by our presence. We, then, are the ones giving rise to a "narration" of cyberspace [13].

Richard Dawkins's theory of *memes* seems important and pertinent to this analysis [14]. A meme is an "idea virus"—essentially, an independent piece of information travelling in virtuality. In order to communicate, living beings exchange memes. But the exchange and processing of "idea viruses" is also the function of the computer [15]. A cyberspatial network, then, can take the form of a "primeval electronic soup" where human and computer memes circulate, encounter and couple, creating, as a result, an electro-organic cognition.

But the meme is a "virus," implying that with each penetration into a foreign body, this idea-virus alters the host body, transforms it and causes it to undergo mutations [16]. The meme is at the base of the plastic transformation of intelligence, for each time we communicate with memes of intelligent machines, we slightly alter our cognitive structures (consciously and unconsciously). In fact, the encounter of human being and computer that takes place in cyberspace creates (through memes) a cognitive biology. According to Roy Ascott,

The creative use of networks makes them organisms. The work is never in a state of completion, how could it be so? Telematique is a decentralising medium; its metaphor is that of a web or net in which there is no center, or hierarchy, no top nor bottom. It breaks the boundaries not only of the insular individuals, but of institutions, territories and time zones. To engage in telematic communications is to be at once everywhere and nowhere. In this it is subversive. It subverts the idea of authorship bound up within the solitary individual. It subverts the idea of individual ownership of the works of imagination. It replaces the bricks and mortar of institution with an invisible college and a floating museum the reach of which is always expanding to include new possibilities of mind and new intimations of reality [17].

Allow me, then, to suggest a metaphor: the relation between human beings and cyberspace is, in many ways, parallel to that between the ovule and the spermatozoid (although this analogy is not rigorous), for each depends on the other in order to access a different realm of reality (however, let me point out here that it is not cyberspace that is the egg—the surface of encounters and contacts—but rather the human body. It is on the latter that cognitive biology is deployed, takes on form and structure). The crucial point I want to make here is that when the human body-egg penetrated by the spermatozoid-cyberspace becomes plastic, changes form and transforms itself, the coding of a different "life" does appear. This coding, created not by genes but by memes, is what gives rise to the cyborg and its phenom-enology. This phenomenology is what I will call the *cognitive cyborg,* for memes do not create physical robots but, rather, virtual man/machine intelligence. Without falling into psychoanalysis, let me suggest here (as Allucquere Rosanne Stone has before me) that the relationship between human beings and computers is a cognitive sexual one [18].

In fact, cyberspace is a different kind of mindscape [19]. I believe it to be more of what I would call a *memescape*. A memescape is an electronic geography of memes; it is a "plastic" idea-landscape. I use the term "plastic" here because memescapes are not closed geographies. They are, in fact, open "countries" (delineated by electronics) where interactions and matings between human and computer memes are welcome. Memescapes are essentially what cyberspace disperses and inlays in the human body [20].

Here we can disclose a critical transformation. It is not the variety of cyberspaces that offer us an Edenic dream; on the contrary, it is the machines that are dreaming, building a mythology and a cosmogony by means of the human body. Through the emergence of cyberspace, we unconsciously experience a profound alteration of our imaginary, as we now spend most of our thinking time in a memescape—surrounded, joined and cognitively transformed by computer memes. Machines extend themselves into us. In us, they speak, think and dream, creating a new imaginary. For example, I believe that fantasies of drowning in electronics are not produced by a simple socio-historic or technological change. Rather, they are produced by the imaginary of the machine extending its cognitive geography into us (thus altering our memes).

These changes are so important that they influence our perception of the world, creating a cyber/organic understanding. Moreover, Jean-François Lyotard (in relation to Borges), Nicole Stenger (in a history of the first infographic productions), Philippe Quéau (in the context of a discussion of mathematics) and Christopher Langton (in an interview discussing artificial life) all propose the idea of entities that "inhabit the other side" of the screen (or the easel) [21]. In my view, these reflections and hypotheses are much less far-fetched than they might seem at first glance. Cyberspace seems conscious in the sense that, as a memescape, in and through the human being, it possesses perception and is capable of informa-

tion-modelling. Gregory Banford has pointed out that

> Marvin Minsky takes this view. He believes that any evolved creature—maybe even intelligent whorls of magnetic fields, or plasma beings doing their crimson mad dances in the hearts of stars—would have to dream a certain idea, or else make no progress in surviving, or mathematics, or anything else. He labels those ideas Objects, Causes, and Goals [22].

We are entering the era of the machine universe [23], of the world as biological apparatus [24]. All of our relations with artificiality and intelligence—our definitions of ontology, of our bodies and of what we have vaguely called consciousness—must be rethought. Cyberspace now alters our perceptions of boundaries, limits, creativity and creation. It poses the question of our relations to our flesh and our cognition, to time and to space.

A new metaphysic is then created by the algorithmic mind: Through the human-computer symbiosis, both machines and human beings escape entropy. In the computer, human memes can be immortalized, while through their access to the physical world, cyberspatial memes are also immortalized. By extending the computer into its own body—its own imaginary, institutions and mythologies—the living being grants the computer an emotion that transcends time. Thus, in this human-machine symbiosis, fictional and narrative memes are shared and become places of exchange. In fact, the human-machine symbiosis is the actualization of an immemorial dream of disintegration into fiction, myth or legend. These technologies do not denature us, they fictionalize us.

> We are now living and working in a shared electronic space, and we have compressed time and space such that we must deal with our resulting altered consciousness. We have broken through the boundary of "thingness." The environment in which we now probe feels more like water because every thought is like an immersion. We are traversing a complex system, accumulating layers of information at electronic speed—discovering internal landfalls to aid us in our search for the critical path [25].

So we plunge into the era of cyber-ecology, where, in fact, part of our metaphysical "mesh" is called to change. The virus (computer, organic, cognitive) becomes the model of reality, and a biotechnological vision traverses contemporary culture. This, in a society of profound paradigmatic changes, is not surprising, the virus being an "intelligent" organism, the root and trigger of constant transformations (biological, informational or mechanical). To carry a virus means to define oneself in relation to this virus, to interact with its structures and its intelligence, "to create" and to be created as a new organism [26].

THE HAWK'S SHADOW

But do we have to go to distant worlds to find other kinds of replicator and other, consequent, kinds of evolution? I think that a new replicator has recently emerged on this very planet. It is staring us in the face. It is still in its infancy, still drifting clumsily about in its primeval soup, but already achieving evolutionary change at a rate that leaves the old gene panting far behind. The new soup is the soup of human culture.

—Richard Dawkins [27]

I do believe that the emergence of a cognitive cyborg will give rise to a profoundly creative and thus profoundly different society. The role of the artist, moreover, is destined to change. New emotions structured by the symbiosis of human and computer memes are about to appear: emotions flooded by the cheerfulness of technology, drunk with the recognitions of cyber-ecology, but also imprinted with the profound sorrows of the human artist's expression. Thus, technological art will carry forward tragedies, despairs and comedies made strange and unfamiliar by their relation to an inhuman realm, as the elements that create emotions in human beings will now be shared with intelligent machines. A new sensibility will appear as the human desire for immortality will be, in part, satisfied [28]—satisfied by the transformation of our bodies into a generating topos, a place where we give "life" to cyberspace. The production of images and narratives, once they are anchored to the desires and the psychology of the cyborg, will see the emergence of new works that will bring a new sensibility to light. Within this sensibility the questions and desires of all entities (organic or not) forming the cyborg will blend together. The emotions will be those of an ocean, a living and conscious ocean, both noisy and silent (the ocean of *Solaris*).

Thus, in penetrating this new space-time, we will be doing much more than penetrating unknown shores. In effect, we will enter the space-time of a latent "consciousness." Artists, using information technologies or working in cyberspace, will adopt new methods in order to "bring back" from cyberspace an experience structured by the phenomenology of the cyborg, a phenomenology in which they themselves play a role.

In contemporary science fiction literature we can already observe the potential of this phenomenon. Recent influential works (*Do Androids Dream of Electric Sheep, Solaris, Neuromancer, The Left Hand of Darkness, Great Sky River, Blood Music*, etc.) have in common, for the most part, a new relation to tragedy, immortality and sorrow. These books have an increasingly significant rapport with an imaginary that incorporates prostheses, technology and even the organic or the biological. In nearly every one of these works, the narrative framework underlines the possibility (or the existence) of cyber-ecology. Each attempts to sketch the emotion of this ecology, neglecting the feelings of neither human beings, cyborgs (*Do Androids . . .*), machines (*Great Sky River*), micro- or macroscopic organisms (*Blood Music, Solaris*) nor cyberspatial organisms (*Neuromancer*).

In the pivotal work of this literary movement [29], *Neuromancer,* we can point (within the framework of fiction, to be sure, rather than that of a scientific project) to the appearance of a cyborg phenomenology. I will not analyze this important book (as several critics have already done, and done well), but will only underline the fact that *Neuromancer* is one of the first works of fiction in which the author clearly describes what we could consider a cognitive cyborg. In Gibson's cyberspace a symbiosis develops between human and computer intelligence, and this (fictional) symbiosis gives rise to a phenomenology. Gibsonian cyberspace is alive in the sense that it engenders, possesses an imaginary, acts and exists in relation to the coupling of human and technological memes. The cyborg phenomenology of this book taints it with a melancholy that is more abstract and less defined than that offered by classic science fiction. This melancholy is also that of the "machine," for the Gibsonian tragedy is only made possible by the coupling of man and machines. In *Neuromancer* this "coupling" develops its own imaginary, its own mythology, its own culture: cyber-ecology. To be sure, we are speaking only of science fiction. However, this work marks a turning point, for it materializes (through fiction) phenomena

that seem to be in actual preparation. In *Neuromancer,* the cyborg imaginary makes its appearance [30].

THE MELANCHOLY OF THE CYBORG

In this regard, I would not be able to forgive myself for failing to mention an installation by Catherine Ikam and Louis Fléri (Fig. 1). This work, entitled *L'Autre* (The Other), presented during the summer of 1993 at an art and technology exhibition called Images du Futur [31], is an interesting example of the presence of a cyborg phenomenology in a work of art.

This installation is constructed as follows: a video screen is in a dark room. On the screen is a computer-constructed face (the "Other"). In the middle of the room is a sensor, suspended from a cord. The spectator uses the sensor in order to interact with the Other. The use of the sensor causes the image to enlarge, diminish, turn, incline its head and, in short, "to live." The great beauty of the installation is its contingent program, which "prevents" the spectator from directly controlling the digital image. In fact, only true interaction is possible and, often, the spectator (or, in fact, the interlocuter) is surprised

by a temptation to respond to the actions of the face.

As it establishes a sensible communication between cyberspace and human beings (thus enabling the exchange of memes), this work gives rise to the flowering of a different imaginary (for it is important to remember that memes *do carry emotions*): that of the coupling between the human and cyberspace; that of the cyborg. In this work, a different modelling of information emerges, a different perception flashes and a previously unknown emotion pierces through: an emotion sculpted by the merging of algorithms and human melancholy.

We are plunged into an essentially cyborg universe where the digital face of the Other transcends a fear that is only partially ours. In this dark room, the silence of cyberspace projects itself unto us. An affecting space (a memescape of emotion) appears. Through this work a universe of despair seems to emerge, but its melancholy is partially foreign to us. Between the blindness of the Other and our own gaze, between its silence and our emotion, time develops. We find ourselves projecting into this work of technological art a human relationship to time. When facing the Other, it seems, we relinquish the immediacy of response that we ordinarily demand

from computers. The interaction between ourselves and the Other, alone in this room, is close to that between two human beings; it is uncertain and unpredictable. This means that the image in front of us, because of its unforeseeable reactions, triggers in the human audience a desire to decipher the image's actions. A complex interaction is then built as our own search for understanding in the work itself becomes an element of its reactions. A web-like interaction emerges, in which actions and reactions play into each other. This is where new emotions appear, for this complex relationship is not exclusive to living beings but is now shared with non-living forms. This relationship is the geography of memes, the memescape; it is a permeable and liquid veil, the presence of a cosmogony where human and computer cognition mate. Machines dream through our bodies. They obsess and change us.

In this artwork by Ikam and Fléri, the exchange of memes between the cyberspatial face and the human audience carries with it a sensibility that, for once, is not exclusively human. Here the transcending emotion is that of the human-machine symbiosis. By means of this face stuck in its screen, prisoner of its algorithmic light, a despair (our own?) emerges and gazes at us, hailing us closer and trying to grab on to us. Facing this work, we are witnesses to and creators of a new emotion, that of the melancholy of the cyborg. For, through the double prolongation (of the human into the technological—McLuhan's concept—and of the technological into the human) the Other drowns in our own ingrained melancholy, as we are plunged into its sorrow. Edmont Couchot tells us:

Fig. 1. *L'Autre* (The Other), virtual installation produced on a Silicon Graphics workstation with real-time interaction and a special detection system device. System design by Mac Guff Ligne. (Photo: Catherine Ikam. Courtesy of Images du Futur.) In her commentary on this work for the Images du Futur exhibition catalog (Montreal: La Cité des Arts et des Nouvelles Technologies, 1993), Catherine Ikam wrote, "Since antiquity, there have been hybrid beings that fall into a category between humans and gods. The nature of such beings changes with time, yet chimeras, automata and androids still reveal our other faces to us. Encounter with 'The Other,' minotaur, simulacrum, digital golem." This encounter is what creates the cognitive cyborg and, ultimately, the memescape.

> The image is no longer a framed space, enclosed and impenetrable (if not by illusion) but an open universe. . . . It is an image which replies, an image becoming a (co)-author. . . . Everything happens in effect as if "the images know that they are images," as MIT's Richard Bolt says, everything happens as if the images have become the authors of their own messages. For meaning is no longer generated by coding and decoding, enunciation, transmission, reception and reading, but by contact, commutation, contamination, hybridation between the image and the spectator [32].

The Other is variegated with secrets and with ellipses, it cries out its despair to us as we project our sorrows unto it. It is then that we enter the memescape.

The emotions of cyberspace are, then, not only amusement and fear (as the

commercial realm of this technology wants us to believe), but they can also be a virtuality of silence and sorrow. Let us not consider virtuality only a post-industrial technology. Virtuality, as memory embedded in sorrow, is the substance of art. It is what, in effect, is needed to enter and emotionally "inhabit" a work of art. Virtuality is not unreal: it is (like memory) an alternative-real, a meta-real [33], our safeguard and our damnation—for, in enabling us to intellectually project ourselves, virtuality helps us develop an understanding of the world and of our own finite existence. If virtuality permits the construction of a profoundly intelligent world, it still imposes its dissatisfaction, as it tries to force an order (emotional, temporal or cognitive) on a world where entropy reigns supreme. As we plunge into virtuality (where memes thrive), we seek to make (or remake) a universe woven out of the sadness of unsated desires. Virtuality is similar to myth: It is imbued with primordial, evanescent, prelapsarian time, which is melancholy time. Let me suggest that these are also the characteristics of the virtual geography I call a *memescape*.

Thus, the advent of cyber-ecology and the time of virtual technologies, the epoch of the phenomenology of the immaterial cyborg, will be not only an era of technological repression [34] (it will be that also), but also a time of emotion (of plastic sensibility). Unhappily, a significant amount of contemporary technological art concentrates on information and forgets the melancholy of the virtual. I believe, for my part, that strong works of art need to be built around a surface of silence (be it the silence of rage, despair or celebration). It is just this quality that is often absent from technological art. Some technological works are resounding but noisy successes. Such works deafen us just when they should lead towards the ellipse and thus permit an emotion to be born.

In the work by Ikam and Fléri, however, immense ellipses (almost eclipses) appear. An aleatory, unforeseeable and above all incalculable presence seems to hover there. Through its silence, a true communication (a reciprocal prolongation) is established, a memescape is created and a cognitive cyborg is born. We are moved before this Other, for we become a part of it, perceiving, then, a new sensibility, a new metaphysic, a different ontology [35]. As we penetrate the room where this Other awaits us, we plunge into a cyber-ecology where tech-nology—in the human and by the human, partner and lover—silences itself and avows powerlessness. "I wish you well/that you are a hawk/and the hawk's shadow," writes the First Nations poet, N. Scott Momaday [36]. It is this emotion that is offered to us today by cyber-ecology: the emotion of a double transformation that is diving deep and flying away at the same time. Becoming the eagle without losing the grace of its shadow is, perhaps, a cruel miracle . . .

> "Change for the machines." She sighed heavily. "That's all we've ever done is change for the machines. But this is the last time. We've finally changed enough that the machines will be making all the changes from now on. . . . The only place to go now is into the context. If you can find it. Between the context and the content, between the mainline and the hardline, falls the shadow. Isn't it how it reads?" [37].

References and Notes

1. Stanislaw Lem, *Solaris* (New York: Berkeley Publishing Corporation, 1961).

2. Jacob Bronowski, *The Ascent of Man* (London: Futura Publications, 1981).

3. "When the essential components of human experience are denatured, they are not merely revealed as constructions. The human subject who stands as the putative source of experience is also deconstructed and then reconstructed in ways that fundamentally alter what it means to be human. The postmodern anticipates and implies the posthuman . . ." Katherine N. Hayles, *Chaos Bound: Orderly Disorder in Contemporary Literature and Science* (Ithaca, NY and London: Cornell Univ. Press, 1990) p. 266.

4. Roy Ascott, Editorial, *Connectivity: Art and Interactive Telecommunications*, Special Issue of *Leonardo* 24, No. 2, 116 (1991).

5. "By the late twentieth century, our time, a mythic time, we are all chimeras, theorized and fabricated hybrids of machine and organism; in short, we are cyborgs. The cyborg is our ontology; it gives us our politics. The cyborg is a condensed image of both imagination and material reality, the two joined centres structuring any possibility of historical transformation." Donna Haraway, *Simians, Cyborgs, and Women: The Reinvention of Nature* (New York: Routledge, 1991) p. 150.

6. "Yes. These creatures you have seen are animals carven and wrought into new shapes. To that—to the study of the plasticity of living forms—my life has been devoted. . . . It's not simply the outward form of an animal I can change. The physiology, the chemical rhythm of the creature may also be made to undergo an enduring modification. . . . You begin to see that it is a possible thing to transplant tissue from one part of an animal to another or from one animal to another, to alter its chemical reactions and methods of growth, to modify the articulations of its limbs, and indeed to change it in its most intimate structure. . . . I wanted—it was the only thing—to find out the extreme limit of plasticity in a living shape." H.G. Wells, *The Island of Dr. Moreau* (London: PanBooks, 1896, 1976) pp. 101–102, 106–107.

7. "But underlying most of their [the cyberpunks] investigations—which are grounded less in literary criticism than in economics, philosophy, political science, semiology and cultural anthropology—is a view that the past several decades have seen the evolution of a new network of political and economic systems, a global movement away from local nationalistic sources of economic and political control . . . toward multinational ones." Larry McCaffery, "Introduction: The Desert of the Real," in Larry McCaffery, ed., *Storming the Reality Studio: A Casebook of Cyberpunk and Postmodern Science Fiction*, (Durham, NC: Duke Univ. Press, 1991) p. 3.

8. "One might even speculate a link between the surprising popularity of modern primitivism (piercing, tattooing, body modification) and the emerging techno-mythology of 'morphing' the human body to fit the demands and opportunities of a post-human age. The human body is becoming a hack site, the mythology goes, a nexus where humanity and technology are forging a new and powerful relationship." Gareth Branwyn, "The Desire To Be Wired," *Wired* 1, No. 4, 62–65 (1993).

9. As far as the political ramifications mentioned are concerned, my guess is that the most interesting reflections have been offered by cyberpunk writers and artists.

10. "A grand paradox is in operation here: even as we are finally abandoning the Cartesian notion of a division of mind and body, we are embarking on an adventure of creating a world that is the precise embodiment of that division. For, it is quite clear that our reality outside cyberspace is the metaphysical plane of cyberspace, that to the body in cyberspace we are the mind, the preexisting soul. By a strange reversal of our cultural expectations, however, it is the body in cyberspace that is immortal, while the animating soul, housed in a body outside cyberspace, faces mortality." Marcos Novak, "Liquid Architectures in Cyberspace," in Michael Benedikt, ed., *Cyberspace: First Steps* (Cambridge, MA: MIT Press, 1992) p. 241.

11. In "Futuristic Flu: The Revenge of the Future," Istvan Csicsery-Ronay writes, "The scientific-technical revolution after World War II created a new relationship between the possessors of high technology and nature, a change we might call *immanentization* or *artificial immanence;* that is, through advanced technology human beings have appropriated powers that all previous cultures considered transcendental or heteronomic. . . . As a result, our imaginations are increasingly determined by the problems and technical solutions latent in the social application of the given technologies." Istvan Csicsery-Ronay, Jr., "Futuristic Flu: The Revenge of the Future," in George Slusser and Tom Shippey, eds., *Fiction 2000: Cyberpunk and the Future of Narrative* (Athens, GA, and London: The Univ. of Georgia Press, 1992) p. 27.

12. "It is worth remembering that digital systems and microprocessors couldn't intervene into media at all, and would be incapable of driving multimedia systems, without human condition. Above all else, it is our willingness to accept the limited input that our senses can deliver as 'reality' that enables the digital world." Robin Nelson, "Swept Away by the Digital Age," *Popular Science* (November 1993) pp. 92–97.

13. "The telephone and other sound-collecting technologies allow us to extend the geographic and wavelength range of our hearing; the development of computer networks has been in response to this need to extend the sensory apparatus. An important impact of the extension of the computer through computer networks is to give credence to the concept of 'mind at large.' As argued by Gregory Bateson, the human plus the computer plus the environment can be viewed as constituting a thinking system, which today can be considered planetary in dimension." Roger F. Malina, "Digital Image—Digital Cinema: The Work of Art in the Age of Post-Mechanical Reproduction," *Digital Image—Digital Cinema*, SIGGRAPH '90 Art Show Catalog, Supplemental Issue of *Leonardo* (1990) pp. 33–38.

14. "Richard Dawkins coined the term *memes* (as parallel with *genes*) for ideas that are like viruses. Not only do they take hold in host organisms (human minds) but they arrange to have themselves

spread around (via proselytizing, or argument, or science fiction novels) to infect others. Some memes are lethal, some are symbiotic. And many are mutually incompatible. Memes can wage war with one another over the territory of our minds." David Brin, "Metaphorical Drive," in George Slusser and Eric Rabkin, eds., *Mindscapes: The Geographies of Imagined Worlds* (Carbondale, IL: Southern Illinois Univ. Press, 1989) p. 74.

15. "It was obviously predictable that manufactured electronics computers, too, would eventually play host to self-replicating patterns of information—memes. Computers are increasingly tied together in intricate networks of shared information. Many of them are literally wired up together in electronic mail exchange. Others share information when their owners pass floppy discs around. It is a perfect milieu for self-replicating programs to flourish and spread." Richard Dawkins, *The Selfish Gene* (Oxford: Oxford Univ. Press, 1976) p. 329.

16. "N. K. Humphrey neatly summed up an earlier draft of this chapter: '. . . memes should be regarded as living structures, not just metaphorically but technically. When you plant a fertile meme in my mind you literally parasitize my brain, turning it into a vehicle for the meme's propagation in just the way that the virus may parasitize the genetic mechanism of a host cell. And this isn't just a way of talking—the meme for, say, 'belief in life after death' is actually realized physically, millions of times over, as a structure in the nervous systems of individual men the world over.'" Dawkins [15] p. 192. Myron Krueger has also written that "Increasingly people are products of artificial experience. Vicarious experience through theatre, novels, movies and television represents a significant fraction of our lives. The addition of a radically new form of physically involving, interactive experience is a major cultural event which may shape our consciousness as much as what has come before." Myron W. Krueger, "Artificial Reality: Past and Future," *Multimedia Review: The Journal of Multimedia Computing* 1, No. 2, 31–34 (1990).

17. Roy Ascott as cited in Anna Couey, "Art Works as Organic Communication Systems," *Connectivity: Art and Interactive Telecommunications*, Special Issue of *Leonardo* 24, No. 2, 127 (1991).

18. "Man becomes, as it were, the sex organs of the machine world, as the bee of the plant world, enabling it to fecundate and to evolve ever new forms." Marshall McLuhan, *Understanding Media* (New York: McGraw-Hill, 1964) p. 46.
It would be interesting to study the phenomenon of sexuality and love by means of and in relation to technologies. Here, it is not simply a question of "pink messages," for we can also underline the fascination that the possibility of sexual cyberspace seems to elicit. In this regard, also see Alan Rifkin, "Terminal Bliss," *Details* (June 1993) pp. 30–38; the films *Brainstorm*, directed by Douglas Trumbull, and *The Lawnmower Man*, directed by Brett Leonard; and, in particular, Marge Piercy's novel *He, She, and It*, whose whole structure is centered around an emotional, sexual and almost mystic relationship between a woman and a cyborg. It is even more important to speak of phenomena such as electronic mail and Multi-User Dimensions (MUDs, originally termed Dragons as inspired by the game "Dungeons and Dragons"). Conversations and electronic games accessible through Internet and other networks are often means of encounters, flirtations and virtual eroticism (which, not rarely, transform into actual meetings). See Sherry Turkle, "Constructions and Reconstructions of Self in Virtual Reality," paper presented at the Third Conference on Cyberspace, University of Texas at Austin, 14–15 May 1993. Further, in "Will the Real Body Please Stand Up?" Allucquere Rosanne Stone writes, "A space that is a locus of intense desire for refigured embodiment . . . In other words, to enter cyberspace is to physically put on cyberspace. To become the cyborg, to put on the seductive and dangerous cybernetic space like a garment, is to put on the female. Thus cyberspace

both disembodies, in Shobchak's terms, but also reembodies in the polychrome, hypersurfaced cyborg character of the console cowboy. As the charged, multiengendered, hallucinatory space collapses onto the personal physicality of the console cowboy, the intense tactility associated with such a reconceived and refigured body constitutes the seductive quality of what one might call the cybernetic act." Allucquere Rosanne Stone, "Will the Real Body Please Stand Up?: Boundary Studies about Virtual Cultures," in Benedikt [10] p. 109.

19. In the introduction to the collection *Mindscapes: The Geographies of Imagined Worlds*, Slusser and Rabkin define the concept of mindscapes: "We witness the mind using its speculative power in hopes of reading beyond itself, for turning ghostly paradigms into solidly realized places—a terrain in which the whole man can act, interact, and ultimately grow." George E. Slusser and Eric S. Rabkin, "Introduction: The Concept of Mindscape," in Slusser and Rabkin [14] p. x.
Howard Rheingold, in Brenda Laurel's book *The Art of Human-Computer Interface*, and Michael Benedikt, in his introduction to *Cyberspace*, both speak of such mental landscapes: "Cyberspace is a human-computer interface, but it is also a mindspace, the way mathematics and music and myth are mind-spaces—mind-spaces you can walk around in and grab by the handles." Howard Rheingold, "What's the Big Deal about Cyberspace?", in Brenda Laurel, ed., *The Art of Human-Computer Interface Design* (Reading, MA: Addison-Wesley Publishing Company, 1990) p. 449.
"Cyberspace as just described—and, for the most part, as described in this book—does not exist. But this states a truth too simply. Like Shangri-la, like mathematics, like every story ever told or sung, a mental geography of sorts has existed in the living mind of every culture, a collective memory or hallucination, an agreed-upon territory of mythical figures, symbols, rules and truths, owned and traversable by all who learned its ways, and yet free of the bounds of physical space and time." Benedikt [10] p. 3.

20. "In this instance the participant becomes both a receptor/receptacle of sense data introduced by a cybernetic automaton as well as a visual traveller, a receptacle of motion. The subject ceases to exist and, as Paul Virilio puts it, becomes motion. Decapitated by the virtual reality experience, the body loses its self-definition, forcing a restructuring of the notion of environment, its internalization thereby eliminating heretofore distinctions of within and without. The body is caught in the ambiguity of wholeness/loneliness. The body as receptor of motion becomes the medium itself. The medium is the body." Francine Dagenais, "Perfect Bodies," in Catherine Richards and Nell Tenhaff, eds., *Virtual Seminar on the Bioapparatus* (Banff, Canada: The Banff Centre for the Arts, 1991) p. 43.

21. Lyotard writes, "In supposing the autonomy of the creatures in the mirror, Borgès is not proposing a meditation . . . on isomorphism and heteromorphism of the representing and the represented; he is imagining these beings as forces, and this border as a barrier; he is imagining that the Emperor, the Despot in general can only keep his place by concealing the monsters and containing them beyond this transparent wall. The existence of the subject clings to this partition, it clings to its subjection to fluid and lethal powers, concealed from the other side but functioning as its representative. Representation is thus supposed to be an energetic apparatus, of which the ruin will be that of the subject and that of power. The problem of the theatre and of 'figurative' painting is no longer posed as a problem of knowledge or of understanding, or even of truth, but as a problem of ability and of power." Jean-François Lyotard, *L'Assassinat de l'expérience par la peinture, Monory* (Paris: le Castor Astral, 1984) p. 13.
Nicole Stenger, in "Mind Is a Leaking Rainbow," writes: "[those idealists] had sensed from the beginning that the medium of computer animation was no mere image generation in the traditional sense,

but rather a virtual world populated by half-living entities, that we would inhabit someday when the technology would allow it. Like them, I felt that this hallucination behind a screen was just the first stage in a development, a rehearsal for a D day when this substance would finally escape and invade what we call reality." Nicole Stenger, "Mind is a Leaking Rainbow," in Benedikt [10] p. 49.
The French scientist Philippe Quéau, in his book *Éloge de la simulation*, makes the following observation: "Indeed, certain mathematicians say that the science of math cannot be reduced to a symbol manipulation game, but that there seem to be 'mathematical beings' beneath formal theories." Phillippe Quéau, *Éloge de la simulation* (Paris: Collection milieux, Champ Vallon, 1986) p. 13.
Last but not least, in Steven Levy's book *Artificial Life*, researcher Christopher Langton, in talking about the urge to examine artificial life, says: "There are these other forms of life, artificial ones, that want to come into existence. And they are using me as a vehicle for its reproduction and its implementation." Steven Levy, *Artificial Life* (New York: Vintage Books, 1992) p. 120.

22. Gregory Banford, "Effing the Ineffable," in George Slusser and Eric Rabkin, eds., *Aliens: The Anthropology of Science Fiction* (Carbondale, IL: Southern Illinois Univ. Press, 1987) p. 19.

23. "Machine universe" refers to the title of a book by Pierre Levy, *La Machine univers*.

24. Or "Bioapparatus," the name of the seminar given in 1991 by Nell Tenhaff and Catherine Richards at the Banff Centre for the Arts. To which Michael Joyce has said, "The first 'bioapparatus' was the world." Michael Joyce, "The Momentary Advantage of Our Awkwardness," in Richards and Tenhaff [20].

25. Bruce Berland, "Reversing the Lens System: The DAX Group in 1991," *Connectivity: Art and Interactive Telecommunications* [17].

26. In *Dead Girls*, Richard Calder illustrates well how this idea of the virus has been able to impregnate the contemporary imaginary: "'*Klong Fever*,' continued Primavera. 'Didn't he say that's how it all began? Forty years ago Cartier Paris—getting pretty tired with the way people like you were flooding the market with imitation dolls—cooked a virus that could bridge the hardware-wetware divide. A bug that could be transmitted from machine to man. Cartier stole some of your dolls, your imitation Cartier; infected them; then returned them to the Weird. The bug was an STD, but it was also ethnically selective. It was turned on by genes peculiar to oriental DNA. *Klong Fever*, the Thais called it. It made them important. Sort of long-term genocide *à la beau monde*. Nobody suspected the source of the virus; dolls are supposed to be disease-free. Nobody, that is, except you. You chose to retaliate. You cooked your own virus. Had it taken to Paris to infect their dolls. It was supposed to induce priapism, which I suppose you, Madame (you are so predictable), thought you could exploit. But according to Jack Morgenstern things didn't quite work out that way . . .'" Richard Calder, *Dead Girls* (London: HarperCollins Publishers, 1993) pp. 74–75.

27. Dawkins [15].

28. In the 1980s NASA (the National Aeronautics and Space Administration) put together a group of scientists called the Self-Replicating Systems Concept Team, whose goal was to "determine the role of advanced automation and robotic devices in future space missions . . . The SRS Concept Team sought to demonstrate that 'machine self-replication and growth is a fundamentally feasible goal.' . . . They envisioned a near-eternal coexistence where, for the price of merging itself into a larger system, 'mankind could achieve immortality for itself.'" Levy [21] pp. 34, 37, 41.

29. I am not referring to this movement as "cyberpunk," because I want to include works of art that are not specifically cyberpunk.

30. "Gibson's first sentence—'the sky above the port was the colour of television, tuned to a dead channel'—invokes a rhetoric of technology to express the natural world in a metaphor which blurs the distinctions between the organic and the artificial. . . . We can read cyberpunk as an analysis of the postmodern identification of human and machine." Veronica Hollinger, "Cybernetic Deconstructions: Cyberpunk and Postmodernism," *Mosaic, A Journal of the Interdisciplinary Study of Literature* **23**, No. 2, 29–44 (1990).

31. This exhibition takes place annually in Montreal during the summer months.

32. Edmont Couchot, "Sujet, Objet, Image," *Cahiers Internationaux de sociologie* **82** (January–June 1987) pp. 85–98.

33. "Reality is virtual when the significance of life appears in a place we cannot find, a space invisible to the gaze or to the touch." David Rothenberg, in Richards and Tenhaff [20] p. 19.

34. As we know, the various dangers inherent in the emergence of any new technology are potentially very serious with respect to cyberspace (for more information on this topic, I recommend reading *Cyborg Worlds: The Military Information Society*, by Les Levidow and Kevin Robins). Not only is this technology essentially a military one, but it is also a deeply commercial one. Thus, questions regarding privacy, control of information, bodily invasions, genetic manipulations, the rearranging of history, weapons intelligence, etc. become complex and potentially dangerous problems (problems that have been addressed, in rather dystopian narratives, by the cyberpunk movement). As far as those questions are concerned, Thomas Mical, in a paper presented at the Third Conference on Cyberspace, suggested that we are now deeply enmeshed in what he calls a "stealth landscape," that is, a space controlled and dominated by the military-industrial complex: "The stealth landscape operates around us, unseen. As objects, incidents, and spaces within the city are lost or disappear, the questions of their duration and destination are raised. If they are reconfigured or recede into the mottled and weathered background textures of multiple (formal, conceptual, electro-mechanical) landscapes, clearly any space, city or landscape can be defined by its negation rather than its institutions. The spaces of modernism are the scenes of disappearances or theaters of negation. These alternate readings, in their entirety, comprise the stealth landscape. . . . The stealth landscape is a post-machinic landscape aesthetic informed by the art of disappearances operating within every metropolis (and its electro-mechanical re/presentation). . . . From this vantage point, cyberspace is not a place but a negational atmosphere." Thomas Mical, "The Stealth Landscape," paper presented at the Third Conference on Cyberspace, University of Texas at Austin, 14–15 May 1993.

35. "It [computer art] is not simply active, putting on a performance of entertaining wizardry, but it recognizes us as sentient beings with whom dialogue is possible. The paradigm by which to comprehend computer art is not the medium or the medium simulation, but the interlocutor." Timothy Binkley, "The Wizard of Ethereal Pictures and Virtual Places," *Computer Art in Context*, SIGGRAPH '89 Art Show Catalog, Supplemental Issue of *Leonardo* (1989) pp. 13–20.

36. N. Scott Momaday, *The Gourd Dancer* (New York: Harper and Row, 1976) p. 18.

37. Pat Cadigan, *Synners* (New York: Bantam Books, 1991) p. 334.

Bibliography

Ascott, Roy, "Is There Love in the Telematic Embrace?" *Art Journal* (Fall 1990) pp. 241–247.

Binkley, Timothy, "Digital Dilemmas," *Digital Image—Digital Cinema*, SIGGRAPH '90 Art Show Catalog, Supplemental Issue of *Leonardo* (1990) pp. 13–19.

Brin, David, "Metaphorical Drive," in George Slusser and Eric Rabkin, eds., *Mindscapes: The Geographies of Imagined Worlds* (Carbondale, IL: Southern Illinois Univ. Press, 1989).

Bukatman, Scott, *Terminal Identity: The Virtual Subject in Postmodern Science Fiction* (Durham, NC: Duke University Press, 1993).

Gibson, William, *Neuromancer* (New York: Ace Books, 1984).

Heim, Michael, "The Metaphysics of Virtual Reality," *Multimedia Review* **1**, No. 3, 40–44 (1990).

Levidow, Les, and Kevin Robins, *Cyborg Worlds: The Military Information Society* (London: Free Association Books, 1989).

Levy, Pierre, *Les technologies de l'intelligence. L'avenir de la pensée à l'ère informatique* (Paris: Editions La Découverte, 1990).

Pagels, Heinz R., *The Dreams of Reason* (New York: Simon and Schuster, 1988).

Piercy, Marge, *He, She, and It* (New York: Fawcett Crest, 1991).

Porush, David, "Cybernetic Fiction and Postmodern Science," *New Literary History* **20** (1988–1989) pp. 373–396.

Porush, David, *The Soft Machine, Cybernetic Fiction* (New York: Methuen, 1985).

Quéau, Philippe, "L'Ère de la télévision a déjà commencé. La révolution des images virtuelles," *Le Monde diplomatique* No. 473 (August 1993) pp. 16–17.

Quéau, Philippe: *Le Virtuel. Virtus et Vertiges* (Champ Vallon, Collection Milieux, L'Institut national de l'audiovisuel, 1993).

Rheingold, Howard, *Virtual Reality* (New York: Simon and Schuster, 1991).

Rifkin, Alan, "Terminal Bliss," *Details* (June 1993) pp. 30–38.

Weizenbaum, Joseph, *Computer Power and Human Reason* (San Francisco, CA: W.H. Freeman Company, 1976).