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Becoming Virtual

Reality in the Digital Age

Also by Pierre Lévy

Collective Intelligence:
Mankind's Emerging World in Cyberspace

Becoming Virtual

Reality in the Digital Age

Pierre Lévy

Translated from the French by

Robert Bononno

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For Eden and Loup-Noé, joy and innocence

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Introduction

"The virtual possesses complete reality, in its virtuality."

Gilles Deleuze, *Différence et Répétition*

"Virtual reality corrupts, absolute reality corrupts absolutely."

Roy Ascott, Ars electronica Prize, 1995

A general movement of virtualization has begun to affect not only the fields of information and communication but also our physical presence and economic activities, as well as the collective framework of sensibility and the exercise of intelligence. The process of virtualization has even affected our modalities of being together, the constitution of a collective "we" in the form of virtual communities, virtual corporations, virtual democracy. Although the digitization of messages and the extension of cyberspace play an important role in the ongoing change, the wave of virtualization taking place extends far beyond the field of information technology.

Is there a reason to fear a general process of derealization, a kind of all-encompassing disappearance, as Jean Baudrillard has suggested? Are we threatened by the looming presence of a cultural apocalypse, by the terrifying implosion of space-time, which Paul Vir-

ilio has been talking about for the past several years? This book assumes a different, noncatastrophic point of view. As we enter the third millennium, societies throughout the world are undergoing various forms of cultural evolution. Despite the undeniably bleak and terrifying aspects of such change, the process of hominization continues.

Never before have the technological, economic, and social changes around us occurred so rapidly or been so destabilizing. Virtualization itself represents the essence, the cutting edge of the mutation taking place. As such, virtualization is neither good nor bad, nor even neutral, but manifests itself as the very process of humanity's "becoming other"—its heterogenesis. In place of fear, condemnation, or unquestioning acceptance, I am asking that we take the trouble to recognize and understand virtualization in all its breadth.

As I will try to show in this book, the virtual, strictly defined, has little relationship to that which is false, illusory, or imaginary. The virtual is by no means the opposite of the real. On the contrary, it is a fecund and powerful mode of being that expands the process of creation, opens up the future, injects a core of meaning beneath the platitude of immediate physical presence.

Many philosophers have dealt with the concept of virtuality, including a number of contemporary French thinkers such as Gilles Deleuze and Michel Serres. What then do I hope to accomplish in the present work? Quite simply, rather than defining the virtual as a specific mode of being, I want to analyze and illustrate *the process of transformation from one mode of being to another*. This book is a study of the virtualization that ascends from the real or the actual toward the virtual. The philosophical tradition, including some of the most recent work in the field, has analyzed the transition

from the possible to the real or from the virtual to the actual. To my knowledge there has been no study about the *opposite transformation*, the movement toward the virtual. Yet it is precisely this movement of return that seems to characterize both the process of self-creation that resulted in the development of the human species and the accelerated cultural transition taking place today. Consequently, this book addresses the virtual from three separate but related points of view: philosophical (the concept of virtualization), anthropological (the relationship between the process of hominization and virtualization), and sociopolitical (understanding contemporary change so that we can play a role in the events taking place in the world). With respect to this latter point, the most useful alternative avoids any simplistic opposition between the real and the virtual, and instead presents us with a choice among various modalities of virtualization. Moreover, we need to distinguish between a virtualization in the process of creation, on the one hand, and its alienating, reifying, and invalidating caricatures on the other. Thus there is, in my opinion, an urgent need that we establish a cartography of the virtual, which this book attempts to satisfy.

In the first chapter, "The Nature of Virtualization," I define the principal concepts of reality, possibility, actuality, and virtuality that will be used throughout the book, as well as the various transformations from one mode of being to another. This chapter also provides an opportunity to analyze virtualization itself and, in particular, deterritorialization and the bizarre spatiotemporal phenomena generally associated with it.

The three following chapters concern the virtualization of the body, the text, and the economy. The concepts introduced in previous chapters are then used

to discuss contemporary phenomena and analyze the dynamic of economic and cultural change taking place.

The fifth chapter analyzes the process of hominization in terms of the theory of virtualization: the virtualization of the immediate present by language, the virtualization of physical action by technology, and the virtualization of violence by the contract. Thus, despite its brutality and strangeness, the crisis of civilization we are experiencing can be understood in terms of the continuity of the human adventure.

Chapter Six, "The Operations of Virtualization or the Anthropological Trivium," uses the empirical data presented in the preceding chapters to address the invariant core of basic operations at work in all processes of virtualization: a grammar, dialectic, and rhetoric that have been expanded to accommodate technological and social phenomena.

The seventh and eighth chapters examine the "virtualization of intelligence." They introduce the technosocial operation of cognition by following a dialectic of the objectivation of interiority and the subjectivation of exteriority, which are typical of virtualization. These chapters end with the presentation of two major ideas: first, a renewed vision of the *collective intelligence* that is emerging within digital communications networks, and second, the construction of a concept of the *object* (as social mediator, technological substrate, and nucleus of intellectual operations), which the theory of virtualization provides.

The ninth chapter summarizes and systematizes the information provided earlier, and outlines a philosophical project capable of incorporating the duality of event and substance, intimated throughout the course of the book.

The epilogue looks to an art of virtualization and a new aesthetic sensibility, which, during this period of profound deterritorialization, makes an expanded sense of hospitality its principal focus.

1

The Nature of Virtualization

The Actual and the Virtual

Consider the simple and misleading opposition between the real and the virtual. As it is currently used, the word "virtual" is often meant to signify the absence of existence, whereas "reality" implies a material embodiment, a tangible presence. Reality is implied when someone says "I've got it," virtuality when they say "You'll get it." The illusion involved generally allows us to introduce a sense of trivial irony to evoke the various forms of virtualization. As I'll try to show later on, this approach involves an interesting element of truth, but it is obviously too simplistic to form the basis of a general theory.

The word "virtual" is derived from the Medieval Latin *virtualis*, itself derived from *virtus*, meaning strength or power. In scholastic philosophy the virtual is that which has potential rather than actual existence. The virtual *tends* toward actualization, without undergoing any form of effective or formal concretization. The tree is virtually present in the seed. Strictly speaking, the virtual should not be compared with the real but the actual, for virtuality and actuality are merely two different ways of being.

Here, I would like to introduce the distinction between the possible and the virtual, which Gilles Deleuze discussed in *Différence et Répétition*.[1] The possible is already fully constituted, but exists in a state of limbo. It can be realized without any change occurring either in its determination or nature. It is a phantom reality, something latent. The possible is exactly like the real, the only thing missing being existence. The realization of a possible is not an act of creation in the fullest sense of the word, for creation implies the innovative production of an idea or form. The difference between the possible and the real is thus purely logical.

The virtual should, properly speaking, be compared not to the real but the actual. Unlike the possible, which is static and already constituted, the virtual is a kind of problematic complex, the knot of tendencies or forces that accompanies a situation, event, object, or entity, and which invokes a process of resolution: actualization. This problematic complex belongs to the entity in question and even constitutes one of its primary dimensions. The seed's problem, for example, is the growth of the tree. The seed *is* this problem, even if it is also something more than that. This does not signify that the seed *knows* exactly what the shape of the tree will be, which will one day burst into bloom and spread its leaves above it. Based on its internal limitations, the seed will have to invent the tree, coproduce it together with the circumstances it encounters.

In one sense the entity conveys and produces its virtualities. An event, for example, reorganizes a previous problematic and is susceptible of being interpreted in various ways. In another sense the virtual constitutes

[1] Complete references will be found in the annotated bibliography located at the end of the book.

the entity. The virtualities inherent in a being, its problematic, the knot of tensions, constraints, and projects that animate it, the questions that move it forward, are an essential element of its determination.

Actualization

Actualization thus appears as the solution to a problem, a solution not previously contained in its formulation. It is the creation, the invention of a form on the basis of a dynamic configuration of forces and finalities. Actualization involves more than simply assigning reality to a possible or selecting from among a predetermined range of choices. It implies the production of new qualities, a transformation of ideas, a true becoming that feeds the virtual in turn.

For example, if running a computer program, a purely logical entity, implies a relationship between the possible and the real, then the interaction between humans and computer systems implies a dialectic between the virtual and the actual. Writing a software program, for example, is a way of addressing a problem in an original manner. Each team of programmers redefines and resolves, although differently, the problem it is faced with. The actualization of the program during use in a work environment, however, ignores certain skills, reveals new kinds of functionality, gives rise to conflicts, resolves problems, and initiates a new dynamic of collaboration. The software carries with it a virtuality of change that the group—also set in motion by a dynamic arrangement of tropisms and constraints—actualizes in a more or less inventive way. The real resembles the possible. The actual, however, in no way resembles the virtual. It responds to it.

Virtualization

We now have a better idea of the difference between realization (the occurrence of a predetermined possible) and actualization (the invention of a solution required by a problematic complex). But what is virtualization? No longer the virtual as a way of being but virtualization as a dynamic. Virtualization can be defined as the movement of actualization in reverse. It consists in the transition from the actual to the virtual, an *exponentiation* of the entity under consideration. Virtualization is not a derealization (the transformation of a reality into a collection of possibles) but a change of identity, a displacement of the center of ontological gravity of the object considered. Rather than being defined principally through its actuality (a solution), the entity now finds its essential consistency within a problematic field. The virtualization of a given entity consists in determining the general question to which it responds, in mutating the entity in the direction of this question and redefining the initial actuality as the response to a specific question.

Let's look at the very contemporary example of the virtualization of a company. The conventional organization gathers its employees in one building or a group of buildings. Each employee occupies a precisely defined physical position, and his schedule indicates the hours he will work. A virtual corporation, on the other hand, makes extensive use of telecommuting. In place of the physical presence of its employees in a single location, it substitutes their participation in an electronic communications network and the use of software resources that promote cooperation. The virtualization of the corporation consists primarily in transforming the spatiotemporal coordinates of work into a continuously renewed problem rather than a stable solution. The organization's center of gravity is no longer a group of

buildings, workstations, and schedules, but a process of coordination, which redistributes the spatiotemporal coordinates of the labor community and each of its members as a function of various constraints.

Actualization proceeds from problem to solution, virtualization from a given solution to a (different) problem. It transforms an initial actuality into a particular instance of a more general problematic, one on which the ontological accent is now placed. Having done so, virtualization fluidizes existing distinctions, augments the degrees of freedom involved, and hollows out a compelling vacuum. If virtualization were nothing more than the transition from a reality to a collection of possibles, it would be derealizing. But it implies as great a sense of irreversibility in its effects, indeterminacy in its processes, and creativity in its striving, as actualization. Virtualization is one of the principal vectors in the creation of reality.

Getting Away: Virtualization as Exodus

Having defined virtualization in its most general sense, I would now like to examine one of its principal modalities: its detachment from the here and now. As I indicated earlier, common sense interprets the virtual as something intangible, the complement of the real, or tangible. This approach contains a significant germ of truth, however, for the virtual is quite often literally "not there." The virtual corporation can no longer be precisely located. Its elements are nomadic, dispersed, and the pertinence of their geographic position significantly diminished.

Does the text exist here on paper, occupying its assigned position in physical space, or rather in terms

of some abstract organization that is actualized in a variety of languages, versions, editions, and typefaces? Today a given text can appear as the actualization of a digital hypertext. Does such a text "virtually" occupy every point in the network connected to the digital memory in which it is encoded? Does it extend to each terminal from which it can be copied in a matter of seconds? While it is possible to assign an address to a digital file, given the present state of on-line technology, this address is transitory and relatively insignificant. Deterritorialized, fully present in all its existing versions, copies and projections, deprived of inertia, ubiquitous inhabitant of cyberspace, hypertext helps produce events of textual actualization, navigation, and reading. Only such events can be said to be truly situated. And although it requires a real physical substrate for its subsistence and actualization, the imponderable hypertext has no place.

Michel Serres's book *Atlas* illustrates the theme of the virtual as something "not-there." Imagination, memory, knowledge, and religion are the vectors of virtualization that have enabled us to leave this "there" long before the appearance of computerization and digital networks. While developing this theme, Serres indirectly pursues a polemic against the Heideggerian philosophy of "being-there." This is the literal translation of the German *dasein*, which primarily signifies existence in classical philosophical German and specifically human existence—being a human being—for Heidegger. However, the fact of not being associated with any "there," of clinging to an unassignable space (the one in which telephone conversations take place?), of occurring only *between* things that are clearly situated, or of not being only "there" (like any thinking being)—none of this prevents us from existing. Although etymology doesn't really prove anything, it is worth pointing out that the word "exist" is derived

from the Latin *sistere*, to cause to stand or place, and *ex*, outside of. Does existence therefore mean being in a place or leaving it? *Dasein* or existence? It is as if the German emphasized actualization and the Latin virtualization.

A virtual community can, for example, be organized on the basis of its affinities through the intermediary of telematic communications systems. Its members are reunited by the same centers of interest and the same problems: geography, being contingent, is no longer a starting point or constraint. Although it is strictly speaking "not-there," this community is guided by passions and projects, conflicts and friendships. It exists without a stable point of reference: wherever its mobile members happen to be...or nowhere at all. Virtualization reinvents a nomadic culture, not through a return to the Paleolithic or to the early pastoral civilizations, but by creating a medium of social interaction in which relations reconfigure themselves with a minimum of inertia.

When a person, community, act, or piece of information are virtualized, they are "not-there," they deterritorialize themselves. A kind of clutch mechanism detaches them from conventional physical or geographical space and the temporality of the clock or calendar. They are not totally independent of a referential space-time since they must still bond to some physical substrate and become actualized somewhere sooner or later. Yet the process of virtualization has caused them to follow a tangent. They intersect classical space-time intermittently, escaping its "realist" clichés: ubiquity, simultaneity, massively parallel or distributed systems. Virtualization comes as a shock to the traditional narrative, incorporating temporal unity without spatial unity (by means of real-time interactions over electronic networks, live rebroadcasts, telepresence systems),

continuity of action coupled with discontinuous time (answering machines and electronic mail, for example). Synchronization replaces spatial unity, interconnection is substituted for temporal unity. Yet the virtual is not imaginary. It produces effects. Though we don't know where, telephone conversations do take "place," as I'll show in the following chapter. Though we don't know when, we communicate effectively by means of answering machines. The most deterritorialized agents, those that have been decoupled from a specific spatiotemporal presence, the most fully virtualized and virtualizing communities of the contemporary world, are those associated with technoscience, finance, and the media. And they structure our social reality with the greatest force, perhaps even the greatest violence.

Taking a profoundly actual constraint (time and place) and making it a contingent variable clearly involves the creation of an effective solution to a problematic and thus of virtualization in the sense in which we defined it earlier. It was therefore to be expected that deterritorialization, the escape from the "here" and "now" and "that," would be encountered as one of the royal roads to virtualization.

New Spaces, New Velocities

But the same movement that makes ordinary space-time contingent also opens up new environments for interaction and synchronizes unforeseen chronologies. Before analyzing this important property of virtualization, I would first like to introduce the notion of the plurality of times and spaces. As soon as subjectivity, signification, and pertinence come into play, we are no longer dealing with a single expanse or uniform chronology, but a multitude of types of space

and duration. Every life form invents its world (from the microbe to the tree, the bee to the elephant, the oyster to the migratory bird) and with this world, a specific space and time. The cultural universe, characteristic of humanity, further extends this spatial and temporal variability. For example, each new system of communication and transportation modifies the system of practical proximities, that is, the pertinent space for human communities. When we build a railway network, it is as if we had physically joined the cities or regions connected by rail and dissociated those that are not part of the network. For those who don't travel by train, however, the former distances are still valid. The same is true of the automobile, air travel, the telephone, etc. Several systems of proximity coexist, several practical spaces.

In analogous fashion, different systems of recording and transmission (oral traditions, writing, audiovisual recording, digital networks) construct different rhythms, velocities, and historical qualities. Each new mechanism, each technosocial "machine" adds a space-time, a special cartography, a singular music, to a kind of elastic and complicated system in which expanses are covered over, deformed, and interconnected, in which temporalities interact, respond, or are contrasted to one another. The contemporary multiplication of spaces has made us nomads once again. But rather than following tracks and migrations within a fixed domain, we leap from network to network, from one system of proximity to the next. The spaces metamorphose and bifurcate beneath our feet, forcing us to undergo a process of heterogenesis.

The process of virtualization that disengages us from a specific environment did not begin with the human species. It is inscribed in history, in life. According to Josef Reichholf, from the most primitive single-cell creatures up through birds and mammals, improve-

ments in locomotion have introduced "increasingly larger spaces and more abundant possibilities of existence for living beings" (Reichholf 1994, 222). The invention of new velocities is the first degree of virtualization.

Reichholf notes that "the number of persons who now travel cross-country for vacation is greater than the total number of persons who were in transit during the period of the great invasions" (Reichholf 1994, 226). The acceleration of communication is contemporaneous with an enormous growth in physical mobility. Both are part of the *same* wave of virtualization. Tourism is currently the number one global industry in terms of annual turnover. The economic significance of the activities involved in supporting and maintaining the processes of physical locomotion (vehicles, infrastructures, fuel) is infinitely greater than it was in previous centuries. Will the multiplication of the media and increasing speed of communication become a substitute for physical mobility? Probably not. For until now, the two types of growth have always paralleled one another. Those who make the most phone calls are also those who interact with the largest number of people face to face. The growth of communication and the generalization of high-speed transport are part of the same process of virtualization affecting society, the same tension that drives us to get away from "there."

The transportation revolution has complicated, shortened, and metamorphosed space, but this has obviously resulted in the significant degradation of the traditional environment. By analogy with the problems of locomotion, we should also question the price we will have to pay for computer-mediated virtualization. What fuel will we burn when we are still unable to monitor its usage? Will wear and decay have any meaning in this environment? Will we leave in our wake a

series of devastated landscapes of data? Here, the ultimate substrate is subjective. Just as ecology balanced recycling with the technologies of waste and pollution, human ecology will have to balance continuous learning and skills improvement with disqualification and the accumulation of human waste (the so-called "marginal" individual). With respect to this meditation on the escape from "there," we should bear in mind that virtualization does not simply accelerate already known processes or suspend, or even annihilate, time and space, as Paul Virilio has claimed. Based on expenditure and risk, it creates qualitatively new velocities, mutant space-time systems.

The Moebius Effect

Aside from deterritorialization there is another characteristic often associated with virtualization: the transition from interior to exterior and from exterior to interior. This "Moebius effect" takes place in several different registers: between public and private, personal and shared, subjective and objective, map and territory, author and reader, etc. I will give several examples throughout the course of the book but the idea can be illustrated using the previously mentioned notion of the virtual corporation.

The traditional worker had *his* office. The participant in the virtual corporation, however, *shares* a number of physical (buildings and furnishings) and software resources with other employees. The member of the conventional corporation travels from the private space of his home to the public space of the workplace. In contrast, the telecommuter transforms his private space into a public space and vice versa. Although the opposite is more often the case, he is frequently able to man-

age a public temporality on the basis of purely personal criteria. The limits of interaction are no longer self-evident. Place and time blend together. Clear borders give way to fractalized divisions. The very concepts of public and private are called into question. Earlier, I referred to the worker as a "member" of the corporation. This assumes a clear sense of belonging. However, this is precisely the source of the problem, since there now exists a continuum among the traditional long-term employee, the contract employee, the term employee, the beneficiary of social programs, the member of an affiliate, the client, supplier, intermittent consultant, and loyal independent contractor. And at each point in the continuum the question is repeated: Who am I working for? Intercorporate systems for electronic document management, like the group projects shared among several organizations, frequently weave stronger bonds among mixed communities than those that passively unite individuals who officially belong to the same legal entity. The sharing of resources, information, and skills does indeed result in such indecision and active blurring of boundaries, oscillating between outside and inside.

Only in reality do things have clearly defined limits. Virtualization, the transition to a problematic, the shift from being to question, necessarily calls into question the classical notion of identity, conceived in terms of definition, determination, exclusion, inclusion, and excluded middles. For this reason virtualization is always heterogenesis, a becoming other, an embrace of alterity. We should not confuse heterogenesis with alienation, its intimate and menacing opposite, its enemy sister, which I would characterize as reification, a reduction to the thing, to the "real." These ideas will be more fully developed and illustrated in the following chapters, where I will look at three specific instances of virtualization: the virtualization of the body, the text, and the economy.

2

The Virtualization of the Body

Reconstructions

By means of communications and telepresence technologies we are simultaneously here and there. Medical imaging makes our organic interiority transparent. Using grafts and prostheses, we blend our physical being with that of others and with artifacts. By extending our knowledge of the body and the ancient arts of nutrition, we have devised hundreds of ways of constructing and remodeling ourselves: dietetics, body building, cosmetic surgery. We can change our individual metabolism through the use of drugs or medicaments, which serve as transcorporeal physiologic agents or collective secretions. And the pharmaceutical industry continues to discover new active principles. Reproduction, immunity against disease, the control of emotional states, all of which were traditionally private, have now become public, exchangeable, externalized. From the socialization of somatic function to the self-control of affects or mood through industrial biochemistry, our physical and psychic life is now filtered to an ever greater extent through a complicated "exteriority" in which economic, institutional, and technoscientific processes are intertwined. Biotechnology forces us to consider current plant and animal species (and even our own) as particular and perhaps contingent within a vast and still unexplored virtual biological continuum. Like informa-

tion, knowledge, economy, and society, the virtualization of the body that we are experimenting with today represents a new stage in the process of self-creation that our species sustains.

Perceptions

I would like to take a closer look at the somatic functions in detail to demonstrate the operations of the contemporary process of the virtualization of the body. Perception is a way of bringing the world to us, a function obviously externalized in telecommunications systems. The telephone for the sense of hearing, television for sight, systems of remote manipulation for touch and sensorimotor activity—all are ways of virtualizing the senses. In doing so they pool the resources of the virtualized organs. People watching the same television program, for example, share the same collective eye. Using cameras, video devices, and tape recorders, we are able to perceive the sensations experienced by another person, at another time and place. So-called virtual reality systems enable us to experiment with the dynamic integration of different perceptual modalities. We are practically able to relive someone else's complete sensory experience.

Projections

The symmetrical function of perception is the projection in the world of action and image. The projection of action is obviously associated with machinery, transportation networks, circuits of energy production and transfer, and weapons. In this case a large number of individuals share the same enormous, deterritorialized

virtual arms. I won't develop this aspect of the question any further, however, since it would require more detailed analysis of technological phenomena in general.

The projection of the image of the body is generally associated with the notion of telepresence. But telepresence is always something more than just the projection of the image. The telephone, for example, already functions as a telepresence device. It does not merely convey an image or representation of the voice; it carries that voice. The telephone separates voice (the audible body) from the tangible body and transmits it to a remote location. My tangible body is here, my audible body, doubled, is both here and there. The telephone already actualizes a partial form of ubiquity. The audible body of my correspondent is also affected by the same act of doubling. So that we are both, respectively, here and there, but the distributions of our tangible bodies intersect.

Systems of virtual reality transmit more than images; they transmit a quasi-presence. Clones, the visible agents or virtual marionettes that we control by our gestures, can affect and modify other marionettes or visible agents and can even remotely activate "real" devices and operate in the ordinary world. Some bodily functions, such as the ability to manipulate objects, coupled with real-time sensorimotor activities, can thus operate at a distance, along a complex technological pathway that has become increasingly well understood in industrial environments.

Inside and Outside

What is it that makes the body visible? Its surface? Hair? Skin? A sparkle in the eye? Medical images enable

us to see inside the body without breaking its sensitive surface, sectioning vessels, or cutting tissues. We could say that it brings to light other skins, buried epidermises, unsuspected surfaces that rise up from within the organism. X rays, scanners, nuclear magnetic resonance systems, sonograms, positron cameras—all virtualize the surface of the body. Using these virtual membranes, we can reconstruct three-dimensional digital models of the body and, through them, physical models that can be used by doctors to prepare for an operation. All these skins, all these virtual bodies have considerable importance for medical diagnostics and surgery. In the realm of the virtual the analysis and reconstruction of the body involves neither suffering nor death. Once virtualized, the skin becomes permeable. Before an infant is even born, we can now determine its sex and aspects of its physical appearance.

Each new device adds another type of skin, another visible body to our actual body. The organism is turned inside out like a glove. The interior appears on the outside, while remaining within. For the skin is also the boundary between the self and the external world. Using medical imaging systems, the center of the body teems with layer upon layer of film. By means of telepresence and telecommunications systems, visible, audible, and sensible bodies are multiplied and dispersed outside us. As in the Lucretian universe, a crowd of skins or dermatoid specters emanate from our own body—simulacra.

The Hyperbody

The virtualization of the body encourages travel and exchange. The existence of grafts, for example, has resulted in the circulation of organs among human

bodies, from one individual to another, between the dead and the living, even between one species and another. We have transplanted baboon hearts and pig livers into human beings, injected them with hormones produced by bacteria. Implants and prostheses blur the boundary between mineral and animal: glasses, contact lenses, false teeth, silicon implants, pacemakers, hearing aids, auditory implants, external filters in place of healthy kidneys.

Eyes (cornea), sperm, eggs, embryos, and blood have now been socialized, mutualized, and preserved in special banks. Deterritorialized blood flows from body to body through an enormous international network in which we can no longer distinguish the economic, technological, or medical components. The red fluid of life irrigates a collective body, formless and dispersed. Flesh and blood, now shared, are stripped of subjective intimacy and move outside us. But this public flesh returns to the grafted individual, the recipient of a transfusion, the hormone consumer. The collective body modifies our private flesh. At times it resuscitates or fecundates it *in vitro*.

For a long time the constitution of a collective body and the participation of individuals in this physical community made use of purely symbolic or religious intermediaries: "This is my body. This is my blood." Today, it makes use of technological means. Just as we are able to share our intelligence and our vision of the world with others who speak the same language, we can now virtually participate in a communal body, along with those who belong to the same technological and medical networks. Each individual body becomes a participant in an immense hybrid and globalized hyperbody. Echoing the hypercortex that spreads its axons throughout the planet's digital networks,* humanity's hyperbody extends its

chimerical tissues throughout the earth's species, beyond borders and oceans, between the shores of life's roiling flood.

Intensifications

As a kind of reaction to the virtualization of the body, the modern world has witnessed the development of a form of sports that has affected a larger portion of the population than ever before. I am not referring to the "healthy" and athletic body emphasized by authoritarian political regimes or promoted by fashion magazines and advertising, nor even to team sports, which I will discuss in the chapter on the virtualization of intelligence. Rather, I am referring to the attempt to exceed physical limits, the conquest of new environments, the intensification of sensation, the exploration of other velocities, which have characterized the explosion of interest in sports specific to our century.

In swimming (a relatively uncommon sport before the twentieth century) we immerse ourselves in an aquatic environment. We experiment with a new way of sensing the world and moving through space. Undersea diving, a form of leisure activity, maximizes this sense of alienation. Speleology, the "journey to the center of the earth," was barely known before Jules Verne. In mountain climbing the body is confronted with a rarefied atmosphere, intense cold, implacable slopes. It is precisely for these reasons that it has become, or nearly so, a popular sport. In all of these cases the same attempt to leave the framework, the same effort of hybridization, of "becomings," that tend toward metamorphosis, is involved—to become a fish, a goat, a bird, a bat.

The most emblematic of the sports of tension and becoming are those of falling (parachuting, paragliding, bungee jumping) and sliding (skiing, water skiing, wind surfing, surfing). In one sense they are reactions to virtualization. These highly individual sports do not involve the use of cumbersome collective hardware and frequently make use of discrete artifacts. They maximally intensify our physical presence in the here and now. They reconcentrate the person in his vital center, his mortal "center of being." Actualization reigns.

And yet this maximal embodiment in the here and now can only be obtained by causing boundaries to tremble. Between air and water, between earth and sky, between soil and summit, the surfer or parachutist is never entirely *there*. Leaving the soil and its support, he rises into the air, slides along interfaces, follows vanishing lines, is vectorized, deterritorialized. Riding the waves, living within the intimacy of the sea, the California surfer is cloned in the *Net surfer*. The waves of the Pacific are coupled to the informational deluge and the hyperbody to the hypercortex. Subject to gravity but making use of equilibrium until he is nearly airborne, the body of the parachutist or skier is devoid of weight. It tends toward pure velocity, transition, flight. Ascensional even when it appears to fall or move horizontally, it is the glorious body of the parachutist or surfer, his virtual body.

Apotheosis

Thus the body escapes itself, acquires new velocities, conquers new spaces. It overflows itself and changes technological exteriority or biological alterity into concrete subjectivity. By virtualizing itself, the body is multiplied. We create virtual organisms that en-

rich our sensible universe but do not cause us pain. Does this imply disembodiment? Using the body as an example, we can show that virtualization can't be reduced to a process of disappearance or dematerialization. At the risk of repeating myself, I want to again emphasize that virtualization involves a change of identity, a transition from a particular solution to a general problematic, the transformation of a specific and circumscribed activity into a delocalized, desynchronized, and collectivized functioning. The virtualization of the body is therefore not a form of disembodiment but a re-creation, a reincarnation, a multiplication, vectorization, and heterogenesis of the human. However, the boundary between heterogenesis and alienation, actualization and commodity reification, virtualization and amputation, is never clearly defined. This uncertain boundary must constantly be estimated and evaluated by the individual, to help determine how to conduct his life, and by society, to determine how to structure its laws.

My own body is the temporary actualization of an enormous hybrid, social, and technobiological hyperbody. The contemporary body resembles a flame. It is often tiny, isolated, separated, nearly motionless. Later, it moves outside itself, intensified by sports or drugs, is transmitted by means of a satellite, launches a virtual arm high in the air, flows through medical or communications networks. It entwines itself with the public body and burns with the same heat, shines with the same light as other body-flames. It then returns, transformed, to its quasi-private sphere, and continues thus, sometimes here, sometimes there, sometimes alone or with others. One day, it will detach itself completely from the hyperbody and vanish.

3

The Virtualization of the Text

Reading: the Actualization of the Text

Since its Mesopotamian origin the text has been a virtual object, abstract, independent of any particular substrate. This virtual entity is actualized in multiple versions, translations, editions, instances, and copies. Through the process of interpretation, by giving meaning to the text here and now, the reader continues this torrent of actualization. I am specifically referring to the actualization of reading and not the realization that would occur by selecting from among preexisting possibles. Faced with the configuration of stimuli, constraints, and tensions offered by the text, the reader resolves the problem of meaning in an inventive and always singular manner. The reader's intelligence erects a mobile and irregular semantic landscape above the smooth pages of the text. Just how does this process of actualization occur?

We read. We listen to a text. What takes place when we do so? First, the text is shot through, peppered with holes. These are words, parts of sentences that we don't hear or understand (in a perceptual but also intellectual sense). They are text fragments that we are unable to comprehend, do not view as part of a whole, fail to attach to other fragments, or simply overlook. So that, paradoxically, reading, or listening, be-

gins by ignoring, by failing-to-read, by undoing the text.

While we are tearing the text apart by reading or listening to it, we are also mishandling it. We rumple it. We shift corresponding passages. We weave together its scattered members, spread out, dispersed across the surface of the pages or within the linearity of discourse. We stitch them together. Reading a text means rediscovering the textile gestures that have given it its name.

The passages of text virtually embody a correspondence, a kind of epistolary activity, which we actualize, more or less, by following—or failing to follow—the author's instructions. As makers of text, we travel from one side to the other of the space of meaning, guided by the system of addresses and pointers that the author, editor, and typographer have prepared for us. But we are just as capable of disobeying those instructions, following different paths, rearranging the text incorrectly, establishing secret, clandestine networks, allowing other semantic geographies to emerge.

Based on a linearity or initial uniformity, the reader's work involves tearing, rubbing, twisting, and repiecing the text to create a living environment in which meaning can be established. The space of meaning does not exist before the text is read. It is while moving through the text, mapping it, that we fabricate and actualize meaning.

But while we fold the text in upon itself, thereby producing its self-referentiality, its autonomous existence, its semantic aura, we are also relating the text to other texts, other discourses, images, and affects, to the immense fluctuating storehouse of desires and signs that constitutes our being. It is no longer the

meaning of the text that concerns us, but the direction and elaboration of our thought, the accuracy of our image of the world, the fulfillment of our plans, the awakening of our pleasure, the thread of our dreams. This time the text is no longer crushed and crumpled into a ball, but cut up, pulverized, distributed, evaluated in terms of an autoparturient subjectivity.

Of the text itself, nothing more remains. At best, through the text, we have been able to adjust our models of the world. The text enables us to establish a resonance among the images and words already in our possession. At times we are able to carry some of its fragments, invested with special intensity, to a specific region of our mnemonic architecture, others to a section of our intellectual networks. The text will have served as an interface to ourselves. Only rarely will our reading or listening result in the dramatic reorganization, as if by some sudden threshold effect, of the tangle of representations and emotions that shape us.

Listening, looking, and reading ultimately amount to a kind of self-invention. By initiating the attempt at signification that comes from the other, by laboring, digging up, crumpling, and cutting the text, incorporating it within ourselves, destroying it, we help erect the landscape of meaning that inhabits us. The text serves as a vector, a substrate, or pretext, for the actualization of our own mental space.

From time to time we confide fragments of the text to the signs that roam within us. These ensigns, relics, fetishes, and oracles have nothing in common with the author's intentions or the living semantic unity of the text, but help create, recreate, and reactualize the world of signification that we are.

Writing: The Virtualization of Memory

This analysis can also be applied to the interpretation of other types of complex messages besides alphabetic text: ideograms, diagrams, maps, flowcharts, simulations, iconic or filmic messages. The word *text* should be understood in its most general sense: an elaborated discourse or deliberated utterance.

You may have noticed that I have not yet mentioned *hypertext*. And yet, it lies at the heart of our discussion. By hierarchizing or selecting regions of meaning, by making connections between those regions, joining a text to other documents, embedding it in a memory that serves as the background from which it detaches itself and to which it returns, we are, in fact, describing computer-mediated hypertext.

An intellectual technology nearly always exteriorizes, objectivizes, virtualizes a cognitive function, a mental activity. In doing so, it reorganizes the intellectual economy or ecology as a whole and modifies in turn the cognitive function it was intended merely to support or strengthen. The relationship between writing (intellectual technology) and memory (cognitive function) bear witness to this process.

The arrival of writing has accelerated the artificialization, exteriorization, and *virtualization of memory* that most likely began with hominization. Virtualization, not merely a form of prolongation: the partial detachment of a living body, sharing, heterogenesis. We cannot reduce writing to the recording of speech. Yet, having enabled us to conceive of memory as a kind of record, it has transformed the face of Mnemosyne. The semi-objectivation of memory in the text has helped promote the development of a critical tra-

dition. In effect, writing creates distance between knowledge and its subject. It is most likely because I am no longer that which I know that I am able to question my knowledge.

Because it is virtualizing, writing desynchronizes and delocalizes. It has led to methods of communication in which messages are often separated in time and space from their source, and thus received out of context. From the reader's point of view, it has been necessary to refine the practice of interpretation. From the writer's point of view, it has been necessary to imagine self-sufficient systems of utterance, independent of context, which have promoted messages that respond to criteria of scientific or religious universality. By means of writing and, to an even greater extent, the alphabet and printing, theoretical and hermeneutic modes of knowledge have surpassed the narrative and ritual knowledge of oral societies. The demand for a universal truth, objective and critical, has only been able to assume precedence in a cognitive ecology largely structured by writing or, more specifically, by writing on a static substrate.

The contemporary text feeds electronic messages and newsgroups and flows through networks, fluid, deterritorialized, immersed in the oceanic medium of cyberspace. It is this dynamic text that reconstitutes, but differently and at an infinitely greater scale, the copresence of the message and its living context, which characterizes oral communication. Once again the criteria have changed and are now similar to those of a dialogue or conversation: pertinence with respect to the moment, readers, and virtual settings; brevity, the ability to point directly to our references; and efficiency, for helping the reader (navigate the text), are the surest ways to signal our presence within the informational deluge.

Digitization: the Potentialization of the Text

The new text has a number of technical features that need to be determined and whose analysis embodies a dialectic between the possible and the real. The reader of a book or article on paper is confronted with a physical object in which a specific version of the text is incorporated. This reader can write annotations in the margins of the text, make photocopies, cut and paste it, create a montage, but the initial text is always present, black on white, already fully realized. When reading on screen, this extensive presence that precedes the act of reading has disappeared. Digital media (diskette, hard drive, optical disc) does not contain a text that can be read by a human being but a series of digital codes that will be translated by a computer into alphabetic signs intended for a display. The screen is like a small window through which the reader can explore a potential storehouse of text.

Potential, not virtual, for the digital engram and the software used to read the text predetermine a set of possibles, which, though immense, are numerically finite and logically bound. However, it is not quantity that distinguishes the possible from the virtual. The essential distinction is to be found elsewhere. If we consider the mechanical substrate alone (hardware and software), computer technology provides only a combination of possibles, albeit infinite, and never a problematic domain. Digital storage is a potentialization, display a realization.

A hypertext is a matrix of potential texts, only some of which will be realized through interaction with a user. There is no difference between a possible text and a text we read on screen. The majority of software

programs are designed to display (realize) messages (text, image, etc.) on the basis of a computational mechanism that determines a universe of possibles. This universe can be immense or introduce random processes. Nevertheless, it is fully precontained and calculable. Thus, strictly speaking, we shouldn't describe digital images as virtual images but as possible images displayed on screen.

The virtual begins to flourish with the appearance of human subjectivity in the loop, once the indeterminateness of meaning and the propensity of the text to signify come into play, a tension that actualization, or interpretation, will resolve during the act of reading. Once these two planes, that of the potential–real and that of the virtual–actual, have been clearly identified, it is critical that we immediately promote their reciprocal enfolding: digitization and new forms of displaying text on screen are only interesting because they imply other ways of reading and understanding.

The reader of on-screen text is more "active" than the conventional reader of paper-based text. Reading text on screen implies that, even prior to the act of interpretation, we are able to control a computer so it displays a partial realization of the text on a small, bright surface. If we think of the computer as a tool for producing conventional text, then it is no more than an instrument, although more practical than the combination of a mechanical typewriter, photocopier, pair of scissors, and a tube of adhesive. Although produced by a computer, the ontological status or aesthetic properties of a printed text are no different than those of a text prepared with the tools that were available in the nineteenth century. The same is true of an image or film made on a computer and viewed with conventional media. But if we consider the set of all the texts (all the images) that the reader can display *automatically*

by interacting with the computer through a digital matrix, we enter a new universe for the creation and reading of signs. By considering the computer merely as an additional instrument for producing texts, sounds, or images on permanent media (paper, film, magnetic tape), we deny its cultural fecundity, that is, the appearance of new genres associated with interactivity.

The computer is thus primarily a means of *potentializing information*. Based on an initial store of data, a model or metatext, a program can calculate an indefinite number of *different* visible, audible, or tangible manifestations, on the basis of the current situation or the demands of the user. It is really only on screen or by means of other interactive devices that the reader encounters this new plasticity of text and image, since paper-based text (or images on film) is by necessity already fully realized. The computer screen is a new "typereader," the place where a reserve of possible information is selectively realized, here and now, for a particular reader. Every act of reading on a computer is a form of publishing, a unique montage.

Hypertext: Virtualization of the Text and Virtualization of Reading

An act of reading is an actualization of the significations of a text, actualization rather than realization, since the interpretation involves an ineradicable creative element. Hypertextualization is the opposite of reading in the sense that it produces, from an initial text, a textual reserve and instruments of composition with which a navigator can project a multitude of other texts. The text is transformed into a textual problematic. But, once again, this problematic exists only if we

take into consideration the human–machine interaction and not only computer-based processes. We can then speak of virtualization rather than potentialization. In effect, hypertext can't be logically deduced from the source text. It is the result of a series of decisions: adjustment of the size of the nodes and basic modules, arrangement of connections, structure of the navigational interface, etc. In the case of automatic hypertextualization, these choices (creation of a specific hypertext) will occur at the time the software is designed and selected.

Once these quasi-technical factors have been established, it would appear to be very difficult to speak of the potentialization and virtualization of the text as *homogenous* phenomena. On the contrary, we are confronted with an extreme diversity, closely bound to three interrelated factors: the nature of the initial digital store, the software, and the communications mechanism.

A conventional linear text, even digitized, can't be read as a true hypertext, or database, or a system that will automatically create texts as a function of interactions fed by the reader. The relationship between the reader and the software for reading and navigation is much closer than that between reader and screen. Does the program only enable the reader to follow the text sequentially (like the first word processors, which regressed the reading process to a point where it resembled the fussy manipulation of antique paper rolls, a point that even fell short of the pages of a codex)? Does the software provide features for searching and moving through the text? Can automatic links be constructed among different parts of the text, different types of annotation? Can the reader personalize the software? These are all significant variables that will strongly influence the reader's intellectual activities. Finally, does

the digital media provide the means for new forms of collective reading (and writing)? A varied continuum extends between the individual reading of a specific text and navigation within vast digital networks in which a multitude of persons annotate, augment, and connect texts by means of hypertext links.

Thought is actualized in a text and a text in the act of reading (interpretation). Ascending the slope of actualization, the transition to hypertext is a form of virtualization. This ascent doesn't return us to the thought of an author, but turns the actual text into one of many possible figures in an available, mobile, freely reconfigurable, textual field, and thus connects it with other texts, incorporates it in the structure of other hypertexts and the various instruments of interpretation. By doing so, hypertextualization multiplies our opportunities for producing meaning and makes the act of reading considerably richer.

We have come back to the problem of reading. We know that in the first alphabetic texts individual words were not separated from one another. It was only gradually that spaces between words, punctuation, paragraphs, the division of books into chapters, tables of contents, indexes, page layout, the cross-referencing found in encyclopedias and dictionaries, footnotes, etc. were developed—all elements that facilitate the reading and use of written documents. Helping to control texts, structure them, articulate them beyond their linearity, such auxiliary technologies construct what we might refer to as an apparatus for artificial reading.

Hypertext, hypermedia, or interactive multimedia thus continue an ancient process of artificializing reading. If reading consists in selecting, diagramming, and constructing a network of cross-references within the text, associating it with other data, integrating words

and images within a personal memory that is continuously being updated, then hypertext mechanisms represent an objectivation, exteriorization, and virtualization of the reading process. I am not referring only to the technical processes for digitizing and displaying text, but the human act of reading and interpreting, which integrates the new tools. Artificial reading has existed for quite some time, however. Is there a difference, then, between the system that has stabilized on the pages of books and newspapers and that which is currently being created on digital media?

The simplest way of approaching hypertext, which excludes neither sounds nor images, is to describe it, in contrast with linear text, as network-based text. Hypertext would then consist of nodes (elements of information, paragraphs, pages, images, musical sequences, etc.) and links among those nodes (references, notes, pointers, "buttons" pointing the way from one node to another). Reading a conventional encyclopedia is already a kind of hypertext event, since it incorporates the navigational tools embodied in dictionaries, glossaries, indexes, thesauruses, atlases, tables, tables of contents, and endnotes. However, digital media are considerably different than precomputerized hypertexts: Searching and navigating, moving from one node to another takes place very rapidly, within seconds. Digitization also enables a single media to incorporate sound, animation, and text. Based on this approach, digital hypertext could be defined as a collection of network-based multimodal information that can be quickly and "intuitively" navigated.

Compared to earlier network-based technologies, digitization represents a minor Copernican revolution: We no longer have a navigator who follows instructions and moves physically through a hypertext, turning pages, carrying heavy volumes from place to place,

roaming through a library. Now there is a mobile and kaleidoscopic text, which presents its various facets, turns, folds and unfolds itself before the reader. A new art of publishing and documentation is being invented that attempts to take advantage of our capability of rapidly navigating large masses of information, which are being condensed into increasingly smaller volumes.

From a different point of view, we could consider the contemporary trend toward the hypertextualization of documents as a movement toward indistinctness, the blending of the functions of reading and writing. This is the process of virtualization, which so often results in linking together exteriority and interiority, and in this case the intimacy of the author and the estrangement of the reader with respect to the text. Like a Moebius strip, this continuous transition from inside to outside already characterizes conventional reading. For, in order to understand a text, the reader must "rewrite" it mentally and thus go inside it. Similarly, the difficulty of writing consists in rereading what we have written in order to correct it, and in the effort to alienate ourselves from the text. Hypertextualization objectivizes, functionalizes, and brings to power within the community this identification of reader and author.

Let's examine the situation from the reader's point of view. If we define a hypertext as a space of possible readings, a text would then represent a particular reading of a hypertext. The navigator thus participates in the writing or at least the publishing of the text he "reads," since he determines its final organization (the *dispositio* of classical rhetoric). The navigator can become author in a more profound sense than by transiting a preestablished network, however. He can participate in structuring the hypertext and creating new links. Some systems record the reader's movements and strengthen (make more visible, for ex-

ample) or weaken the links on the basis of how they are used by the community of navigators. Finally, readers can not only modify the links but also add or modify the nodes (text, images, etc.), connect one hyperdocument to another, making a single document out of two separate hypertexts, or create hypertext links among a number of documents. These methods are now being developed on the Internet, primarily on the World Wide Web. Any public text accessible through the Internet is now a virtual component in an immense and ever-expanding hypertext. Hyperdocuments that are accessible through a computer network are powerful instruments of a *collective reading–writing process*.

In this way reading and writing exchange their traditional roles. The person who participates in structuring a hypertext, who outlines possible folds of meaning, is already a reader. In turn, the person who actualizes a process or manifests a specific aspect of the document store helps write and momentarily realize an interminable act of writing. The seams and cross-references, the paths of original meaning that the reader creates, can be incorporated in the structure of the corpus. In the hypertext every act of reading is an act of writing.

Cyberspace: the Virtualization of the Computer

By focusing strictly on the transition from paper to the computer screen, we obtain only a partial view of the contemporary virtualization of the text and reading. As a medium for the presentation of potential messages, the computer is already integrated, one could

say, dissolved, in the fabric of cyberspace, that turbulent zone transited by vectorized signs. Before discussing the deterritorialization of the text, however, I would like to say a few words about the virtualization of the computer.

For a long time polarized as a "machine," balkanized by the available software, contemporary information technology, both hardware and software, deconstructs the computer to create a navigable and transparent communications space centered on the flow of information. Computers sold by various manufacturers can now be assembled from nearly identical components, and computers by the same manufacturer contain parts from various sources. Today's hardware components (transducers, memory, processors, etc.) not only are used in computers, but can be found in smart cards, automatic distributors, robots, motors, household appliances, communications networks, photocopiers, facsimile machines, video cameras, telephones, radios, televisions, etc., anywhere that digital information is automatically processed. Moreover, a computer connected to cyberspace can make use of the storage and processing power of other computers on the network (which are also engaged in a similar process), as well as various remote devices for capturing and displaying information. The majority of data processing functions (input, digitization, storage, processing, display) are distributable and, to a greater and greater extent, distributed. The computer is no longer the center but an element, a fragment of the whole, an incomplete component in a universal computational network. Its dispersed functions impregnate every element of the technocosmos. Ultimately, there will be no more than a single computer, a single text substrate, but it will be impossible to determine its limits or establish its contour. Its center will be everywhere and its circumference nowhere. A hypertextual computer, dis-

persed, living, pullulating, incomplete, virtual. A Babel computer. Cyberspace.

The Deterritorialization of the Text

Millions of individuals throughout the world are at work building and improving the immense hypertext known as the World Wide Web. On the Web, as with any hyperdocument, we need to conceptually distinguish two distinct types of memory. First there is the multimodal text or document store, the data, quasi-amorphous, yet sufficiently well organized so that individual elements can be provided with an address. Second, there is the set of structures, paths, directional signs or networks of pointers, which represent specific arrangements, selective and subjective, of the store. Each individual, each organization is encouraged, not only to add to the store but to provide other cybernauts with a view of the whole, a subjective structure. These subjective points of view appear in the links found on the various home pages displayed by an individual or group. In cyberspace, since any point is directly accessible from any other point, there is an increasing tendency to replace copies of documents with hypertext links. Ultimately, there will only need to be a single physical exemplar of the text, stored in a computer connected to the network, for it to be integrated by means of an interplay of pointers into the millions of different search paths or semantic structures that are continually being constructed. Based on the available home pages and on-line hyperdocuments, we can follow the threads of a multitude of subjective universes.

In the digital world, the distinction between original and copy has ceased to have any real significance.

Now, cyberspace has blurred the notions of unity, identity, and location. Hypertext links can connect us with an address that supplies us not with a specific text but with data that is updated in real-time: statistical results, political information, images of the world sent by satellite, etc. Thus, like the river in Heraclitus, hypertext is never the same. Fed by sensors, it opens a window on cosmic flux and social instability.

The hypertext found in digital networks has *deterritorialized* the text. It has created a text that lacks sharp outlines or a definable interior. Now, there is only *text*, as we might say of water or sand. The text has been set in motion, swept up in the flow, vectorized, metamorphosed. In this sense it is much closer to the movement of thought or its representation. Having lost its affinity with immutable ideas intended to transcend the sensible world, the text has become the analog of the universe of processes with which it is intertwined.

The text will always exist, but the page has been stripped of its significance. The page, the Latin *pagus*, blank field, territory enclosed by white margins, intersected by lines and sown with characters, is still weighed down by the Mesopotamian clay and clings to the Neolithic soil. This ancient page is slowly disappearing beneath the informational flood, its untethered signs carried away by the digital ocean. It is as if digitization were establishing a kind of immense semantic plane, accessible from anywhere, which each of us can help produce, manipulate, or modify. And yet—as if the point needed to be emphasized—the economic and legal forms inherited from previous centuries prevent the movement of deterritorialization from reaching its fulfillment.

The same analysis could be applied to images, which virtually constitute a single hypericon, bound-

less, kaleidoscopic, growing, subject to a multitude of chimeras. The music of cyberspace rises up from banks of sound effects, repertoires of sampled timbres, synthesized scores, automatic sequences and arrangements. It composes an inaudible polyphony, or collapses into cacophony.

Interpretation, the production of meaning, no longer refers exclusively to the interiority of an intention, to hierarchies of esoteric signification, but to the individual appropriations of a navigator or surfer. Meaning is based on local effects, it is formed at the intersection of a deterritorialized semiotic plane, and its goals are efficiency and pleasure. I am no longer interested in what an unknown author thought, but ask that the text make *me* think, here and now. The virtuality of the text nourishes my actual intelligence.

Toward a Resurgence of the Culture of Text

If reading involves arranging, selecting, diagramming, constructing a semantic network, and integrating acquired ideas with a memory, then digital technologies of hypertext and navigation constitute a form of technological virtualization and exteriorization of the reading process. Through digitization there has been a resurgence of text and reading, along with their profound alteration. We can imagine a time in the near future when books, newspapers, printed technical and administrative documents will be no more than temporary and partial projections of much richer and still vital on-line hypertexts. Since the alphabetic writing in use today has been stabilized on and for a static substrate, it is reasonable to ask if the appearance of a dynamic

substrate might lead to the creation of new writing systems that are better able to exploit this new potential. The computer icons, video games, and interactive graphic simulations used by science represent the first steps in the direction of a dynamic ideography of the future.

Does the increased number of computers signal the end of writing, as our contemporary prophets of doom have led us to understand? The idea is very likely based on a misconception. Certainly, the digitized, fluid, and reconfigurable text, nonlinear, circulating throughout local or global networks in which each participant is an author and potential editor, is vastly different than the conventional printed text. It is important, however, that we not confuse the text with the unilateral method of distribution found in printing, or the static substrate of paper, or the linear and closed structure of messages. The culture of text, along with everything it involves—the deferral of expression, the sense of critical distance implied by interpretation, the closely related cross-references within a semantic universe of intertextuality—is, on the contrary, undergoing a tremendous development in the new communications space found in digital networks. Far from destroying the text, virtualization seems to have helped it conform to its newly revealed essence. It is as if the contemporary process of virtualization had brought about the text's becoming. As if we were leaving a period of prehistory and the adventure of the text was just now beginning. As if we had, at last, just invented writing.

4

The Virtualization of the Economy

An Economy of Deterritorialization

Contemporary economy is an economy of deterritorialization and virtualization. Worldwide, tourism—travel, hotels, restaurants—has the largest turnover of all sectors of economic activity. Humanity has never devoted so much of its resources to being somewhere else, to eating, sleeping, and living elsewhere, to getting away from home. If we add to the overall sales attributable to tourism alone that of vehicle manufacturers (cars, trucks, trains, subways, boats, planes, etc.) and fuel and infrastructure sales (roads, airports), transportation accounts for nearly half the world's economic activity. Commerce and distribution in turn are responsible for the movement of signs and objects. But electronic and digital communications methods have not taken the place of physical transportation. On the contrary, communications and transport, as I have emphasized, are part of the same general wave of virtualization. To the sectors associated with physical deterritorialization, we must obviously add telecommunications, data processing, and the media, all of which are growing sectors of the virtual economy. Like the tourist industries, education and training, which contribute to intellectual heterogenesis, are also producers of virtuality. And as I mentioned in a previous chapter, the health industries, primarily medicine and

pharmaceuticals, are responsible for the virtualization of the body.

Finance

Finance, the beating heart of the global economy, is unquestionably one of the most characteristic activities associated with the growth of virtualization. Money, the basis of finance, has desynchronized and delocalized labor, commercial transactions, and consumption on a large scale, all of which have traditionally operated with the same units of time and place. As a virtual object, money is obviously easier to exchange and share than more concrete entities, such as land or services. We find in the discovery and development of money (along with more complex financial instruments) the distinctive features of virtualization: not only displacement from the here and now, deterritorialization, but the transition to public forms of interaction, anonymity, the possibility of sharing and exchange, the partial substitution of an impersonal mechanism for the incessant interplay of negotiations and individual relations of force. The bill of exchange puts into circulation the recognition of a debt between different currencies and individuals, the insurance contract pools risk, publicly traded corporations develop the concepts of property and collective investment. Such developments extend the power of money and promote the virtualization of the economy.

Today, finance (banking, insurance) constitutes between five and seven percent of the gross domestic product of the industrialized countries (Goldfinger 1994). Global financial trade exceeds international commerce and, within the financial sector alone, the growth of derivatives (a form of insurance for conventional

products and perhaps the most completely virtualized of all financial instruments) is greater than the average. More generally, the increasing importance of the monetary economy and finance is one of the most striking manifestations of the current process of virtualization. In absolute figures, the largest global market is the currency market, or exchange market, which is considerably larger than the market for stocks and bonds.

How do financial markets operate? Essentially, financial investors base their actions on those of other financial investors, just like a crowd, in which each member follows a crowd psychology. The "arguments" used to justify their actions are primarily the economic indicators published by governments and statistics organizations, along with the prices and values of the various currencies, shares, and financial instruments. Yet these prices and values are themselves "conclusions" that have been arrived at by the market on the basis of a collective decision, one that is parallel and distributed. While the financial market does take into account data "external" to its own operation (wars, elections, etc.), it primarily operates recursively, using the results of its own activities. As mentioned above, each of these elementary "processors" simulates in a crude way the operation of the whole.

A parallel could be made with the situation of contemporary art, which is even more self-referential, centering on quotes, criticisms, differences, and questions about the limits and identity of art, etc. As with finance, the major operations of contemporary art involve the judgments of others, the work of art intervening as a vector, pointer, or switch in the recursive dynamic of collective judgment.

To return to the virtualization of the economy, banks, on-line data, expert systems, and other comput-

er-based instruments make market "rationalizations" increasingly transparent to themselves. International finance is developing in close cooperation with digitally based networks and intellectual technologies. It tends toward a kind of distributed collective intelligence in which money and information are gradually becoming equivalent. Of course, this collective intelligence is relatively crude, since it is based on a single criterion of evaluation or, if we prefer, a single "value." Moreover, its overall dynamic, even though chaotic, frequently unpredictable, and subject to fads, is rather convergent in the sense that (contrary to biological evolution, for example) it is unable to keep several paths of differentiation open simultaneously. We can only dream of a financial system that is more intelligent, capable of exploring several forms of evaluation at a time, imaginative, and able to project multiple futures rather than responding to situations by reflex alone.

Information and Knowledge: NonDestructive Consumption and NonExclusive Appropriation

Aside from specific sectors of virtualization such as tourism, communications, and finance, all activities now depend initially on highly specific economic goods, namely information and knowledge. Information and knowledge have become the principal sources for the production of wealth. Some might claim that this has always been the case. Hunters, peasants, merchants, artisans, and soldiers had to acquire certain skills and information about their environment to carry out their tasks. But the relationship to knowledge that we have experienced since the Second World War, and to an even greater extent since the seventies, is radical-

ly new. Until the second half of the twentieth century, a person could utilize skills learned during his youth throughout his career. More important, he was able to transmit this knowledge, nearly unchanged, to his children or apprentices. Today this pattern has become obsolete. Not only are people asked to change their skills several times throughout their life, but, even with a given "trade," knowledge has an increasingly shorter lifespan (three years or less in computer technology, for example). It has become difficult to design "basic" skills in a given field. New technologies and new socioeconomic configurations now have the ability to reshape the order and importance of knowledge at any time.

As a result we have made a transition from the implementation of stable skill sets, which traditionally formed the background of a given activity, to bring to the foreground the continuous navigation of knowledge, a condition of permanent apprenticeship. In the past, knowledge remained in the background. Today, it has become a moving figure. Traditionally a contemplative activity, immutable, it is now a kind of flux, a component in a series of efficient operations, and itself an operation. Moreover, knowledge is no longer restricted to a caste of specialists but has been opened to the majority of the population, now called upon to learn, transmit, and produce knowledge cooperatively as part of their day-to-day activity. Information and knowledge have become fundamental economic categories, which was not always the case. What's more, their position in the infrastructure—or infostructure—as source and determinant of all other forms of wealth has become more obvious, no longer obscure.

These new key resources are governed by two laws, which have turned traditional economic arguments on their head: They are not destroyed when we consume them or lost when we transfer them. The per-

son who gives up a sack of wheat, a car, an hour of labor, or a sum of money has given up something to the benefit of another. Whether we make flour, drive a car, exploit the labor of a worker, or spend money, an irreversible process takes place: wear, expense, transformation, consumption. To a large extent the economy is based on the scarcity of goods. Scarcity itself is based on the destructive nature of consumption as well as the exclusive or private character of transfer and acquisition. Yet if I transmit information to you, I don't lose it, and I can make use of it without destroying it. Because information and knowledge are the sources of other forms of wealth and are now considered to be among the most important economic goods, we can foresee the emergence of an economy of abundance whose concepts and practices will contrast sharply with the operations of traditional economy. To a large extent we are already living under the new system, but we continue to make use of the inadequate instruments of the economics of scarcity (Goldfinger 1994).

Dematerialization and Virtualization: The Nature of Information

What is it in the nature of information and knowledge that gives them their particular economic properties? The immediate response is that they are "intangible" goods. Let's take a closer look at this assumption, which implies an underlying metaphysics of substance. Presumably there are "material" things and "immaterial" things. Yet even so-called material goods have value primarily because of their shape, structure, or specific properties, that is, ultimately an "immaterial" dimension. Strictly speaking, purely material goods

comprise raw materials alone. On the other hand we cannot separate information from its material substrate without the risk of destroying it, even though we can easily copy, transmit, or reproduce it. Without any "material" support, information would simply disappear forever. As for human knowledge, it is even more closely bound up with a material substrate since it assumes the existence of a living being, several pounds of working gray matter. A critic might claim that the essential point here is the fact that knowledge can be transmitted from person to person, that it is not necessarily limited to a single individual. Precisely. However, knowledge and information are not "immaterial" but deterritorialized. Far from being exclusively attached to a specific substrate, they can move around. This does not mean that information and knowledge are consequently "material." The opposition between materiality and immateriality is only valid for substance, for things, whereas information and knowledge are events or processes.

According to the mathematical theory of communication, the information contained in a message represents an event that reduces our uncertainty about a given environment. In this theory we consider a universe of signs in which the occurrence of each sign in a message is associated with a measurable quantity of information. For example, the occurrence of each letter in this book provides information and the amount of information is greater as the likelihood of its occurrence decreases. But an occurrence is not a thing. It is neither material like an apple, nor immaterial like an immortal soul. Similarly, a thing is neither probable nor improbable. Only an event or "fact" can be associated with a probability and thus provide information, such as the fact that a given object may be present or absent. We intuitively feel that information is associated with a subjective probability of occurrence or appear-

ance. A fact that is entirely predictable provides us with no new information, whereas an unexpected event does indeed provide information.

What is this information like? Let's assume that an election has been held in a certain country. This election occurs at a specific time and place. As such the event is inseparable from a particular "here and now." In fact we refer to the election as having taken "place." In this case we would say that an *actual* event has taken place. As a first approximation, when press agencies announce or comment on this election, they do not broadcast the event itself but a message about the event. Here we can state that while the event itself is actual, the production and distribution of messages about it constitute a *virtualization* of the event, one supplied with all the attributes previously associated with virtualization: The event is detached from a specific time and place, becomes public, undergoes heterogenesis. The messages that virtualize the event are at the same time its prolongation; they participate in its accomplishment, its incomplete determination. They become a part of it. Through the press and its commentary, the results of the election have a given effect on the financial market of some foreign country. Each day, on the stock market of an economic center in some city, singular transactions take place. The event continues to be *actualized* at other times and in other places. But this actualization itself produces new messages and new information, micro-virtualizations. We are back on the Moebius strip: The message about the event is also and indissolubly a sequence in the unfolding of the event. The map (the message) is part of the territory (the event), and the territory consists primarily of an indefinite addition, a dynamic articulation, a network of expanding maps. In other words, everything that is an event is part of a dynamic of actualization (territorialization, instantiation in the here and now, particular

solution) and virtualization (deterritorialization, detachment, sharing, elevation to a problematic). Events and information about events exchange their identities and functions at each stage of the dialectic of signifying processes.

Why is the consumption of information not destructive, and why is the possession of information not exclusive? Because information is virtual. As I have stressed repeatedly, one of the distinctive features of virtuality is its detachment from a particular time and place. It is for this reason that I can supply a virtual good, one that is essentially deterritorialized, without losing it. Moreover, the virtual can be assimilated to a problem and the actual to a solution. Actualization is not an act of destruction but, on the contrary, an inventive act of production, an act of creation. When I use information, when I interpret it, connect it with other information to create meaning or help make a decision, I actualize it. In doing so I accomplish a creative act, a productive act. Knowledge is the product of apprenticeship, the result of a virtualization of immediate experience. It can also be applied or, preferably, actualized in situations other than that of the initial apprenticeship. Every effective implementation of knowledge is an inventive resolution of a problem, a small creation.

Dialectic of the Real and the possible

Let's go back to our sacks of wheat and our automobiles. Their production and consumption is not so much a dialectic of actualization and virtualization as it is a cycling back and forth between the possible and the real. Instead of being mesmerized by their "material" nature, we should try to understand the

type of dynamic in which their use is inscribed. Goods destroyed by consumption and subject to exclusive ownership are reservoirs of possibilities, "potentials." Their consumption (eating wheat, driving a car) is equivalent to a realization, that is to say an exclusive and irreversible choice among several possibles, a "potential drop." This realization only confers existence upon certain possibles to the detriment of others. Possibles are candidates and not a problematic field; realization is a choice or selection rather than the resolution of an inventive problem. The virtual good presents us with a problem, exposes a field of interpretation, resolution, or actualization, whereas an envelope of possibles can only participate in an exclusive realization. As reality potential, the destructible and privative good cannot be both here and there, detached from the here and now. It is governed by the law of the excluded middle—either–or—without which it could be realized in two different ways at two distinct places and times, something that, by definition, is impossible. The reserves of possibles, the goods whose consumption is a realization, cannot be detached from their physical substrate.

It may help clarify the situation to point out that the distinction I am making here is conceptual and not based on some exclusive principle of classification. A work of art, for example, simultaneously possesses aspects of possibility and virtuality. As a source of prestige and aura, or as pure commodity value, a painting is a reserve of possibles (the "original") that can't be simultaneously realized (exhibition, sale) here and now. As the bearer of an image subject to interpretation, of a tradition that can be pursued or contradicted, as an event in a cultural history, a painting is a virtual object whose original, its copies, engravings, photographs, reproductions, digitizations, and interactive on-line presence, are all actualizations. Every mental and cultural

effect produced by one of these actualizations is in turn an actualization of the painting.

Labor

In the traditional institution of labor, as determined in the nineteenth century, the worker sells his labor power and receives a salary in return. This labor power represents possible labor, a potential that is already determined by the bureaucratic organization of production. It is also a potential because an hour worked is irrevocably lost. Traditional salaried labor represents a loss of potential, a realization, and for this reason can be measured by the hour.

The contemporary laborer, however, no longer sells his labor power but his skill, or rather, a capacity for learning and innovation that is continually maintained and improved and that can be actualized in an unpredictable manner within changing contexts. The labor power of the traditional worker, a potential, is replaced by a skill, a knowledge-of-being, a knowledge-of-becoming, dependent on the virtual. Like any virtuality, and unlike a potential, a skill is not used up when applied, quite the contrary. There is one problem, however: The actualization of a skill, that is, the unfolding of a quality in a living context, is much more difficult to measure than the realization of labor power.

Labor has never been pure execution, however. Its perception as loss of potential, as realization, has always followed a form of social violence that has denied (while continuing to exploit) its character of creative actualization. One thing is certain, though, the uniform hour shown by the clock is no longer the pertinent unit for measuring labor. This inadequacy

has been obvious in artistic and intellectual occupations for quite some time, and is gradually beginning to affect all forms of activity. We can now understand why the reduction of the work week can never be a long-term solution to the problem of unemployment. Based on a system of measurement, it prolongs a concept of labor and organization of production that is doomed to failure by the evolution of the economy and society. We can realistically measure—and thus remunerate—hourly labor only if it involves a potential labor power (already determined, pure execution) that is realized. Knowledge that is maintained, a virtual skill that is actualized, is a resolution of the inventive problem within a new situation. How can we evaluate the reserve of intelligence in an individual? Certainly not on the basis of a diploma. How do we measure quality in a given context? Not with a clock. Whether referring to labor or some other activity, through virtualization we undergo the transition from an economy of substances to an economy of events. When will our institutions and attitudes adapt themselves to such new concepts? How can we implement the measurement systems that go hand in hand with such a transformation?

Wage labor remunerates potential; the new labor contracts will recompense the actual. In the economy of the future, successful societies will give priority to recognizing and maintaining the virtual and its living bearers. There are two possible methods of increasing the efficiency of labor: (1) reification of labor power through automation; or (2) virtualization of skills using means that augment collective intelligence. In one case, we view the situation in terms of substitution: Mankind, disqualified, is replaced by the machine. Once on the path to virtualization, however, we conceive the increase in efficiency in terms of the co-evolution between man and machine, an enrichment of

activities, a validating bond between individual intelligences and the dynamic memory of communities.

The Virtualization of the Market

When referring to the information highway, political discussions often evoke the "new markets" that will promote growth and create jobs. The error here consists in focusing on new products, new services, and new employments, a quantitative approach (*additional* products and jobs), without realizing that the traditional concepts of the market and labor are changing. Cyberspace does indeed open a new market, but it is less representative of a future wave of consumption than the emergence of a qualitatively different transaction space, in which the roles of consumer, producer, and middleman are undergoing profound change. The online market knows nothing of geographic distance. In principle, every point in cyberspace is "near" the potential buyer (home shopping networks). The smallest details involving consumption and demand are captured and tracked. At the same time, marketing and product placement services become increasingly common. Overall the cybermarket is more *transparent* than the traditional market. In principle, this transparency should benefit consumers and small producers and accelerate the deterritorialization of the economy.

The use of on-line medical and legal databases by nonspecialists continues to grow. In this way individuals are able to question a medical diagnosis or professional advice, and can even directly access pertinent information from the world's top specialists through their interaction with databases, expert systems, or hypermedia designed for public access. Since primary producers and consumers can contact one another di-

rectly, an entire class of professionals now runs the risk of being perceived as parasitic intermediaries of information (journalists, editors, teachers, doctors, lawyers, midlevel managers) or transaction processing (bankers, various financial service providers) and of seeing their customary role threatened. This phenomenon is referred to as *disintermediation*. The institutions and professions threatened by disintermediation and the growth of transparency will only be able to survive and prosper in cyberspace by migrating their skills toward the development of collective intelligence and navigational aids.

The increased transparency of an increasingly fragmented and personalized market enables producers to closely monitor changes in buying patterns as well as their varying nature in real time. We can even imagine a just-in-time relationship developing between "retromarketing" networks and flexible manufacturing systems, where production control is governed entirely by consumers (De Rosnay 1995).

Any recordable act effectively or virtually creates information or, in an information economy, wealth. Yet cyberspace is the quintessential medium in which actions can be recorded and transformed into usable data. Because of this the consumer of information, transactional data, or communications services also produces, at the same time, information that has virtual value. Not only is the consumer a coproducer of the information he consumes but he is also a cooperative producer of the virtual worlds in which he evolves and an agent of market visibility for those who exploit the traces of his actions in cyberspace. The most valuable products and services in the new market are interactive, that is, in economic terms, the production of added value is shifted to the consumer or, rather, the notion of consumption should be replaced by that of the *copro-*

duction of merchandise or interactive services. Just as the virtualization of text implies the growing confusion between the roles of reader and author, the virtualization of the market highlights the convergence of consumption and production.

The end user is increasingly better equipped to refine information when equipped with a computer, a modem, and software for filtering and analyzing data, and working in cooperation with other users in networks designed for the cooperative exchange of services and information. The conventional producer (teacher, editor, journalist, television producer) must now fight to avoid being seen merely as a supplier of raw materials. This is the basis of the struggle among "content producers" to reinstate, to as great an extent possible, in the new interactive space, the role they once held in the system of one-way media distribution or within the rigid structure of hierarchical institutions. But in terms of supply, the new economic environment is much more favorable to the suppliers of spaces, architects of virtual communities, sellers of transaction and navigation instruments, than to traditional content distributors.

As for the economic exploitation of this content, the conventional methods of realizing the value of information (purchase of the physical media or payment of conventional royalties) are less and less suited to the fluid and virtual character of messages. By completely abandoning any claim to the ownership of software and information, as certain network activists have suggested, we risk compromising copyright and patent protection and returning to an epoch when the ideas that neuronal laborers sweated over risked being blocked by monopolies or appropriated by powerful economic or political entities. But in the economy of information and knowledge, rather than

abandoning software ownership rights entirely, which amounts to a shameful theft of services from the low-level producers, the new proletariat of intellectual laborers, we are becoming more sophisticated in our approach to the notion of copyright. This trend is going in two directions: the transition from territorial rights to rights of circulation, and the transition from exchange value to use value.

Currently, if we want to use a photograph for an on-line multimedia service, we must first pay a royalty to its owner. The photograph is like a microterritory. There is no opportunity to use it unless we first purchase or rent the terrain. This constraint acts as a powerful brake on economic and cultural innovation in cyberspace. The small, innovative entrepreneur simply doesn't have the wherewithal to pay such royalties, and in this case the owner receives nothing. The author's idea is confined to a small circle and the Net surfer is deprived of the image. The solution would consist not in eliminating royalties entirely but in substituting for them systems for continuously metering the use of information by the end user. Usage information, for example, could be captured whenever a message is decrypted. In this way the owner would ultimately be compensated and the service provider could display the photograph (for example) without having to pay a fee in advance, a fee he often doesn't have. We would pay for information the same way we now pay for water or electricity: by metering its use. There would be a difference in scale, however, since, in the future scenario, it is as if each drop of water contained its own microcomputer. Thus the photograph could be copied, used, or distributed freely, without restriction. Only, by duplicating the image, now liquid and ubiquitous, we would also duplicate the code that records the decrypting operation and automatically debits the user's account by

a small amount while at the same time crediting the account of the author or owner.

Measurement of consumption usage can be perfected through the use of what might temporarily be referred to as a "use value" payment. For example, in the American Information Exchange (AMIX) network any information sold is paid for on the basis of its timeliness and the nature of the request. Not just a method of selling information whereby the price is determined by the seller, AMIX operates like a stock market in which demand helps determine price in real time (Goldfinger 1994). Several on-line services operate like this, recording individual patterns of usage, movement, and preference, and providing users with a joint evaluation or personalized system of navigation. For example, the World Wide Web now provides services such as FishWrap for documents, Ringo++ for musical titles, and Idea Futures, which has organized a market for scientific and technological ideas. As of 1995 these services did not have access to any system of direct monetary payment, however. The Knowledge Tree® (Authier, Lévy 1992) and Gingo®[1] software also provide a means for measuring the use value of skills (or documentation, or any kind of information), a value that varies with context and time. Gingo incorporates a complete system for determining use value through the use of a special form of currency known as Standard Open Learning (SOL).

I mentioned the transition from a system based on rigid notions of territorial property to one based on the compensation of deterritorialized fluctuations and the transformation of an economy of exchange value into an economy of use value. In truth this scenario is closer

[1] The Knowledge Tree® and Gingo® are registered trademarks of the TriVium® corporation.

to metaphor than to a conceptually rigorous characterization of the situation. Strictly speaking, when I buy a book or a record, I pay for something real: the physical media holding the information. The book I don't read costs me as much as the one I read. The quantity of books is limited as well, since the book in my library isn't in yours. Ultimately, it remains a question of scarce resources. If I purchase the rights to a book, however, I no longer pay for something real but for a potential, the possibility of realizing or copying the information as much as I wish. But the new on-line market, the cybermarket, needs new methods for handling the dialectic between the virtual and the actual. Systems for measuring and improving either real or potential values are no longer adequate. Before it is read the information that flows through cyberspace is not potential but virtual, to the extent that it can assume different and unpredictable significations depending on how it is used in a given hyperdocument. It is virtual because what is at stake is not a realization (copy, print version, etc.) but an actualization, an act of reading, the signification it can assume in context, which is inseparable from the deliberate participation of at least one conscious human being. It is virtual because a reproduction or copy costs practically nothing, other than the general expense of maintaining cyberspace. It is virtual because I can give a document to someone and still keep it, and reuse parts of it without destroying the original. In cyberspace the document becomes as intangible and virtual as information or ideas.

An apparent solution to the problem of the economy of the virtual and the actual would be to assume that while virtual goods would be recorded, tracked, and represented, they would be free. Such goods could circulate without restriction and mingle with other virtual goods. Each actualization, however, would result in a payment. The price of this actualization would be

indexed to the existing context, dependent on the environment and the moment. This value can be cooperatively determined by groups of users on the open market or the stock exchange of information and ideas. The form of the new economy will depend largely on systems for tracking virtual transactions and measuring actualization, systems that will be invented in the forthcoming years.

Economy of the Virtual and Collective Intelligence

With respect to the new economy of the virtual, the concepts of production and consumption (tightly bound to the realm of exclusive selection associated with the real–possible) are not always the most appropriate for understanding the processes at work. A war is neither material nor immaterial, nor are love, invention, or apprenticeship. Upsizing, downsizing, reorganization, birth, disappearance—something is happening. Where? For whom? We might say that they are operations of thought, emotion, conflict, enthusiasm, and forgetfulness within a hybrid thinking machine that is at once cosmic, human, and technological.

Should we consider the operations of the economy of the virtual as events within a kind of social megamind, the subject of a collective intelligence that is coming into being? I will discuss the idea of collective intelligence at greater length later on, but I would like to outline its essential features here. The megamind can be broken down into four closely related dimensions:

- a connectivity or "space" undergoing constant transformation, consisting of associations, links, paths, etc.

- a semiotic, that is, an open system of representations, images, and disparate signs circulating in the connection space

- an axiology, or "values" that determine positive or negative tropisms, affective qualities associated with the representations or zones of the psychic space

- an energics that determines the strength of the affects associated with images

The social mind can thus be conceived as a fractal hypertext, a hypercortex that is identically reproduced at different scales and that includes the transindividual psyches of small groups, individual souls, and infrapersonal minds (regions of the brain, "unconscious" complexes). Each node or zone of the hypercortex contains in turn a living mind, a kind of dynamic hypertext intersected by tensions and energies, colored by affective qualities, animated by tropisms, agitated by conflict.

Within the fractal megamind, the following operations can take place:

- acting on connectivity: setting up networks, opening gateways, distributing or restricting information, maintaining firewalls, filtering information, or even guaranteeing the safety of the group (communication, transport, commerce, training, social services, police, armies, governments, etc.)

- creating or modifying representations and images, and helping the languages in use and the signs in circulation to evolve (art, science, technology, industry, media, etc.)

- creating, transforming, or maintaining tropisms, values, and social affects: good and evil, useful and harmful, pleasant and painful, beautiful and ugly (education, religion, philosophy, morality, etc.)

- modifying, displacing, enhancing, or diminishing the strength of the affects associated with a given representation in circulation (media, publicity, commerce, rhetoric)

Every event participates, to some degree, as a molecular component in all such aspects of the life of the collective megamind, even those that are not recorded in commercial transactions. At any given moment, everyone contributes to the process of collective intelligence. In an economy of the virtual, which explicitly accepts such an approach, even consumption is productive. Earlier I pointed out that the actualization ("consumption") of information is also simultaneously a small creation (an interpretation). But that is not all. For traditional destructive consumption, once captured and returned to the producer or seller, or to some regulatory or metering body, itself becomes ipso facto, the creation of information, and helps augment overall social intelligence. This idea can be generalized as follows: Every act is virtually a producer of social wealth through its participation in the collective intelligence. Any human act is a moment in the process of thought and emotion of a fractal megamind, and as such capable of being enhanced or even remunerated. If every act could be captured, transmitted, integrated in some sort of regulatory loop, retransmitted to a producer, and thus participate in improving a society's overall information about itself, collective intelligence would undergo a significant qualitative change.

Such a perspective has only become practical since the existence of microprocessors, nanosensors, and dis-

tributed computers operating in real time and supplied with user-friendly interfaces (images, voice, etc.). The current market can be considered the still imperfect embryo, coarse and one-dimensional, of a general system for the evaluation and remuneration of individual acts by everyone else. To prevent such a system from turning into a nightmare world, it is important to specify that, based on this concept, evaluation must remain anonymous and every act not only be evaluated but evaluate in turn. The system of integration, measurement, and regulation described here, a kind of cyberspace "metamarket," is primarily an instrument for a society to cooperatively evaluate itself, using a distributed and multicriterial system.

5

Language, Technology, Contract

The virtualization of the body, messages, and the economy illustrates a much more general contemporary trend toward virtuality. I believe we should consider this movement as the pursuit of a continuous process of hominization. Our species, as I'll try to show in the present chapter, is in fact constituted in and by virtualization. As a result the current mutation taking place can be interpreted as a resumption of humanity's drive toward self-creation.

The Birth of Language: the Virtualization of the Present

Three processes of virtualization led to the emergence of the human species: the development of language, the growth of technology, and the increased complexity of its institutions. Language virtualizes a "real time" that holds the living captive in the here and now. In doing so it opens up the past, the future, and time in general as a realm unto itself, a dimension with a consistency of its own. Through the creation of language, we now inhabit a virtual space—temporal flux taken as a whole—that the immediate present only partially and fleetingly actualizes. We *exist*.

Human time does not possess the same mode of being as a parameter or a thing (precisely because it is not "real") but that of an open-ended situation. Within this time, thus conceived and lived, action and thought do not consist only in selecting from among a range of predetermined possibles but in constantly redeveloping a signifying configuration of objectives and constraints, improvising solutions, reinterpreting a past actuality in which we remain involved. For this reason we experience time as a problem. Through their vital connection, the inherited, remembered, and reinterpreted past, the active present, and the hoped-for, feared, or simply imagined future are psychic, existential. Time, as a complete dimension, exists only virtually.

Of course, elaborate forms of memory and learning are already present among the higher mammals, even those that do not possess complex languages. However, we can hypothesize that in animal life, memory is primarily related to the actual modification of a behavior associated with past events. Through language we have "direct" access to the past in the form of an immense collection of time-stamped memories and internal narratives.

Signs do not only evoke "absent things" but scenes, intrigues, complete series of interconnected events. Without language we would be unable to ask questions or tell stories, both of which are ways of detaching ourselves from the present while intensifying our existence. Human beings can partially detach themselves from current experience and remember, evoke, imagine, play, simulate. By doing so they travel to other places, other moments, other worlds. We do not attribute this ability solely to spoken languages such as French, English, or Wolof, but to our plastic, visual, musical, or mathematical languages as well. As languages become more complex and extensive, we increase the

possibilities for simulating, imagining, and helping others imagine an elsewhere, an alterity. This reveals an important characteristic of virtualization: by undoing the here and now, it opens the way to new spaces, other velocities. The emergence of language is accompanied by an acceleration of the learning process, an unprecedented rapidity of thought. The pace of cultural evolution exceeds that of biological evolution. Time itself bifurcates in the direction of the internal temporalities of language: the time of narrative, the endogenous rhythm of music or dance.

The transition from private to public and the reciprocal transformation from interior to exterior are attributes of virtualization that can also be analyzed from the point of view of the semiotic operator. An emotion that has been verbalized or sketched on paper can more easily be shared. What was internal and private becomes external and public. But this is also true in the opposite sense: When we listen to music, look at a painting, or read a poem, we internalize or personalize a public item. As soon as we begin talking, we begin to externalize, objectivize, and exchange primarily subjective entities such as complex emotions, understanding, and concepts, which travel from place to place, time to time, and from one mind to another.

Human language virtualizes real time, material objects, actual events, and ongoing situations. Out of the disintegration of the absolute present, like two aspects of the same creative act, time and outside-time arise, the obverse and reverse of existence. Adding a new dimension to the world, the eternal, the divine, and the ideal have a history. They grow along with the complexity of language. Questions, problems, and hypotheses bore holes in the here and now to end up in the virtual world on the other side of the mirror, somewhere between time and eternity.

Technology: the Virtualization of Action

Virtualization should not be thought of as necessarily accompanied by disappearance or loss. On the contrary, it often involves a process of materialization. This can be easily illustrated in the case of technological virtualization.

Where do tools come from? Initially, we identify some physical or mental function of a living being (striking, trapping, walking, flying, calculating). We then detach these functions from a specific assemblage of flesh, bones, and neurons. In doing so we also separate them from internal and subjective experience. The abstract function is materialized in a new form, which differs from the animal's customary gesture. In place of the nude body we substitute hybrid devices, different media: the hammer for striking, the trap, hook, or net for trapping, the wheel for walking, the inflated balloon, wings of a plane, or blades of a helicopter for flying, the abacus or slide rule for arithmetic operations. Through this materialization the private becomes public, shared. What was previously inseparable from a subjective immediacy, an organic interiority, has now become, wholly or partially, external, and has entered into an object. But through a kind of dialectic spiral, technological exteriority often becomes effective only after it has again been internalized. In order to use a tool, we have to learn new gestures, develop reflexes, reshape a mental and physical identity. The ironsmith, skier, automobile driver, harvester, knitter, or cyclist have all modified their muscular and nervous systems to integrate the instruments they use into a kind of enlarged, modified, and virtualized body. And since technological exteriority is public or shared, it helps bring into being a collective subjectivity. The technological dynamic feeds off its own products, sets in motion lat-

eral and rhizomatic interactions, and ultimately machines, complex arrangements that are extremely remote from any simple bodily function. A sail boat, water mill, clock, or nuclear reactor virtualize motor, cognitive, or thermostatic functions but cannot be conceived as extensions of the individual body. They are only fully reintegrated or interiorized as hybrid social megamachines or collective hyperbodies.

The design of a new tool virtualizes a combination of organs and gestures that appears only as a specialized, local, and momentary solution. By designing a tool, rather than concentrating on a given action, we operate on a much higher level, that of an indeterminate set of situations. The creation of a tool is not a response to a particular stimulus but partially materializes a generic function. It acts as a fulcrum for the resolution of a class of problems. A tool held in the hand is a real object, but this object gives us access to an indefinite set of possible uses. Following Marshall McLuhan and André Leroi–Gourhan, it is sometimes said that tools are the continuation or extension of the body. This theory doesn't seem to do justice to the specificity of the technological phenomena, however. You can give your cousin a piece of cut silex. You can produce thousands of bifaces. But it is impossible for you to grow more fingers or lend them to your next-door neighbor. A tool is more than just an extension of the body; it is the virtualization of an action. The hammer may give us the illusion of being an extension of our arm. A wheel is obviously not an extension of our leg but a virtualization of walking.

There are few virtualizations of action and many actualizations of tools. The hammer could have been invented three or four times during the course of history. Let's say there were three or four virtualizations. But how many times has a hammer been struck? There

have been billions and billions of actualizations. The tool and the permanence of its form are the memory of the original moment of virtualization of the actual body. The tool crystallizes the virtual. Technology virtualizes not only bodies and actions, but things as well. Before humans learned to strike bits of silex together on top of a small pile of kindling, fire was something that was either present or absent. With the discovery of ways of generating sparks, fire could now be seen as something virtual. It is virtual everywhere there are matches. While the presence or absence of fire was a fact that early man had to confront, it is now an open-ended eventuality. A constraint has been transformed into a variable.

A given technological object can be viewed in terms of any of four modes of being. As problematization, deterritorialization, deprivatization, and metamorphosis and recomposition of a bodily function, the technological object is an agent of virtualization. A hammer *virtualizes* when we view it as the memory of the invention of the hammer, the vector of a concept, an agent of the hybridization of the body. In this sense the hammer *exists* and causes to exist.

With each blow of a mallet or bushhammer, the virtualizing hammer, present witness of what was once the discovery of a new way of striking, is actualized. Actualizing, the hammer guides action. A given configuration, a given hybridization of the body, effectively *takes place* through it, here and now, and each time differently. Each stroke of the hammer is an *occurrence*, an attempted resolution of a problem on a molecular scale. And sometimes it fails: We can strike incorrectly, hitting too hard or off the mark.

The real hammer is the sledge hammer, the pole ax, the sculptor's axhammer: the thing with its price,

its weight, its wooden handle and metal head, its precise shape. The real hammer has to be forged, assembled, realized by the manufacturer, stored, protected. The hammer resists or *subsists*.

Last, the hammer embodies a potential, a power or force. Considered as potential, the hammer is perishable. It is a finite reserve of blows and particular uses. No longer a vector of the body's metamorphosis, the discovery of a new physical relationship to the world (the virtualizing hammer), no longer the conductor of a singular act in the here and now (the actualizing hammer), no longer a material thing (the real hammer), but a reservoir of possibles. Thus the potential of a new hammer is greater than that of an old one, and the shoemaker's adz no longer has the same qualitative potential as the glazier's mortise axe. The hammer *insists*.

The Contract: The Virtualization of Violence

Three processes of virtualization led to the emergence of humanity. The first is associated with signs: a virtualization of real time. The second with technology: the virtualization of action, the body, and the physical environment. The third process increases with the growing complexity of social relations. To express this as concisely as possible, we could say it involves the virtualization of violence. Ritual, religion, morality, law, economic and political regulations are social mechanisms for virtualizing relations of force, immediate impulses, instincts, desires. To take a rather special example, an agreement or contract defines a relation independently of a particular situation. In principle it is independent of the emotional changes of those bound by it and the fluctuation in the relations of force among them.

A law envelops an indefinite quantity of virtual details, only a small number of which are explicitly mentioned in its written embodiment. In a given society a ritual (a marriage or initiation ceremony, for example) is applied to an indefinite number of individuals. The accompanying change in status ("Now, you are husband and wife." "Now, you are an adult.") is automatic and identical for everyone. We are not required to recreate and negotiate something new for each individual situation. Such cases—marriage, initiation, the act of selling—demonstrate that the virtualization of relationships and immediate impulses, while it stabilizes behavior and identity, also determines specific procedures for *transforming* our relationships and personal status. Mediated by language, the emotion virtualized by narrative jumps from mouth to mouth. By means of technology the action virtualized by the tool passes from hand to hand. In the same way, in the world of social relations, we can organize the movement or deterritorialization of virtualized relations. A title of ownership, shares in a corporation, or an insurance contract can be sold or transferred. Recognition of a debt, a letter of exchange, or a bond, which initially involved only two parties, can circulate among an indefinite number of persons. We can also elect a spokesperson, teach someone a prayer, buy a fetish.

Coagulated virtual relations, like contracts, are public entities shared by a society. New procedures, new rules of conduct are built upon those that precede them. A continuous process of virtualizing relations gradually shapes the complexity of human cultures: religion, ethics, law, politics, economy. Concord may not be a natural state for humanity, since the construction of a society takes place through a process of virtualization.

Art: The Virtualization of Virtualization

Why is art so popular despite our difficulty in describing it? Because it represents the summit of our humanity in more ways than one. No animal species has ever practiced the fine arts and with good reason. Art exists at the confluence of three main currents of virtualization and hominization: language, technology, and ethics (or religion). Art is difficult to define because it is almost always found at the boundary of simple, expressive language, ordinary technology (artisanship), and a too clearly identifiable social function. It fascinates us because it implements the most virtualizing of all activities. Art provides an external form, a public manifestation, for emotions, for sensations that are felt in the innermost recesses of subjectivity. Although intangible and fleeting, we feel that these emotions are the spice of life. By making them independent of a particular time and place, or by providing them with a collective force (for the living arts at least), art enables us to share a way of feeling, a subjective quality of experience.

In general, virtualization is a war against fragility, pain, wear. In search of safety and control, we pursue the virtual because it leads us toward ontological regions that ordinary dangers never reach. Art questions this tendency and thus virtualizes virtualization because it attempts to supply both an escape from the here and now and its sensual exaltation. It incorporates this very attempt at evasion in its meanderings and detours. In its play, it ravels and unravels the affective energy that enables us to overcome chaos. And in its final movement, denouncing the engine of virtualization, it problematizes our tireless, sometimes fecund, and always failed effort to escape death.

6

The Operations of Virtualization or the Anthropological Trivium

Do the operations of virtualization possess an invariant core, a formula for virtual activities? I will tentatively answer yes, with the caveat that my response can only be partial and rather general. The theory I am proposing, while it can be used to recognize and analyze virtualization after the fact, is unfortunately not an infallible guide to creation.

The Trivium of Signs

Let's start with language. The three-fold path, or trivium, formed the basis of liberal education throughout antiquity and the Middle Ages. It included grammar (learning how to read and write correctly), dialectic (learning how to reason), and rhetoric (learning how to prepare speeches and convince an audience). My hypothesis is that each of the three paths of the trivium embodies operations that are nearly always at work in the process of virtualization.

Based on a continuum of sounds, a language isolates or segments phonemes, which are elementary, nonmeaningful units of sound. Meaningful units (words, sentences, or speech) can be analyzed as sequences of elements deprived of meaning in them-

selves (phonemes). Each combination of elements will have a different meaning, and elements assume a distinct value depending on how they are combined. Grammar is the art of constructing small units of meaning out of nonmeaningful elements and large, meaningful units (sentences, speech) out of these smaller units. The grammatical operations of cutting up and arranging these elements affect not only language but writing as well, including nonalphabetic forms of writing.

Initially the art of dialogue, dialectic later referred to the science of argument and, in the medieval university, included logic and semantics as well. Grammar involved the internal articulation of language, the manipulation of linguistic and writing tools. Dialectic established a relationship of reciprocity between speakers, for all argument assumes an underlying intellectual parity of some sort. Thus, dialectic connects a system of signs and an objective world that functions as a mediator between two speakers. Are the arguments involved true or false? And why? How do they relate to the state of the world? Dialectic involves both the relation to the other (argument) and the relation to the "exterior" (semantics, reference). All language is dependent on such relations of correspondence, or substitution, between an order of signs and an order of things.

Rhetoric designates the art of acting on others and the world by means of signs. At the rhetorical or pragmatic stage, we are no longer concerned solely with representing the state of things but also of transforming them, and even creating a reality out of language, that is, a virtual world, the world of art, fiction, culture, the human mental universe. This world created by language will eventually function as a reference for dialectic operations or will be used for other creative

activities. Language only truly comes into its own at the rhetorical stage, when it feeds off its own activity, imposes its objectives, and reinvents the world.

The Trivium of Things

Grammatical, dialectic, and rhetorical operations, keys to the virtualizing power of language, also characterize technology and relational complexity. This is not to say that everything can be reduced to language. Far from it. Behind the efficiency of language, there exists an abstract, neutral structure, which also characterizes other kinds of human activities. And these activities can help us escape the here and now.

In terms of technology, grammar refers to the segmentation of basic gestures that can be combined in various *sequences* or actions in a given situation. Think of the way we learn gymnastics, dancing, tennis, fencing, martial arts, and a number of other professional skills. Some writers like Michel Foucault claim that this segmentation is a recent phenomenon, which appeared in Europe during the seventeenth and eighteenth centuries and was based on attempts to discipline the body. It is important to note, however, that we have the *ability* to isolate our physical actions and that this generally results in increased efficiency, at least during group learning situations. Also, the fact that such segmentation becomes explicit (for itself) in a given culture doesn't signify that it is not implicit (in itself) in others. The analysis of language clearly demonstrates this. Grammar, as a separate discipline, comes into being only after writing, and the majority of human beings learn to speak without the vaguest idea of the rules of grammar. Nevertheless, words are still combinations of phonemes, and each language is

a kind of combinatory system that complies with specific rules for creating sequences of sounds. Technological grammar involves more than gestures, however. It also refers to basic material modules, which can be combined to form artifacts and tools. For example, the same handle can be used to assemble a shovel or pickax, and very different kinds of houses can be built from identical bricks.

Although we are inclined to admit the existence of a technological grammar, a dialectic of things seems problematic. Language refers to the real world. It enables us to make true or false statements, arouse emotions, and generate ideas. It signifies. Technology, however, seems to belong to a different order than that of signification, the order of efficient action and operationality. Language provokes mental states, the tool displaces matter. How can a dialectic of instruments come into being? And yet, technology also makes sense.

Substitution lies at the heart of signification. If the word "tree" signifies, it is primarily because, under certain circumstances and for specific uses, it stands for the real tree. In nearly the same way, a technological device stands for another nontechnological device or one that is less complex. For example, our modern system of running water replaces the traditional system of bucket and fountain. The fountain in the town square in turn stands for the process of going to the river or well to get water. The faucets on our kitchen or bathroom sink "denote" the following signification: You no longer have to draw water from a well or hire a porter. The bicycle serves as a technological object only because it can be substituted for unassisted walking or horseback riding. In general, the *meaning* of an artifact or tool is the device we would have had to use to obtain the same result if it hadn't been invented.

Not only does the technological object, like the sign, fulfill a function of substitution, it also engenders the same kind of abstraction. The word "tree" does not only refer to the fig tree in my garden or the birch in the forest, but to any particular tree or even any general concept of a tree. In the same way, a bicycle doesn't exactly replace my legs when I'm walking or the horse in the stable. It stands for a general function of transportation, an abstract function, which is detached a priori from any specific referent and refers to an indeterminate number of situations or concrete devices of movement.

Technology also possesses its own rhetoric in the sense that its movement is not limited to the accumulation of practical or useful artifacts and tools, which save time and energy. Technological discovery opens the way to radically new possibilities whose development culminates in the creation of an autonomous world, a ramifying creation in which static criteria of utility can no longer serve as the basis of evaluation. From the point of view of technological dialectics alone, tools can be seen merely as means to an end. The acts of drinking or going to the neighboring village remain unchanged as ends in themselves. The technologies for carrying water or pedaling simply enable us to attain these ends more quickly and at lower cost. But the production of artifacts reaches the stage of rhetoric when it participates in the creation of new ends. For example, the electronic calculators developed during the forties were able to carry out arithmetic operations a thousand times faster than earlier electromechanical or analog calculators. But there was no point in using the new machines to carry out the same operations as the old ones at a faster pace. We exploited this increased speed to radically modify the design of calculating machines. Instead of building instruments that were intended for a specific type of computation,

we developed universal computers, which were programmable and capable of processing information in a variety of ways. This was made possible only through the speed of electronics, which did away with the need to optimize the material arrangement of circuits as a function of the required operation. Ultimately this led to the development of information technology and the proliferation of a software universe.

An unarticulated vision of information technology, limited to the stage of dialectics, reduces it to a set of tools for computing, writing, designing, and communicating faster. The fuller, rhetorical approach sees in it a space for the production and circulation of signs that are qualitatively different from their predecessors, in which the rules of efficiency and the criteria for evaluating utility have changed. Our species is committed to this new information space and there is no going back. The question is not whether we should evaluate its usefulness, but how to determine the future direction of an irreversible process of cultural creation. We could say the same for the majority of our methods of transportation as well, which have done more to change our sense of geography and blur the distinctions between town and country than they have to accelerate the speed of horsedrawn carriages and sailboats. The automobile is unquestionably a means of transportation, but it is also the principal urban actor in contemporary life.

As the technocosmos develops, its elements will blend into the background, become naturalized, enter into the dialectic of accepted ends and improving means. But along its most advanced frontier, at the fluctuating interface between creation and the unknown, technological activity discovers virtual worlds in which new goals are being developed.

The Trivium of Beings

Relational complexity also involves a more generalized anthropological trivium. At the grammatical stage we identify and segment elements capable of forming contractual, legal, social, political, moral, or religious compositions. These recombinable elements are as conventional and nonmeaningful as the phonemes of spoken language: sentiments, passions, atoms of relation, gestures, parts of the soul, subjects, persons, the basic building blocks of behavior, relationships, and social identity.

It is important that there exist invariable elements such as safety, anger, offense, promise, or praise, recognizable within an infinite variety of circumstances, so that collective life can stabilize and grow complex. From a strictly physical point of view, all sounds are different. It is only within the virtualizing process of language that two distinct sounds can exemplify the same phoneme. The same is true for classes of feelings or social acts. Though different on the psychological plane, they instantiate the same relational atom in the construction of social complexity. Starting with basic elements, an infinite quantity of sequences of interactions, a kind of relational hypertext, can be constructed.

Earlier I referred to the dialectical dimension of ethics, here understood in the general sense of relational and behavioral complexity. A contract is a *substitute* for a relationship of force or a continuous discussion. A ritual economizes the negotiation of a desire or an identity. As with language and technology, a series of actions can refer to other ethical constructions recursively, forming a bundle of simultaneous significations, a harmonic dimension of the social bond. A

symbolic operation replaces an animal sacrifice, an animal sacrifice takes the place of a human sacrifice, a human sacrifice economizes a civil war.

At the rhetorical stage we can recognize the growth of an autonomous relational universe along the legal, institutional, political, commercial, moral, and religious planes. Here too the question of utility, function or reference, gives way to the ability to create meaning or, rather, to alter meaning, to create radically new worlds of signification: monotheism, Roman law, democracy, capitalist economy...

Grammar: The Foundation of Virtualization

How is it that the three stages of the trivium create a path to virtualization? The operations of grammatization segment a continuum that is strongly tied to presences in the here and now, to bodies, relations, or particular situations, and ultimately results in the production of conventional or standard elements. These abstract atoms are detachable, transferable, and independent of living contexts. They already form the minimum degree of the virtual to the extent that each of them can be actualized in an indefinite variety of occurrences, all of which are qualitatively different but nevertheless recognizable as examples of the same *virtual* element. These atoms are thus not real or substantial. This is an important point, for there is a considerable difference between Cartesian analysis, which divides the world into real elements, and grammatization, which creates virtual particles. The property of nonsignification means that a limited number of basic building blocks, free and detachable, can be used to construct an infinite number of sequences, chains, or compounds of signification. The signification of a

compound cannot be deduced a priori from the list of its elements since it involves an act of creative actualization in a specific context.

The fate of writing provides a good illustration of grammatization. This is confirmed by etymology, the word *gramma* in ancient Greek meaning "letter." Speech is initially inseparable from the breath, a living presence in the here and now. Writing (the grammatization of speech) separates the message of a living body from a particular situation. Printing continues this process by standardizing the printed word, by detaching the text that is read from its direct connection to muscular activity. The virtualizing trait of printing is the use of movable type. In nearly every process of virtualization, we find the equivalent of movable type, something detached from any concrete situation, reproducible and circulating.

Information technology accelerates the movement initiated by writing by reducing every message to a combination of two elementary symbols: zero and one. These characters are the least significant of all, and are identical no matter what the storage medium might be. Regardless of the nature of the message, they compose sequences that can be translated on and by any computer. Information technology is the most virtualizing of all technologies because it is the most grammatizing. Language is characterized by its duality: the interrelation of phonemes with other phonemes to form words, and the interrelation of words with other words to form sentences. With respect to information technology, we can speak of an articulation of *n* levels: basic electronic codes, machine languages, programming languages, high-level languages, interfaces and translators, and finally traditional writing, language, in all its visual and sonorous forms, new systems of interactive signs.

The relationship between contemporary phenomena of deterritorialization and globalization on the one hand and the standardization (virtualization) of recombinable building blocks on the other should be obvious. Standardization can be used to quantify distinct systems of information, economics, and transport. As a result it can be used to construct unbounded economic, informational, and physical spaces, capable of unrestricted circulation, whose characteristic figures (cars, planes, computers) mask a coordinated, fluctuating, and continuous stream of articulable components. Just as computers eventually dissolved into the expanse of cyberspace, aircraft are nothing more than the visible components of an integrated international air transport system centered around the process of coordination among airports.

Turning our attention from signs and technology to social forms, how does grammatization promote new types of contracts and behaviors? Steven Shapin and Simon Schaffer's book, *Leviathan and the Air-Pump*, retraces the birth of the modern scientific community in the seventeenth century in terms of the polemic between Hobbes and Boyle. Boyle wanted to define the rules that were to govern the "experimentalists" and notably the strict separation between *facts*, which were presumably the product of a consensus, and could be confirmed by faithful witnesses and reproduced in the laboratory, and *hypotheses*, theories or causal explanations for which the agreement of the scientific community wasn't necessary. Hobbes, for his part, refused to admit the separation between facts and causal explanations. In fact he felt that philosophical activity was useless if it wasn't based on causal explanation. Moreover, he emphasized that in reality it was impossible to separate the establishment of facts and the formulation of hypotheses or interpretations that orient and shape our vision. Hobbes thus had am-

ple opportunity to criticize the "facts" obtained by Boyle by demonstrating their conventional and synthetic nature. In a sense Hobbes was right. The separation between "meaningless" facts and explanations is artificial. But was the fundamental problem of Boyle and the experimentalists to be considered right, that is, ultimately to restrict themselves to the real? Wasn't their problem rather to devise some means for isolating a virtual component of knowledge, one that was mobile, reproducible, and independent of the individual, even if it existed only within the limited network of laboratories capable of reproducing experiments? Here the mobile, detachable, nonmeaningful characteristic is the *fact*. In the end the attempt to reshape science as a virtualizing machine was probably more fruitful than our desire to stick to reality or truth telling.

A final example will illustrate the virtualizing power of grammatization. In this case my reference is no longer the virtualization of knowledge by the scientific community but the virtualization of the recognition of knowledge and skill by society as a whole. In a profound sense individual abilities are unique, closely bound to the trajectory of a singular existence, inseparable from a sensible body and a world of personal significations. This is and will always remain true. Nonetheless, to satisfy economic and social needs, as well as the symbolic satisfaction of the individual, these skills must be identified and recognized by convention. The need for recognition and identification is even more important given that skill and knowledge are currently the sources of the majority of our forms of wealth. However, the traditional method of recognizing individual skill by means of a diploma is simultaneously:

- deficient since not everyone has a diploma even though everyone knows something

- extremely crude since people holding the same diploma do not possess the same abilities, primarily because of their different backgrounds and experience

- nonstandard since diplomas are associated with universities or, at best, governments, and there is no general system of equivalence among diplomas from different countries

The official code for recognizing skills is thus inherently rigid and provides no form of articulation. Diplomas are not composed of basic elements that can be reused in some other sequence of elements. They are indivisible molar aggregates. Several diplomas do not form a signifying unit that exists at some higher level, but simply a crude juxtaposition.

The knowledge tree was conceived and implemented to virtualize our relation to knowledge and skill (Authier, Lévy, 1992). It enables both groups and individuals to identify and orient themselves within a universe of knowledge in flux. The knowledge tree provides a means for grammatizing the recognition of knowledge. The elementary particles of recognition, or *brevets*, are not fully meaningful in themselves, but only as part of a *blazon*, a group of brevets (curricula) obtained by an individual and displayed on the knowledge tree of a community. A set of brevets can be used to construct an indefinite number of different skill paths. The same individual curriculum assumes different significance and value depending on the community in which the tree appears.

We thus obtain a system structured around two sets of relations: first, that between individual brevets and curricula (similar to the relationship between phonemes and words), and second, that between the curricula and

the tree. A tree is formed from the different skill paths of the members of a community and structures them in turn in the form of blazons. (This is similar to the relationship between words and sentences—the sentence consists of words of indeterminate semantic value and actualizes the meaning of the words it comprises.) Initially, any brevet, more or less, can be integrated into any curriculum, and any curriculum, although with varying results, can be included on any tree. The brevet is the mobile characteristic for the identification of knowledge. This bilateral grammatical function is the condition that makes possible the standardization, deterritorialization, and virtualization of recognized knowledge. A kind of skill-signaling phoneme, the brevet represents a virtual particle of skill. It is, therefore, essential that it be stereotyped and independent of any particular individual, place, or educational program. The blazon that appears on the knowledge tree expresses an individual's competencies in a given context. It provides an image—always singular—of the actualization of a person's skills in a given situation.

Such an approach is rational and practical. It enables us to resolve a number of problems, which are both urgent and concrete. And yet it smacks of heresy, for the same reason that it is novel: The recognition of skills is completely disconnected from any particular assumption about the order of knowledge. The various ways of classifying knowledge, visualized by means of the tree, are the result of the different approaches to apprenticeship taken by different communities. Something has been set free.

Dialectics and Rhetoric

A prehistoric man sees a branch. He recognizes it for what it is. But history doesn't stop there, for the

man, initiating a process of dialectic, sees double. He squints at the branch and imagines a stick. The branch signifies the stick. The branch is a virtual stick. Substitution. All technology is founded on this capacity for twisting and doubling reality, for the heterogenesis of the real. A real entity, embedded in its identity and function, suddenly harbors a different function, another identity, becomes a component in new assemblies, is swept away in a process of heterogenesis. The same capacity for interpreting or inventing meaning is at work in both language and technology, home repair and reading.

Just as there is a dialectic of signs and a dialectic of things, the dialectic of being requires that we mutually integrate the point of view of the other, that we reciprocally signify one another in negotiations, contracts, covenants, treaties, agreements, in the rules of public life in general. By (virtually) putting ourselves in the other's position, we accept the dialectic of substitution.

Dialecticization is an active process. To create a dialectic is to organize a correspondence. It involves the reciprocal exchange of arguments among subjects as well as a relation between entities that suddenly become part of a process of mutual signification. Unlike the chasm between signs and things, the virtualizing dialectic establishes relations of signification, association, or reciprocity among entities. Any object has the ability to signify. Likewise, each sign is dependent on a physical inscription, a means of expression. Caught up in the dialectical process, beings are doubled. They both remain themselves and become the vectors of an other. In so doing they are already no longer themselves, although their identity serves as the basis for their ability to signify. Self and other are part of a loop, interior and exterior are continuously transformed into their opposite, as in a Moebius strip.

The dialectical operation serves as the basis for the virtual because it creates, always differently, a second world. The public or religious world emerges from the interaction among private subjects, which the social reciprocally produces. The technocosmos grows like a fractal complication of nature. Finally, the world of ideas, image of images and site of archetypes, models experience on one side and reflects reality on the other. This second world does not exist prior to the dialectic operation, for it is not "real" or static. Always in a state of coming into being—and always like an other, an other world—it is continuously born and reborn of an infinite process of doubling, return, and correspondence.

Grammatical operations multiply the number of degrees of freedom. Upon the terrain subdued by grammar, dialectics propels the chain of diversion and the rhizomatic processes of meaning, thus opening a passage to the virtual worlds that rhetoric inhabits and augments autonomously. Grammar, dialectics, and rhetoric follow one another only within a logical order of exposition. Within the concrete processes of virtualization, they appear simultaneously or are sometimes even drawn forward by rhetoric. Grammar segments basic elements and organizes sequences. Dialectics creates substitutions and correspondences. Rhetoric detaches its objects from any kind of combination, any reference, and deploys the virtual as an autonomous world. This generalized rhetoric encompasses all the operations involved in creating our world, in both the linguistic and technological or relational domains: invention, composition, style, memory, action. Raw ontological energy, creation lies beyond the grasp of utility, signification, or truth. But the very movement that carries this positivity along with it also creates the attractors and channels that yield to its passage. The rhetorical act, which is the very essence of the virtual,

asks questions, embodies tensions, and suggests objectives. It introduces them, sets them in motion within a vital process. Mankind's greatest inventions are inventions of problems—the creation of a void in the midst of reality.

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The Virtualization of Intelligence and the Constitution of the Subject

In the previous chapter I examined the *operations* of virtualization. I would now like to turn my attention to its *object*, or rather to the creation of the object as the fulfillment of virtualization. In order to approach the object through a process of logical progression, however, I would first like to draw the reader into an examination of the virtualization of intelligence. In this and the following chapter, I examine three interrelated themes: the collective dimension of personal cognition and affect, the question of the "thinking community" as such, and collective intelligence as a technopolitical utopia. The following discussion will help clarify the interrelationship between the object and collective intelligence.

As humans we never think alone or without tools. Institutions, languages, sign systems, technologies of communication, representation, and recording all inform our cognitive activities in a profound manner. The whole of a cosmopolitan society thinks in us. Thus, despite the permanence of elemental neuronal structures, thought is profoundly historical, dated and situated not only by its forms of expression but also in its procedures and methods of operation. If the community thinks in us, is it reasonable to assume that group thought can be real and effective? Can we speak of an intelligence without a unified consciousness or thought

without subjectivity? How far should we go in redefining the notions of thought and psychic life so that they become congruent with society? It is said that we are becoming the neurons of a planetary hypercortex. It is important, therefore, that we be able to explain these problems and underline the differences between various types of collective intelligence, especially those that distinguish human societies from ant colonies and bee hives.

The development of computer-mediated communication and global digital networks appears to be the realization of a more or less well-formulated project to deliberately create new forms of collective intelligence, which are more flexible and democratic and based on reciprocity and respect for singularities. In this sense we could define collective intelligence as a fully distributed intelligence that is continuously enhanced and synergized in real-time. This new ideal could replace artificial intelligence as the myth that drives the development of digital technologies and reorients the cognitive sciences, the philosophy of mind, and anthropology toward such questions as the ecology or the economy of intelligence.

In exploring these problems I'll make use of the concepts of the virtual and the actual and the theory of anthropogenesis through virtualization introduced in previous chapters. The operations of elevation to a problematic, deterritorialization, sharing, and the reciprocal constitution of interior and exterior, which have been associated with virtualization throughout this book, will also be examined. After reviewing the importance of our language, technology, and institutions in shaping the individual psyche, I will briefly discuss the central themes of cognitive ecology and economy. I'll also try to formulate a definition of the psyche that is compatible with the idea of collective

thought. In doing so I will examine the Darwinian notions of intelligence and outline an affective approach to these questions that takes into account the mind's dimension of interiority. Following this I will describe the new forms of collective intelligence made possible by the development of interactive digital networks and the perspectives they create for positive forms of social evolution. An analysis of cyberspace will introduce the next chapter, devoted to analyzing the role of the "object" operator in the formation of intelligent communities, from market capitalism to the enigma of hominization. Finally, I will show how the object, key to collective intelligence and primary substrate of virtuality, confronts the "real," its tenacious and perverse double.

Collective Intelligence in personal intelligence

By "intelligence" I mean the canonical set of cognitive aptitudes, namely the ability to perceive, remember, learn, imagine, and reason. To the extent that we possess such aptitudes, all individual humans are intelligent. The exercise of such cognitive abilities, however, implies a collective or social element that has generally been underestimated. We never think alone but always as an element of a dialogue or multilog, either real or imagined. We exercise our higher mental faculties only as members of living communities, with their heritages, conflicts, and projects. Whether they occupy the background or foreground of mental activity, these communities are always already present in every aspect of our thought, acting as interlocutors, intellectual instruments, or objects of reflection. The knowledge, values, and tools transmitted by culture constitute the nour-

ishing context, the intellectual and moral bath out of which individual thoughts develop, weave minor variations, and occasionally produce major innovations.

For the moment I would like to concentrate on the instruments of thought. It is impossible for us to exercise our intelligence independently of the languages and sign systems (scientific notation, visual codes, musical notation, symbols) we inherit from a culture and share with thousands or millions of others. These languages carry with them methods of segmenting, categorizing, and perceiving the world. They contain metaphors that serve as filters of the given and small interpreting machines. They embody an entire heritage of implicit judgments and preestablished ways of thinking. Languages and sign systems make our intellectual operations possible; the communities that forged them and enabled them to slowly evolve think in us. Our intelligence possesses a significant communal dimension because we are creatures of language.

The tools and artifacts that surround us incorporate humanity's age-old memory. In using them, we make use of collective intelligence. Houses, automobiles, televisions, and computers summarize secular lines of research, inventions, and discoveries. They crystallize the wealth of organization and cooperation that has been used to produce them. But tools are not only memories, they are also perceptual machines that can operate on three different levels: direct, indirect, and metaphoric. Directly, eyeglasses, microscopes, telescopes, X rays, telephones, cameras, and televisions extend our reach and transform the nature of our perceptions. Indirectly, automobiles, aircraft, and computer networks profoundly alter our relationship to the world and in particular our relationship to space and time, in such a way that it becomes impossible to determine whether they transform the human world or

our manner of perceiving it. Finally, material instruments and artifacts provide us with a large number of concrete and socially shared models, with which we can metaphorically apprehend more abstract phenomena or problems. Thus Aristotle considered causality using the example of a potter. The seventeenth century represented the body as a kind of mechanism, and today we construct computational models of cognition. Through the use of artifacts, the immense labor of humanity and its age-old intelligence share in our perception of the world, here and now.

The universe of things and tools that surrounds us and in which we share thinks in us in a hundred different ways. By this means we participate in the collective intelligence that produced them. The social institutions, laws, rules, and customs that govern our relations have a determining influence on the course of our thoughts. Whether we are a high-energy physicist, priest, head of a public organization, or financial investor, we will tend to favor a given intellectual quality over another. The scientific community, church, government bureaucracy, or stock market each embodies different forms of collective intelligence, along with their distinct modes of perception, coordination, learning, and memory. The social "rules" governing the interactions among individuals also model the collective intelligence of human communities as well as the cognitive aptitudes of the individuals that share in them.

Every individual human has a brain, which, roughly speaking, is modeled like the brains of other members of the species. Because of biology our intelligences are individual and similar (although not identical). Because of culture our intelligence is highly variable and collective. In effect, the social dimension of intelligence is closely tied to our languages, technologies, and in-

stitutions, which differ greatly according to time and place.

Cognitive Economies

With the growth of institutions and "rules," there is a transition from the collective dimensions of individual intelligence to the intelligence of the community. We can consider human groups as ecological or economic environments in which various species of representation and ideas come into being and perish, expand or contract, compete or live together symbiotically, remain unchanged or mutate. Not only individual ideas, representations, messages, and statements, but their species: literary or artistic genres, methods of organizing knowledge, current forms of argument or "logic," message types and their media. A human community is the theater of a cognitive ecology or economy within which various species of representation evolve (Sperber).

Social forms, institutions, and technologies model the cognitive environment in such a way that certain kinds of ideas or messages have a greater chance of reproducing than others. Among the factors affecting collective intelligence, intellectual technologies, including systems for communicating, writing, recording, and processing information, play a major role. Indeed, some types of representation have difficulty surviving, or even coming into being, in environments lacking certain intellectual technologies, while they may prosper in other cognitive ecologies. For example, lists of numbers, tables, and other forms of systematically arranged knowledge cannot easily be transmitted in preliterate cultures. Oral societies favor the encoding of representation in narrative forms, which can be preserved and transmitted more easily in the absence of a medium for

writing. To take a more recent example, an increasing percentage of knowledge is currently expressed by means of interactive digital models and simulations—something that was obviously unthinkable before the existence of computers with easy-to-use graphical interfaces. The types of representation that are prevalent within a given cognitive economy favor distinct modes of knowledge (myth, theory, simulation) together with their corresponding styles, criteria of evaluation, and "values." As a result intellectual technologies or media can, even indirectly, have profound repercussions on collective intelligence.

Communications infrastructures and intellectual technologies have always had close ties to economic and political forms of organization. There are several well-known examples of this. The birth of writing is associated with the first hierarchically arranged bureaucratic governments and centralized forms of economic administration (taxes, the management of large agricultural domains). The appearance of the alphabet in ancient Greece is contemporary with the emergence of money, the polis, and especially the creation of democracy. Since the practice of reading had become widespread, everyone was able to learn about laws and discuss them. Printing made possible the widespread distribution of books and the existence of newspapers, which served as the basis for public opinion. Without the printing press, modern democracies would not have been born. Printing also represents the first mass-production industry, and the technoscientific development it promoted was one of the engines of the industrial revolution. The audiovisual media of the twentieth century (radio, television, records, films) have played a role in the emergence of the society of the spectacle, which overturned conventional rules both in politics and the market (publicity, the economy of information and communication).

It is important to emphasize that the appearance or extension of intellectual technologies do not automatically determine a given mode of knowledge or social organization. We must be careful, therefore, to distinguish causal or determining actions from those that prepare the way for or make something possible. Technologies don't determine, they lay the groundwork. They expose us to a broad array of new possibilities, only a small number of which will be selected or employed by social actors. If such technologies weren't themselves condensed forms of collective intelligence, we might say that technology proposes and man disposes.

Darwinian Machines

The notion of collective intelligence is not simply a metaphor, some helpful analogy, but a coherent concept. To describe such a concept, we need to define a "mind" that is fully compatible with a collective subject, that is, an intelligence whose subject is multiple, heterogeneous, distributed, cooperative–competitive, and constantly engaged in a self-organizing or autopoietic process. This set of conditions automatically eliminates computational or informatic models such as Turing machines, which do not possess the capacity for self-creation.

Models based on biology seem to be better candidates, particularly those that employ a Darwinian approach. Darwinian principles are, by definition, applicable to populations, and involve the presence of some means for generating novelty or variability: genetic mutation, use of new neuronal connections, invention, the creation of organizations or products. Coupled to its environment, the Darwinian machine *se-*

lects from among the novel items introduced by the generator. Its choice is notably constrained by the viability and capacity for reproduction of the individuals or subpopulations provided with the new characteristic. Darwinian systems demonstrate a capacity for nondirected learning or an ability for continuous self-creation (which amounts to the same thing for a theory of mind). Through the dialectical interplay of mutation, selection, and transmission of the selected elements, Darwinian machines drag their environments with them along an irreversible historical path. In their own way Darwinian machines embody the memory of that history.

The principles of Darwinian systems can be applied to the ecology of living species, human groups considered as development environments for representation, market economies (populations of producers, consumers, goods), and the individual psyche understood as a society of thoughts and cognitive modules. And finally they can be applied to the operations of the brain seen in terms of the principles of neuronal Darwinism. Systems capable of nondirected learning, together with their environments, can be simulated by computer. Given the development of genetic algorithms and various artificial life systems, it's possible that software, symbiotically connected to the technological and human environment of cyberspace, may soon represent the latest Darwinian systems capable of learning and self-creation.

The intelligence of the Darwinian machine is enhanced when it behaves fractally, at several tightly nested levels of integration. For example, the market can be considered as a Darwinian machine but its intelligence is increased when the businesses and consumers that keep it going are also Darwinian machines (intelligent organizations, consumer groups). A brain is

at the same time the result of Darwinian processes that occur at the level of biological evolution and the level of individual apprenticeship. Moreover, it integrates several types of "learning populations" at different scales: neuronal groups, extended sensory maps, global regulatory systems, etc. (Edelman, 1992).

The Four Dimensions of Affectivity

Although the presence of a Darwinian system may be a necessary condition for the existence of mind, it is not a sufficient one. The question of intentionality or the ability to refer to entities outside the mind is not really the problem, however, as it is often made out to be in discussions concerning the intelligence of computers. For Darwinian machines do not operate in a closed circuit, they are by definition coupled to an environment. Their nature is to translate the other into self or to incorporate the history of their relations with their environment in their own organization. Yet there is nothing in the general definition of Darwinian machines that necessarily implies subjective experience or the dimension of interiority characteristic of sensation, in other words, *affectivity*. It is important to clearly distinguish between affectivity and consciousness. A mind can be unconscious, like the "minds" of certain animals, like a large percentage of the human mind, or like the minds that emerge from intelligent communities. As for affectivity, which can be confused, unconscious, multiple, heterogeneous, it constitutes—unlike consciousness—a necessary dimension of the psyche and perhaps its very essence. Without it the system would return to a state of insensibility, to exteriority, to the ontological dispersion of a simple mechanism. A mind must be affective, but not necessarily conscious. Consciousness is the product of selection, of the linear-

ization and partial display of an affectivity to which it is fully indebted.

For our purposes it is less important to decide what is and what isn't an element of the psyche than to provide a definition of the psyche that can be applied to an individual human mind as well as to a collective intelligence, a concept of mind that is fully compatible with a collective subject. An integral psyche, one that is capable of affect, can be analyzed along four complementary dimensions: topological, semiotic, axiological, and energic. I referred to these four dimensions in the chapter on the virtualization of the economy and would now like to develop them in greater detail.

Topology. The psyche is structured at each moment by its connections, systems of proximity, or a specific space: associations, connections, paths, gateways, switches, filters, attractors. The topology of the psyche is in continuous transformation, some regions being mobile and others stationary, some quite dense, others only sparsely populated.

Semiotics. Mutant hordes of representations, images, signs, and messages of all shapes and kinds (aural, visual, tactile, proprioceptive, diagrammatic) people the space of connections. By circulating throughout the pathways and regions of topological space, the hordes of signs modify the landscape of psychic attractors. Because of this, signs or groups of signs can also be referred to as agents. The transformations of connectivity in turn influence the populations of signs and images. Topology is itself the set of qualitatively differentiated connections or relations among signs, messages, and agents.

Axiology. The representations and regions of psychic space are associated with values, either positive or

negative, depending on the different measurement systems. These values determine the tropisms, attractions and repulsions between images, the polarities among regions or groups of signs. These values are by nature mobile and changing, although some of them may also display a certain stability.

Energics. The tropisms or values attached to images can be strong or weak. The movement of a group of representations can cross certain topological barriers (distend certain connections, create others, modify the landscape of attractors) or, lacking sufficient force, remain within them. All psychic activity is thus irrigated and animated by an energic economy involving the movement or immobilization of forces, the assignment or mobilization of values, the circulation or crystallization of energy, the investment or divestment of representations, connections, etc.

According to this broadly described model, the operations of the psyche are parallel and distributed rather than sequential and linear. An affect, or an emotion, can be defined as a psychic process or event that involves at least one of the four dimensions introduced here: topology, semiotics, axiology, energics. But since these four dimensions are mutually immanent, an affect is generally a modification of the mind, a differential of psychic life. Psychic life in turn appears as a stream of affects.

This model has the virtue of being compatible with the most recent data of cognitive psychology (primarily with respect to the semantic organization of long-term memory) and the major tenets of psychoanalysis, including schizoanalysis. Moreover it does not contradict introspective experience or phenomenology. It is also compatible with the Darwinian approach since the configurations of four-dimensional abstract psychic space

are continuously modified by external elements and redistributed by the dynamics of the psychic environment. We can draw a comparison between these continuous transformations and the effects of the "variety generator" of the Darwinian machine. Coupled to its environment, the psychic system selects viable affective dynamics during the unfolding of a history or by following an irreversible evolutionary path: construction of the individual or collective personality, apprenticeship, invention, language obsolescence, affective investment or divestment.

The psyche constitutes an interiority. Its topology is not a neutral container, a pure system of coordinates, but a qualitative and differentiated space whose component parts are all related to one another and form figures, or figure–ground arrangements. Signs and messages, by circulating through and populating the space, by constantly referring to one another, and by actualizing connectivity, also help create the interiority of the mind. Values mutually determine one another and form a system. Finally, the energy that irrigates the mind leaves one place only to occupy another, helping to create a certain form of coordination, codependence, and unity within the psyche.

Psychic unity however is like a bustling city and its affective interiority open to external influence. Gilles Deleuze wrote that the interior is a fold of the external world. Psyches are *also* Darwinian machines, however, for they can be identified with a process of transformation–translation between the other and the self, a self that is never definitively closed but always in a state of disequilibrium, openness, receptivity, and change, a self whose essence is perhaps the singular quality of the process of assimilation of the other and heterogenesis. This openness begins with a simple sensation, undergoes a process of apprenticeship and dialogue, and

culminates in *becoming*—the chimerization or transition toward another subjectivity.

This model of the psyche can be applied to a text, film, message, or any work of art. In the case of a complex message, for example, we have

- a collection of signs or message components
- connections, cross-references, and echoes among the parts of the message
- a distribution of positive or negative values among the elements, zones, and connections associated with the message, as well as a value emerging from the message as a whole
- energy that is differentially distributed among certain connections and values, lines of force, structure

The message as a whole, if we concentrate on its signification, functions as a dynamic configuration, a kind of unstable force field (which can be variously interpreted) that must obviously refer to an exterior in order to function: other messages, real referents, interpreters.

The message is itself an affective agent for the mind of the person who interprets it. If the text, message, or work of art functions like a mind, it is because they have already been read, translated, understood, imported, and assimilated with mental and affective matter. A subject transmutes a series of physical events into a meaningful message. Just as King Midas could touch nothing without turning it into gold, the mind is unable to apprehend anything that is not, by that very fact, changed into the movements and folds of the rich fabric of affect. What is true of messages is equally true

of all the elements of our experience, of the world itself. For us, the world, our human world, is a problematic field, a dynamic configuration, an immense, constantly metamorphosing hypertext, crisscrossed by tensions, faded and barely present in certain regions, intensely present and luxuriously detailed in others. Geographic proximities and traditional causal connections are no more than a small subset of the bonds of signification, analogy, and affective circulation that structure our subjective universe. The physical universe is a particular instance of the subjective world that surrounds, impregnates, and sustains it. The subject is its world, the world here being understood as everything that affect envelops. Thus to say that the psyche is open to the outside world is something of an understatement. It is *nothing but* exteriority, but an exteriority that is infiltrated, energized, complicated, transubstantiated, and animated by affectivity. The subject is a world bathed in meaning and emotion.

This image of a living intelligence or psyche is also an image of the virtual. By its nature, and although it is always connected to its physical body, the affective subject extends beyond physical space. Deterritorialized and deterritorializing, it exists, which is to say, it continues to grow far from any "there." Because of its construction, the psyche transforms the exterior into interior (the inside is a fold of the outside) and vice versa, since the perceived world is always already immersed in the element of affect. The psychic landscape, as I have described it, is a kind of dynamic configuration. It exists as a knot of forces, constraints, and finalities, the intimacy of an aggregate of tensions, the image of an unstable field of heterogeneous attractors that defines every unbounded problematic situation.

The psyche provides a canonical example of the virtual, a virtual that is actualized through its affects.

How is this virtual actualized? Through affects. Here too, affects refer to psychic acts, regardless of their nature. The quality of an affect depends on the mental environment that gives it meaning and which it helps to determine. Because of the reciprocal implication between a subjectivity and its world, affective qualities are also dependent on environmental qualities, an outside environment that continues to provide new objects, new practical or aesthetic configurations for it to inhabit. Thus there are no longer any a priori limits to the growth of new types of affects just as there are no limits to the production of new objects or landscapes. We could say there exists a kind of affective inventiveness. The ordinary classification of emotion (fear, love, etc.) would thus represent a limited and highly simplified subset of the various types of affects.

Thinking Societies

We can now better understand why intelligence incorporates a collective dimension: It is not only languages, artifacts, and institutions that think in us but the whole of the human world, with its lines of desire, affective polarities, hybrid mental machines, and landscapes of meaning paved with images. To act on one's environment, no matter how slightly, even on a purely technological, material, or physical level, means that we erect a shared world that thinks differently in each of us, indirectly secrete some subjective quality, work in and with affect. What about the production of messages and relations? The heart of the matter is that by living, acting, and thinking, we weave the very fabric of life of others.

For this reason human communities as such can be said to be intelligent. The psyche is by definition

something collective. It involves a multitude of interacting sign–agents, charged with value and investing their energy in mobile networks and changing landscapes. Human communities are a kind of megapsyche, not only because they are perceived and affectively inhabited by persons, but because they can adequately model themselves in terms of mutually immanent topological, semiotic, axiological, and energic dimensions. Social megasubjects, although they do not possess a linearizing consciousness, are crisscrossed by affect. Social life itself is the result of an immense interplay of affects. The role of selection and sequential display performed by the individual consciousness is carried out within communities by political, religious, or media structures, which in turn inhabit individual subjects. But the comparison between the services rendered to the individual by his conscious mind and those provided by centralized media or spokespersons to the community is not always favorable to the latter.

Intelligence is fractal. It reproduces itself in proportion to the relevant scale of magnitude: macrosocieties, transindividual psyches of small groups, individuals, infraindividual modules (unconscious but complex regions of the brain), transverse interactions among infraindividual modules involving different persons (sexual relationships, complementary neuroses, etc.). Each node or region of the collective hypercortex contains a living psyche, a kind of dynamic hypertext crisscrossed by tensions and energies colored by affective qualities, animated by tropisms, and agitated by conflicts. And yet, through its connection to a mortal body and its consciousness, the *person* manifests a psychic tone and affective intensity that are absolutely singular.

There is one quality, however, that is distributed to varying degrees in all types of minds, but which hu-

man societies (rather than individuals) exemplify better than the others: the ability to reflect the whole of the collective mind somewhat differently in each of its parts. Intelligent systems are holographic and human groups are the most holographic of all intelligent systems. Like Leibniz's monads or Whitehead's actual occasions, each individual embodies a selection, a version, a particular vision of the shared world or global psyche.

Human Communities and Insect Societies

The notion of collective intelligence inevitably evokes the operation of insect societies: bees, ants, termites. Human communities and ant colonies are, however, profoundly different. In the first place, and all other distinctions follow from this, collective intelligence thinks in us, whereas the ant is a semi-opaque and not very holographic member, an unconscious cog in the intelligent ant colony. We can take individual pleasure in the collective intelligence, which enhances or modifies our own intelligence. We contain or partially reflect, each in our own way, the intelligence of the group. The ant, however, takes little pleasure in the social intelligence of the colony, of which it has a limited vision. It receives no mental enhancement. An obedient beneficiary, it participates blindly in the life of the colony.

In a more trivial sense this means that man is (rather) intelligent while the ant is, relative to the human, dumb. Not only does the ant receive less social intelligence than a human but it also contributes very little in turn. A woman or man in a human culture is capable of learning, imagining, creating, and modifying, although perhaps only slightly, the language, technolo-

gy, and social relations that exist in their environment, something an ant—highly dependent on genetic programming—is incapable of doing. Among insects, only society can resolve new problems, whereas among humans, individuals are often far more inventive alone than in groups, such as crowds or bureaucracies. The intelligence of human societies is variable and, in the best of cases, evolutive, due to the nature of the individuals who compose it and—what amounts to the other side of the same reality—the bonds, often free or contractual, that hold it together. Within the framework of a given species of ant, however, the operation of the colony is fixed.

The status of the individual in each type of society crystallizes and summarizes the set of differences between them. The position and role of each ant is firmly established. Within a particular species, the types of behavior or morphological differences (queens, workers, soldiers) are invariable. Ants (like bees and termites) are organized into castes and ants of the same caste are endlessly interchangeable. Human societies, however, are continuously inventing new categories. Individuals move from one class to another, and it is impossible to reduce an individual to membership in a class (or a group of classes), for each individual is unique. Humans, because they pursue individual paths of learning and embody different affective worlds and virtualities of social mutation (even minimal), are not interchangeable. Individuals contribute differently and creatively to the life of the collective intelligence that illuminates them in turn, whereas an ant blindly plays a role that dictates its social position within a vast unconscious mechanism of which it is completely unaware.

Certain civilizations, certain political regimes have attempted to compare human collective intelligence with that of ant colonies. They have treated the indi-

vidual as a member of a category and suggested that such a reduction of the human to the insect is both possible and desirable. My own philosophical, moral, and political position on this is quite clear: Human progress in constructing new forms of collective intelligence is radically different from the behavior of an ant colony. On the contrary, this progress should make individual consciousness more receptive to the operations of the social intelligence, furthering the enhancement and integration of creative singularities shaped by individuals and small human groups in the cognitive and affective processes of collective intelligence. There are no guarantees that we will succeed in such an endeavor. Regression is possible. Rather than embodying some historical law, our progress is more like a project that is transmitted, enriched, and newly reinterpreted by each generation, and unfortunately susceptible to stagnation or forgetfulness.

The Objectivation of Shared Context

The contemporary reactualization of this project will most likely involve the judicious use of digital communications technologies. Intellectual and communications technologies are currently undergoing widespread and radical change. As a result cognitive ecologies are being rapidly and irreversibly reorganized. The brutality of cultural destabilization shouldn't prevent us from recognizing the most socially positive forms now emerging and promoting their development, however. One of the principal effects of the current transformation is the appearance of a new method of communication within very large deterritorialized communities, which I refer to as *many-to-many communication*. A similar technology is being used for the Internet, computer bulletin boards, electronic confer-

ences and forums, groupware, virtual worlds, and knowledge trees. The cyberspace now being formed fosters the development of large-scale, nonmedia-driven communication, which constitutes a decisive advance toward new and more evolved forms of collective intelligence.

With conventional media (one-to-many) there is a clear separation between transmitters and passive receivers, which are isolated from one another. Messages broadcast from a transmitter realize a crude form of cognitive or collective unification by supplying a shared context. Nevertheless, this context is imposed, transcendent, does not result from the activity of the participants with the mechanism, and can't be laterally negotiated among the receivers. The telephone (one-to-one communication) does involve a form of reciprocal communication, but it does not provide the participants with a global vision of what is occurring throughout the entire network or enable them to construct a shared context. In cyberspace, however, each of us is a potential transmitter and receiver in a space that is qualitatively differentiated, nonstatic, constructed by its participants, and explorable. Here we no longer encounter people exclusively by their name, geographical location, or social rank, but in the context of centers of interest, within a shared landscape of meaning and knowledge.

Based on modalities that are still primitive but being refined yearly, cyberspace provides large and geographically dispersed groups with the instruments for cooperatively constructing a shared context. Communication is here deployed throughout the full range of its pragmatic dimension. No longer restricted to the distribution or transport of messages, communication now involves participants in a form of interaction that they can modify or stabilize, a negotiation of meanings, a

process of mutual recognition that takes place through the very activity of communication. The important element here is the partial objectivation of the virtual world of significations, which is shared by the participants and reinterpreted by them using the mechanisms of many-to-many communication. This dynamic objectivation of a collective context serves as an agent of collective intelligence, a kind of living bond that takes the place of a memory or shared consciousness. A living subjectivation references a dynamic objectivation. The shared object dialectically engenders a collective subject.

For example, the World Wide Web, as described in Chapter Three, is a carpet of meaning woven by millions of people and continuously being reworked. From the constant addition of millions of subjective universes emerges a memory that is dynamic, shared, "objectivized," navigable. Landscapes of meaning have emerged from collective activity in the form of Multi-User Dungeons (MUDs). A MUD is a role-playing game, a kind of linguistic virtual world, that takes place in real time and involves hundreds or even thousands of people around the world. Electronic bulletin-board conferences and Internet newsgroups represent a less elaborate form of collectively secreted shared memory, where the changing list of groups creates a dynamic map of the interests of shifting communities. In the best of cases these forms of interaction constitute living encyclopedias. The posting of "frequently asked questions" (collectively known as a FAQ) in certain newsgroups avoids repetition and enables everyone to participate in the dialogue with a minimum of basic knowledge about the topic under consideration. This encourages individuals to participate as effectively as possible in collective intelligence.

Shared landscapes of meaning are also to be found in knowledge trees, free markets for a new econ-

omy of knowledge, which provide members of a community with a synthesized view of the range of skills possessed by the group and enable them to locate their identity as an image in the knowledge space. On the knowledge tree information is always presented in context, in terms of a figure–ground relation, the figure being the information and the ground the context. Thus the same information provides a different aspect, image, or mask depending on its context. This context (the tree, its shape, color, etc.) emerges dynamically from the acts of apprenticeship and the knowledge transactions experienced by the participants and, more generally, from the corpus of information under consideration and its use by a community.

The Cortex of Anthropia

The transmission and sharing of social memory are as old as humanity. Stories, physical skills, and wisdom are passed down from generation to generation. The progress made by communications and recording technologies has considerably extended the reach of this shared inheritance (book, audio, and film libraries). Today, the information available on-line or in cyberspace generally includes not only the deterritorialized "stock" of conventional texts, images, and sounds, but hypertextual points of view about this stock, knowledge bases with the capacity for autonomous inference, and digital models for simulations. In addition to these masses of static or dynamic documents, shared landscapes of signification coordinate the varied subjective structure of the informational ocean. The collective memory at work in cyberspace (dynamic, emerging, cooperative, reworked in real time as it is interpreted) must be clearly distinguished from the traditional

transmission of narratives and skills, or the static recordings found in libraries.

Somewhere beyond memory, software functions as an automatic cognitive micromodule that integrates itself with human intelligences to transform or enhance their capacity for calculation, reasoning, imagination, creation, communication, learning, or navigating information. Every time someone produces a new piece of software, they accentuate the collective character of intelligence. While the supply of information increases only the common *stock* (or enriches its structure), software adds to the number of shared *operating modules*. Programming software cooperatively in cyberspace illustrates in striking fashion the autopoiesis (or self-production) of collective intelligence, especially when the software is itself designed to improve the infrastructure of digital communication.

Cyberspace promotes connections, coordination, and synergy among individual intelligences. And its effects are even more pronounced when a living context is shared, when individuals or groups are able to identify one another in a virtual landscape of interests and skills, and when there is greater diversity of shared or mutually compatible cognitive modules. We know that during every historical epoch, humanity has felt as if it were experiencing an important transformation. This may help us put into proper perspective any similar impressions concerning contemporary events. I cannot, however, abandon the idea that we are currently experiencing a significant change in the forms of collective intelligence. The dynamic objectivation of the emerging context, the massive sharing and growth of different cognitive operators, and the existence of real-time interconnections that are independent of geographical distance seem to mutually reinforce one another. One of the most striking features of the new

collective intelligence is the acuity of its reflection in individual intelligences. It is almost as if the psychic acts of a growing fraction of humanity were directly felt by others. Certain forms of the virtual world enable us to express, to map in real time, the topological, semiotic, axiologic, and energic components of collective psyches.

Satellite images of our planet, information from multitudes of global sensors, computerized models that integrate this data, simulations that allow us to interpolate the movements of the Earth, its history, the unimaginable intimacy of its infinitely unhurried existence, opaque, enormous, dispersed—all of this conspires to gradually bring into focus within the human mind the archaic figure of Gaia. In the presence of the ancient goddess, still mingled with the substance of her origin, we can now almost hear and see, rising before our eyes, swift and crackling, the great hypercortex of her daughter, Anthropia, thinking.

No less than the utilitarian search for information, it is the vertiginous sensation of plunging into the communal brain that explains the current enthusiasm for the Internet. Navigating through cyberspace allows us to parade our conscious glance through the chaotic interiority, the tireless drone, the banal futilities and planetary fulgurations of the collective intelligence. Access to the intellectual process of the whole informs that of each part, individual or group, and nourishes in turn that of the whole. In so doing we make the transition from collective intelligence to intelligent community.

Despite its many negative aspects and especially the risk of leaving a segment of humanity on the shoulder of the information highway, cyberspace displays a number of new and exciting properties. These provide

us with an important instrument for the nonhierarchical coordination and rapid integration of intelligences, the exchange and navigation of knowledge, and the deliberate self-creation of intelligent communities.

At a time when a new culture is being formed, it is important that we take advantage of this rare opportunity to deliberately orient the ongoing evolution. By arguing in terms of its impact, we condemn ourselves to passivity. We must stop demonizing virtuality (as if it were the opposite of the real). The choice is not one between a nostalgia for an antiquated reality and a threatening but exciting virtuality, but between *different concepts of the virtual.* The alternatives are straightforward. Either cyberspace will reproduce the media, the spectacle, the consumption of commodity information, and social exclusion we are presently experiencing on a scale far greater than any we have known (to a large extent this is the natural trend seen in the current development of the "information highway" and interactive television), or we will accept the most positive aspects of the ongoing evolution and work toward a civilizing project centered on intelligent communities. This will involve a re-creation of the social bond through the exchange of knowledge, mutual recognition, the awareness and enhancement of singularity, more direct, more participatory forms of democracy, the enrichment of individual lives, the creation of new forms of open cooperation to resolve the terrible problems that humanity must confront, and the improvement of the software and cultural infrastructures associated with collective intelligence.

8

The Virtualization of Intelligence and the Constitution of the Object

The Problem of Collective Intelligence

The problem of collective intelligence is simple to identify but difficult to resolve. Can a group of human beings be more intelligent, wiser, smarter, or more imaginative than the individuals who compose it? And does this hold true not only for the long term, throughout the duration of our technological history, our institutions and culture, but here and now, as events unfold and during our daily activities? Is there a way for us to coordinate intelligences so that they amplify rather than cancel one another? Is there a way to instigate some form of reciprocal improvement, a mutual exaltation of the mental capacities of individuals, rather than subjecting them to a norm or adjusting them downward to some lowest common denominator? In one sense we could interpret the history of institutions, languages, and cognitive technologies as more or less successful attempts at resolving such problems.

While individuals are all intelligent in their own way, groups are often disappointing. In a crowd, for example, individual intelligences, rather than being additive, tend to divide. Bureaucracies and authoritarian forms of organization provide a certain level of coordination, but stifle and flatten singularity. In small groups rules of organization and mutual awareness en-

sure the reciprocal improvement of intelligence. But when tens of thousands of people are involved, hierarchical planning and group management based on broad categorizations have long since become the rule. In keeping with a growing number of politicians, economists, and artists, I feel that contemporary communications technologies may help to alter a long-standing anthropological situation that condemns large communities to forms of political organization that bear little relation to intelligent collectives.

Why has "the world of culture," in the bourgeois sense, that is, the production and consumption of science, philosophy, literature, and the fine arts, had such an appeal for so long a period of time? Most likely because, in its elitist and imperfect way, it approaches an ideal of collective intelligence. What are the social norms, values, and rules of behavior designed to govern (ideally) this world of culture? They include the ongoing evaluation of works of art by the artist's peers and the public, the constant reinterpretation of our heritage, the refusal to accept authoritarian arguments, our encouragement to enrich a shared patrimony, competitive cooperation, continuous education of our notions of taste and our critical faculties, refinement of personal judgment, concern for variety, encouragement in the use of imagination, innovation, unfettered research. Society will have succeeded in resolving a number of crucial problems of the contemporary world once it has begun to implement a method of operation that is "cultivated" outside the restricted environments and specialized fields to which it is generally limited. One of the surest signs of the closeness between the world of culture and intelligent communities is its (theoretical) willingness to limit or sidestep power. The ideal of collective intelligence is obviously not to *distribute* science and the arts throughout society as a whole, thus disqualifying other types of knowl-

edge or sensibility. Rather, it is to recognize that the diversity of human activities, without being exclusive, can and must be conceived, treated, and lived as "culture" in the sense mentioned previously. As a result each human being could and should be respected as an artist or researcher in a republic of minds.

Such a program sounds utopian. However, the key to economic, political, or even military power now resides in our capacity to produce intelligent communities. While I don't deny that relations of power and domination certainly exist, they are ultimately nothing more than a way of sapping our strength. For a universally intelligent society will always be more efficient than an intelligently governed society. The problem is not determining whether we are for or against collective intelligence, but rather choosing among its various forms. Are they self-generating or imposed from above? Do they respect singularity or tend toward homogenization? Do they enhance the diversity of resources and skills available or disqualify them in the name of rationality or some dominant model?

The stadium

How then can we make the transition from collective intelligence, which is an inherent feature of humanity, to intelligent communities, which deliberately optimize their intellectual resources here and now? How can we create a society that is flexible, intense, and inventive without founding the community on hatred of the foreigner, a sense of knee-jerk victimization, or a relation to transcendent revelation or some providential leader? Is there a way for personal acts and resources to operate in concert without subjecting them

to an alienating exteriority? A program such as this can't simply be initiated by decree and requires more than our good will to carry out successfully.

Michel Serres has used the image of the stadium to illustrate certain fundamental anthropological theorems. Take a soccer or rugby game for example. Listen to the sounds that rise from the stands. The supporters of the team all shout the same things at the same time. Individual acts are difficult to distinguish, do not intertwine to create a shared history or memory, fail to trigger any irreversible bifurcation. The individual is buried in the mass of supporters, the background noise of the crowd. Yet the intelligence of this mass (its capacity for learning, imagination, and reasoning) is notoriously low, whether it is manifested in the stadium or at the exits.

Now let's look at what happens on the field. Each player carries out actions that are clearly distinct from those of the other players. Nonetheless, each action is coordinated, attempts to respond to and make sense of all other actions. The acts of the players, unlike those of their supporters, are part of a collective history and orient, although somewhat differently, the course of an as-yet undetermined outcome. The teams implement strategies, improvise, take risks. Each of the players must be aware not only of what the opposing team is doing but also what his own side is planning, so that the actions of his teammates are not in vain. The game is "constructed."

The spectators can take no direct action in the game that unites them; they all have the same function with respect to the field before them, which remains out of reach. The bond (the spectacle of the game) transcends the individuals who compose the collective. In the bleachers, being a society means being for or

against, taking sides, rooting for the home team and booing the visitors.

On the playing field, however, it isn't enough merely to dislike the opposing side. We have to study them, guess their actions, anticipate and understand them. And most importantly, we must coordinate with one another in real time, react quickly and discretely as a single individual. Yet this spontaneous synergy of skill and action is only possible because of the presence of the ball. On the field the process of social mediation abandons its transcendence. The bond among individuals is no longer out of reach but now lies, on the contrary, in everyone's hands (or rather at their feet). The living unity of the players is organized around an immanent object–bond. Making a detour around a circulating being, a mobile center that designates each one in turn as the transitory pivot, the intelligent group of players is its own reference. The spectators need the players; the teams don't need the spectators. A Chinese proverb states that the finger points to the moon and the idiot looks at the finger. The resourceful players make the ball both a revolving index among individual subjects, a vector that enables each one to designate the other, and the principal object, the dynamic link of the collective subject. We can consider the ball a prototype of the object–bond, the catalyzing object of collective intelligence. Such an object, which I will simply refer to as the *object*, is unknown to animal species.

Prey, Territory, Leaders, and Subjects

The higher mammals and especially the social primates from which we evolved do not make use of objects. Like all animals they understand their prey, and in a sense this prey is a proto-object. The hunt can lead

to cooperation. The captured prey leads to rivalry or combat. It serves as a primitive agent of socialization. But the prey will be devoured, incorporated, and finally absorbed in a subject. How would we react if the players on the field were to puncture the ball they've captured, before dividing it among themselves and eating it?

Animals also have strong relationships to the territories they inhabit, each society defending itself against attacks from other animals. Animal society defines its identity primarily by its relationship to a specific territory. Dogs, cats, and other animals mark their territory with their bodily scent. Birds occupy it with their song. Why then is the territory not an object? Primarily because it stands in a relation of appropriation or exclusive identification. You'll never see a soccer player plant his team flag on a ball and claim its exclusive possession. The true founder of civil society was the person who abandoned the idea of enclosing a portion of the physical universe and stated, "This is an object." In order to play its anthropological role, the object must pass from hand to hand, subject to subject, and be free of the cycle of territorial appropriation, identification with a name, exclusivity or exclusion.

The social primates also understand relations of dominance, and these play an essential role in regulating their interactions. Stable relations of domination, however, with gradations of rank and subtle hierarchies, only exist among the vertebrates. The social insects practice polyethism (highly standardized behavior among castes) and polymorphism (whereby anatomical differences reflect the social division of labor). Hierarchical social relations, which are not subject to genetic programming, are frequently determined by open combat. Obviously this must be seen in terms of the aptitude for greater individual autonomy among

mammals compared to insects. Ethologists also consider these relations as a way of regulating aggressiveness among members of the same social group, this type of aggressiveness being very rare among insects. The dominant individual serves to unify and coordinate the society by inhibiting the aggressiveness of other individuals, by focusing the attention of other members of the society, and by making important decisions (hunting, migration). Once again, neither the dominant nor the submissive subject are objects. The ball in play, however, has some affinity to the relation of dominance since it is both submissive and the center of attention. In a sense it serves as a *substitute* for the leader, subordinate, or victim by virtualizing them. Far from determining any stable relationship of dominance, the ball maintains a cooperative (on the same team) and competitive (between teams) relation that is egalitarian and always open-ended. Obviously the game results in winners and losers but their status is maintained only between games. No formal hierarchy exists during the game itself; it is suspended while the ball is in play.

The relationship to the object results from a virtualization of the relations of predation, dominance, or exclusion. The finger designates the victim, points to the dominant subject, indicates the prey or circumscribes the territory. The idiot looks at the finger and invents the object.

Tools, Tales, and Cadavers

The ball serves as a perfect illustration for the object. It is typical of the object's function of hominization since a marked tendency for game playing is one of the major characteristics of our species. No animal

species plays ball or engages in any analogous activity. The majority of the time animal games are simulations of combat, predation, domination, or sexual activity, which directly involve the bodies of the participants without the use of an objective intermediary. Obviously other types of object exist, corresponding, more or less, to the ideal type so well represented by the ball. These would include tools, materials, or artifacts that pass from hand to hand during the activities of collective labor, the traditional stories transmitted orally in slightly different form from generation to generation, each individual serving as listener and teller in turn, the cadaver before and after the funeral rite.

We recognize the object by its power to serve as a catalyst in forming social relations and inducing collective intelligence: technological intelligence and cooperation where tools are concerned, the collective inventiveness of myth, legend, and folklore for the circulation of tales. These two obvious cases do not require any specific comments. The example of the cadaver is less immediate, however. Mortal remains are associated with ritual and what we now call religion, archaic but powerful forms of collective intelligence. During funeral ceremonies, the group circles around its corpse, surrounds it, washes it, dresses it, cries over it, reconstructs it in its eulogies, touches it with flowers or handfuls of dirt, buries or burns it. Even though impure or untouchable, death ritualizes, objectivizes, remains an agent of socialization. However, failure of the cadaver to play a role in the funeral rites that serve as the collective object, its treatment as a simple thing, the inability to virtualize the decomposing flesh of the body of the dead, is a sure sign of the disintegration of a group, its dehumanization. It is tempting to view the relationship to the cadaver as the original form of virtualization, the transition from the subject of dominance to the object: the mummified body of the chief

or the skull of the victim brought back as a trophy. Are the shrunken heads of the Jivaros, which play a complex role in reestablishing the collective, a kind of monstrous precursor of the soccer ball?

Money, Capital

In a capitalist society money serves as one of the most efficient of all objects. If everyone kept their money in a safe, the contemporary economic market would crumble suddenly and completely. On the other hand, if every landowner held on to his lands, there would be no catastrophic consequences for agriculture. Fluid, shared, anonymous, money is the antithesis of territory. This is what is meant by the famous maxim that money has no odor. No individual, no matter how putrid, can imprint money with his identity or his acts. Money as such doesn't exist and has no positive economic function except when it is in circulation. It is the tracer, the vector, and regulator of economic relations.

Money isn't wealth but its virtuality. Although this may appear paradoxical, money can't be appropriated or, rather, through its incessant circulation it returns to the public in private and to the private in public, thus enabling everyone to participate, although somewhat differently, in the collective intelligence of the capitalist market. Money can obviously serve as a form of leverage for power and domination, but it also catalyzes deterritorializing social forces that do not respect existing hierarchies. Indifferent to borders and conflicts, money helps, for better or worse, coordinate and regulate innumerable activities without the need for a central authority. Driving our systems of transport and communication, it is the money of the capitalist market, held by billions of human beings, that weaves glo-

bal society today. And while certain animal societies possess the vague outlines of tools, languages, and funeral rites, they have nothing that resembles money, much less capital.

The Scientific Community and Its Objects

The scientific community is another example of the intelligent community united around the circulation of objects. These objects are in principle "studied for their own sake," in disinterested fashion, which is to say that they are neither territories, nor prey, nor revered or submissive subjects. Such objects emerge from a dynamic of collective intelligence that virtualizes certain specific occurrences (results of observation, experiment, or simulation) to generate consistent problems: electrons, black holes, viruses...

Circulation determines both the object and the community: a phenomenon that occurs in a laboratory doesn't become "scientific" until it can be reproduced (or is at least reproducible) in other laboratories. A laboratory that fails to make use of—and fails to transmit to other laboratories—the instruments, experimental protocols and, finally, the "objects" of the community (stars, elementary particles, molecules, physical or biological phenomena, simulations) is no longer an active member. Scientific inventiveness consists in bringing genuine objects into view, the vectors of intelligent communities, capable of interesting other groups who will in turn circulate, enrich, transform, indeed multiply, the initial object and thus transform their identity within the community. As with soccer, everyone's role is unique and is required to be so (a scientific article must be original). The game is at the same time cooperative and competitive. Actions are "built" on top of

one another, thus leading to the development of a sense of historicity, a complex irreversibility. Professional disciplines construct rigid territorial boundaries around the open dialectic of scientific objects and communities.

Of course, the scientific game is subject to economic, social, and political constraints, including the technological "means" and any anticipated or actual spill-over benefits. The same could be said of professional soccer. But while technoscience can be reduced to a set of constraints, to relations of force and alliances, even within the hybrid environment of human–thing communities, its unique creativity, like its grasp of the world, does not last long. It would be as if we decided to account for love using only the ideas of the Marquise de Merteuil. In saying this I am not so much criticizing the theories of the new anthropology of science and technology (Latour, 1989, 1993) as the caricatures that some of its formulations have led to.

Characterized neither by the simple relations that exist among human beings nor the predation or appropriation of things, the scientific enterprise integrates the reciprocal formation of intelligent communities and objects of understanding. The objects of science, far from preexisting their "discoveries" or constituting transcendent referents for absolute truths, are immanent in the technical procedures that construct them and the communities that enable them to circulate. This does not mean they are arbitrary or purely relative, for they are themselves at risk as elements in the selection processes that qualify them and that they judge in turn. Of all the object candidates that appear, very few of them are finally capable of asserting the relevance of the proofs that will enable them to "become object" (Stengers, 1993).

CyberSpace as Object

The extension of cyberspace represents the most recent ascent of the inductive objects of collective intelligence. What is it that makes the Internet so interesting? To claim that it is "anarchic" would not only be simplistic but inaccurate. The Internet is a shared object, dynamic, constructed, or at least fed by everyone who uses it. It acquired this character of nonseparation, of being fabricated, extended, and improved, from the computer scientists who were initially its principal users. It provides a bond, serving as the common object of its producers and its users (Huitéma, 1995).

Cyberspace provides objects that move from group to group, shared memories, and hypertexts for constructing intelligent communities. Unlike television it does not designate winners and losers out of a mass of separate and powerless individuals. It is equally important, however, that the Internet be distinguished from the "electronic highway," its perverse twin, which presents us with a territory (physical networks, pay-per-use services) rather than shared objects. The electronic highway degrades a circulating object into a thing that can be appropriated. If cyberspace results from the virtualization of computers, the electronic highway reifies this virtual world. The acrimony of the debates concerning the commercial nature of the Internet has profound anthropological implications. One of the legitimate sources of pride of the community that developed the Internet was the discovery of a novel way of constructing an intelligent society along with a new object. The question is not whether to banish commerce from the Internet (why should we?) but to preserve an original method of forming intelligent communities, which is unlike the methods used by the capitalist market. In cyberspace we have no need of

money because the community already possesses a constitutive, virtual, deterritorialized object, which by its very nature is cognitive and capable of producing a bond. Cyberspace itself is perfectly compatible with money or other immanent mediators. It can even increase the virtualizing power and rate of circulation of monetary and scientific objects. Since it is receptive to the circulating bonds of intelligent communities, the Internet serves to accelerate the flow of objects, virtualizes the virtual. And yet, we are witnessing only the early stages of its development.

By means of the products of economic and scientific activity, by using cyberspatial mechanisms, the relationships of predation, appropriation, and power are reinstated on a much larger scale than ever before. Throughout the animal kingdom, it is mankind who has been the greatest proponent of territorial imperialism, the relentless chase, implacable domination. Yet, such relations are momentarily suspended through humanity's relationship to the object. It is true that technoscience, money, and cyberspace turn mankind into the most terrifying hunter, owner, and ruler the world has ever seen. But our most important contemporary objects provide him with access to these powers only after forcing him to undergo the specifically human experience of renouncing his prey, giving up power and abandoning property. The experience of virtualization.

What is an Object?

What are the general characteristics of the anthropological object, the object–bond or mediator of collective intelligence? While such an object must be the same for everyone, it is at the same time different, in the sense that each of us is, from our individual perspective,

in a slightly different position. The object marks or traces the relationships maintained by and among individuals. It circulates, physically or metaphorically, among members of the group. It is simultaneously or alternately at everyone's disposal. This means that each of us can mark the object with our actions, contributions, impulses, or energy. Not only does the object help incorporate the whole in the individual but it implicates the individual in the whole. Contained and controlled by the groups it constitutes, the object nevertheless remains outside them, "objective," since it is not a member of the group as another subject would be. It requires the assistance of a kind of revolving transcendence, alternately and momentarily placing every locale it comes in contact with in the position of central agent. This distributed transcendence, this center that flits from place to place, no doubt constitutes one of the major figures of immanence. In the end the object can only be maintained by everyone and the group is formed only to enable the object to circulate.

The object sustains the virtual: deterritorialized, agent of the reciprocal transition from private to public or local to global, not subject to wear, nonexclusive, it traces a situation, bears with it the field of a problematic, the knot of tensions or psychic landscape of the group. This objectively based virtuality is normally actualized as a social event or process, act or affect of the collective intelligence (by passing a ball, telling a story, buying and selling, through new experiences, new hypertext links to the World Wide Web). Instead of directing our actions, the object can also collapse into a thing, subject, or substance, become reified as prey or territory. Depending on the function it is made to carry out, the same entity can be a thing or an object.

The functioning of an object as a mediator of collective intelligence always implies a contract, a set of

regulations, an agreement. It is important to realize, however, that the majority of contracts do not involve the circulation of objects and a contract (respectively a rule, an agreement, a law, etc.) alone is never sufficient to lead to the emergence of collective intelligence. It is not the signing of a contract or the establishing of a regulation but the flowering of the object that is so unusual. For example, there are very few scientific objects that are not associated with agreements or rules of procedure of some sort, but it is much easier to promulgate epistemological recipes than to make a discovery.

We could describe the history of humanity, starting with its first appearance, as a succession of appearances of objects, each of them inseparable from a specific form of social dynamic. We would find that each new type of object resulted in a particular style of collective intelligence and that every important social change implied the creation of an object. Throughout the course of anthropological duration, communities and their objects are created as part of the same movement. In keeping with the size and circulation of its objects (whether associated with cyberspace, the economy, or technoscience), humanity is alone among the animal kingdom in that it tends to create only a single society. Since communities possess no more intelligence than is contained in their objects, humanity will have to perfect its objects and indeed invent new ones if it is to confront problems on a scale unlike that it has had to face in the past. These future object–worlds, vectors of collective intelligence, will have to ensure that the collective effects of their actions are felt by each individual. And since they are capable of bringing to life within each individual a new sense of immensity, they will have to implicate everyone, take into account each unique locale, in the untotalizable dynamic of the whole. Objectivity on a global scale will only come into being if maintained by everyone, if it

can circulate among nations and lead to the growth of human culture.

The meteorological earth, the earth of earthquakes, elephants, and whales, the earth of the Amazon and the Arctic, the earth circled by satellites, the enormous and pacific earth, is blue like a ball.

ObjeCt—Human

Earlier, I said that humanity constituted itself by virtualizing violence through the contract, the here and now through language, and its organic functions through technology. Yet, the object is able to complete and unify the three forms of virtualization related to beings, signs, and things. Moreover, the virtualization of violence does not occur uniquely through the contract but also, and especially, through the object, which forms nonviolent social bonds because it is not subject to predation, appropriation, or domination.

As already shown virtualization of the here and now through language extends time and space beyond sensory immediacy. But the process of virtualization is only completed with the construction of the object, an object that is independent of the perceptions and acts of the individual subject, an object whose sensible image, its manipulation, causal effect or concept, can be shared by other subjects. The objective world that emerges through language overflows any material world populated only by things. Such is the challenge of language: to bring into existence an objective world that simultaneously connects beings with one another and constitutes subjects.

Technology virtualizes action and organic functions. Yet the tool, the artifact, are not merely efficient things. Technological objects are passed from hand to hand, body to body, like a baton in a relay. They create shared uses, become vectors of knowledge, messengers of collective memory, catalysts of cooperation. From the first biface to modern airports and digital networks, from the original hut to our metropolises crisscrossed by highways and skyscrapers, technological objects and artifacts are the glue that holds mankind together and insinuates the physical world into the most intimate corners of our subjective life. Thus the object intersects the three fundamental virtualizations of anthropogenesis. It constitutes the human as social, cognitive, and practical subject. It interconnects and unifies technological, linguistic, and relational subjectivities.

If you are not an animal, if your soul is more virtual, more detached from inertia than that of a monkey or a bison, it is most likely because it is able to assume a state of objectivity. Our subjectivity is exposed to the play of the shared objects that weave, in a single symmetric and complicated gesture, individual intelligence and collective intelligence, like two sides of the same cloth, embroidering on each surface the indelible and flagrant figure of the other.

9

The Ontological Quadrivium

Virtualization as Transformation

Virtualization, or the transition to a problematic, in no way implies a disappearance in illusion or dematerialization. Rather, it should be understood as a form of "desubstantiation," as was shown earlier using the examples of the body as flame, the text as flux, and the economy of events. This desubstantiation is broken down into a related series of changes: deterritorialization, the Moebius effect—which organizes the endless loop of interior and exterior—the sharing of private elements, and the subjective integration of public items. This transition to collectivity and the reciprocal involvement of the individual has been studied in detail in the two previous chapters concerning the virtualization of intelligence.

Subjectivation is the implication of technological, semiotic, and social means in the individual's psychic and somatic functions. *Objectivation* will be defined as the mutual implication of subjective acts in the process of constructing a shared world. Subjectivation and objectivation are therefore two complementary aspects of virtualization. In fact, in terms of what they *do*, neither subject nor object are substances but fluctuating nodes of events that mutually interface with and envelop one another.

Although we are today experiencing its acceleration, virtualization itself is not a recent phenomenon.

As I have tried to show by analyzing developments in language, technology, and complex social institutions, the human species is constructed in and through virtualization. This process of virtualization can be analyzed as a series of operations, namely

- grammatical: the segmenting of virtual elements, sequencing, duality
- dialectic: substitutions, correspondences, rhizomatic processes of doubling
- rhetorical: the emergence of autonomous worlds and creation of an interrelation of signs, things, and beings independently of any reference to a preexisting "reality" or any notion of utility. Through rhetorical operations virtualization results in the sudden appearance of new ideas and forms, the composition and recomposition of those ideas, the discovery of original "figures," the growth of "memory" machines, the development of systems of action.

This book is about virtualization, that is, the reverse of actualization, the various movements and processes that lead to the virtual. Nevertheless, the real, the possible, the actual, and the virtual are complementary states and possess equivalent ontological dignity. My intention is certainly not to emphasize the virtual at the expense of other modes of being. Since they are inseparable, together they form a kind of four-pole dialectic. Before examining the nature of this dialectic, however, I'd like to say a few words—think of it as a short philological detour—about the title of the present chapter. The term quadrivium, or four-fold path, was coined by Boethius in the sixth century A.D. to designate the scientific studies that were to follow the trivium (grammar, dialectics, and rhetoric), namely, arithmetic, geometry, music, and astronomy. This pro-

gram of study, the trivium and quadrivium—the seven pillars of wisdom—was followed by university scholars in Europe throughout the Middle Ages.

The Four Modes of Being

The possible and the virtual obviously possess a common thread, which explains the frequent confusion between them. Both are latent and not manifest. They imply a future rather than deliver a presence. The real and the actual, however, are both evident or manifest. Disdaining promises, they are fully and firmly *there*. How then are we to understand the split between the possible and the real on the one hand and the virtual and the actual on the other?

Based on the work of Gilles Deleuze, I wrote in Chapter One that the real *resembles* the possible whereas the actual *responds* to the virtual. By nature problematic, the virtual is similar to a subjective situation, a dynamic configuration of trends, forces, finalities, and constraints resolved through actualization. Actualization is an *event*, in the strongest sense of the term. An act is accomplished, but not predetermined, and it in turn modifies the dynamic configuration in which it assumes meaning. The articulation of the virtual and the actual animates the very dialectic of the event, the process, of *being as creation*.

Realization, however, selects from among a number of predetermined possibles that have already been defined. In a way the possible is a *form* upon which realization confers a *material* embodiment. This articulation of form and matter characterizes the *substance* pole, the diametrical opposite of the event pole. We can represent these relationships as a simple table of

four cells in which the two columns of the latent and the manifest intersect the two rows of substance and event. The possible, real, virtual, and actual are each assigned their places in the appropriate cells. Each of them deploys a different mode of being.

The real, substance, the thing, *subsists* or resists. The possible harbors nonmanifest forms that remain dormant: Hidden within, these determinations *insist*. The essence of the virtual, however, as I have shown throughout the course of this book, is as a way out, an exit: It *exists*. The actual, however, as the manifestation of an event, *arrives*, its fundamental operation is *occurrence*.

	Latent	Manifest
Substance	Possible (insists)	Real (subsists)
Event	Virtual (exists)	Actual (arrives)

The Four Transitions

There is a continuous transition among these four modes of being. On this basis we can define four major movements or transformations, each of which corresponds to a different form of causality and temporality. A parallel can in fact be drawn between the ontological quadrivium and Aristotle's four causes. The four types of causality can be illustrated using the example of a statue. The statue's material cause is the marble. Its formal cause follows the contours of the kouros, which sleep within the stone or the mind of the sculptor before they burst forth into the sunlight of Delos. The sculptor himself, the agent of the action, is the efficient cause. And the statue's final cause is its use, its utility, the cult of Apollo, for example.

As I have already suggested, realization can be compared to material causality: It supplies a preexisting form with matter. Similarly, realization embodies a linear temporality, one that is mechanical, deterministic. By irreversibly dissipating potential energy or any available resources, realization follows the slope of the second law of thermodynamics, according to which the increase of entropy in a closed system is inevitable. Realizing temporality consumes, it causes potential to fall.

Through its transition from the real to the possible, potentialization, or formal cause, can be compared to an increase in the flow of entropy. Potentialization produces order and information, it replenishes resources and energy reserves. Its operation can be compared to that of the demon imagined by the physicist James Clerk Maxwell, which was said to be capable of circumventing the law of increasing entropy. Placed near a sliding window separating two compartments of a sealed vessel filled with a gas at uniform temperature, this tiny imaginary demon allowed only the fastest molecules to pass from one compartment to the other. In this manner, and almost without any energy loss, after a certain time we find that one of the compartments is filled with warm gas and the other with cold gas. The difference in temperature between them is itself a source of potential energy. The disorder characteristic of the undifferentiated mixture is counteracted by the demon's ability to select carefully among the molecules together with the presence of a device to ensure the irreversibility of the demon's actions (the window). Potentialization functions somewhat like Maxwell's demon. On a molecular level, creating order or reestablishing energy potentials amounts to the same thing. The possible, or potential difference, is at the same time form, structure, and reserve.

Both realization and potentialization belong to the order of selection, realization being indicative of a molar choice among possibles and potentialization a molecular sorting and reconstitution of form. I would like to contrast this notion of selection with a very different kind of transformation, that of creation or becoming, with which actualization and virtualization are associated.

Actualization creates a solution for the problem presented by the virtual. In doing so it does not simply replenish its resources or provide a form for the mechanism of realization. Actualization *creates form*. It creates a radically new kind of information. Efficient cause is related to actualization because the laborer, sculptor, or demiurge, if it is a living and thinking being, can never be reduced to a simple executant, for it interprets, improvises, and resolves problems. The temporality of actualization is that of the process. Freed from the pull of entropy (realization) and its return to some previous state (potentialization), the creative time of actualization describes a history, it supplies a constantly reinstated adventure of meaning.

The process of virtualization is a transition from the act—here and now—to the problem, to the knot of constraint and finality that inspires our acts. Final causes, the "why" of the situation, are associated with virtualization. To the extent that there are as many temporalities as there are vital problems, virtualization is displaced in a time that contains all time. Virtualization escapes time to enrich eternity. It is the source of time, process, and history, since it controls actualization without determining them. And because it is creative, virtualization devises questions, problems, act-generating structures, lineages of processes, the machinery of becoming.

Transformation	Definition	Order	Causality	Temporality
Realization	Choice, potential drop	Selection	Material	Mechanism
Potentialization	Production of resources	Selection	Formal	Labor
Actualization	Problem resolution	Creation	Efficient	Process
Virtualization	Creation of problems	Creation	Final	Eternity

The four kinds of transformation are conceptually distinguished in the above table. If I were to analyze a concrete phenomenon, as I have done previously, it would become apparent that the four causes, the four modes of being, the four transitions from one mode to another, are inextricably bound up with one another. If we block virtualization, we create alienation, ends can no longer be reformulated, heterogenesis fails; living, open machinations in the process of becoming are suddenly transformed into lifeless mechanisms. If we cut off actualization, then ideas, ends, and problems become sterile, incapable of resulting in inventive action. The inhibition of potentialization inevitably leads to the stifling, exhaustion, and extinction of living processes. Finally, if we suppress realization, processes lose their footing, their substrate, their point of support, and become disembodied. All transformations are necessary and complement one another.

Mixtures

Far from constituting the terms of an exclusive classification, the opposition between the possible and the virtual is never definitive and is recreated with each

new distinction. As an analogy, when we cut a magnet in two, we don't obtain one magnet that repulses and one that attracts, but two smaller magnets, each having a positive and negative pole. An anvil, for example, would be associated with the real (since it is made of some substance, something that "resists"), while the sentence "In the year 2010 all automobiles in the city will be electric" (an occurrence) would be associated with the pole of the actual. But I can, if I wish, decompose the sentence into two elements: an implicit question ("Are we really going to let ourselves be poisoned in this way?") and the proposition that answers this question ("No, because by the year 2010..."). The *question* is here said to be virtualizing and the proposition potentializing, since it can assume several predetermined truth values. By continuing the process of fragmentation, we can further divide the initial statement into an emergent hypothesis, associated with an act of virtualization, "In the year 2010 all automobiles...," and a judgment, "This hypothesis is true," which is a form of realization. The same is true of the anvil. It will be virtual as a substrate of inventive patchwork and diversion, potential as a storehouse of iron, a tool capable of wear, etc.

Real, possible, actual, and virtual are four different modes of being, but they almost always operate *together* in any concrete phenomenon capable of being analyzed. Every vital situation embodies a kind of ontological four-speed motor and, consequently, should never be classified in its entirety in one of the four cells of our table.

I am writing on my computer with the help of a word processor. From a purely mechanical point of view, a dialectic between the potential and the real is at work since, on the one hand, the possibilities of the software and the machine are being realized and a text

is being displayed (realized) on screen, the result of a long sequence of carefully determined encodings and translations. On the other hand, the electric current potentializes the machine and I potentialize the text by typing various digital codes by means of the keyboard. At the same time I am actualizing a number of problems, ideas, intuitions, and constraints of composition in writing this text, which, when I reread it, will modify in turn the virtual space of signification to which it responds (which thus constitutes a virtualization).

It should be clear that the processes of potentialization and realization do not assume meaning except through the dialectic of actualization and virtualization. Similarly, the modes of realization and potentialization of the text (the purely technical or material aspect, if you prefer) condition and strongly influence the creation of a signifying message (dialectic of virtualization and actualization). Captured by the real, the dialectic of the virtual and the actual is reified. Recaptured by the processes of virtualization and actualization, the possible and the real are objectivated or subjectivated. The event pole continues to implicate the substance pole: Problems are further complicated and displaced, subjectivating machines are erected, objects constructed and put into circulation. In this way the world thinks in us. But in return the substance pole envelops, degrades, fixes, and feeds off the event pole: recording, institutionalization, reification.

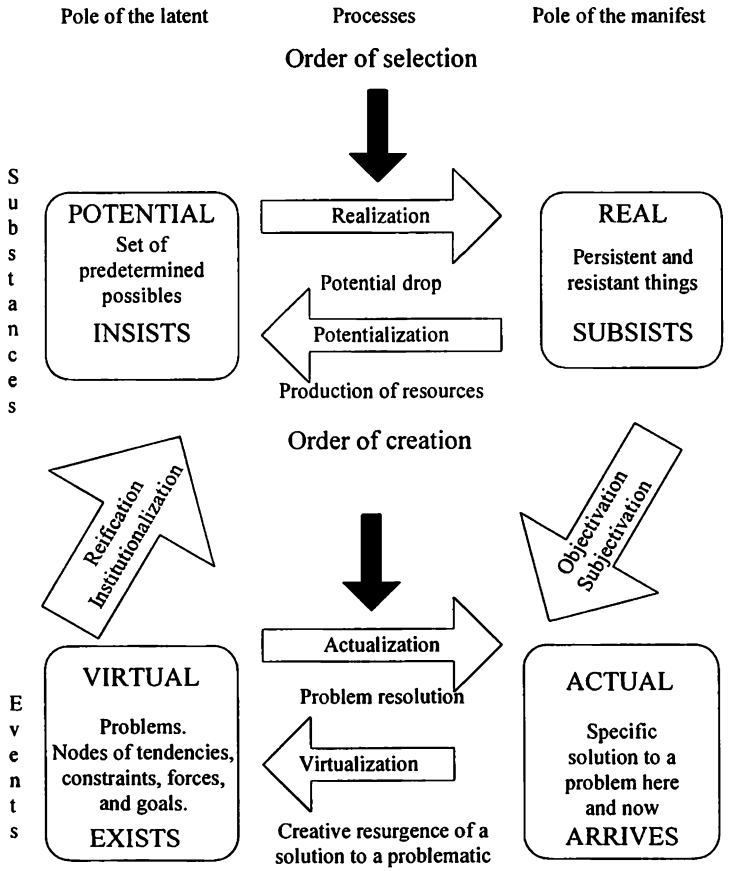
	Enveloped event	Enveloped substance
Enveloping event	Virtualization Actualization	Subjectivation Objectivation
Enveloping substance	Reification Institutionalization	Realization Potentialization

Duality of Event and Substance

The apparent dualism between substance and event may in fact hide a profound unity. In Whitehead's philosophy, the final terms of philosophical analysis—that which truly exists—are events, which are referred to as actual occasions. An actual occasion is a kind of transitory monad, an elementary process of perception, generally unconscious, that receives certain data from previous actual occasions, interprets them, transmits their synthesis to other occasions, and then disappears. Even if we are willing to admit that actual occasions represent the final word concerning "factual" reality, we are nevertheless forced to admit that, at least in appearance, there are permanent substances, durable things. Whitehead resolved the problem by taking into account our experience of durable things in terms of *coordinated societies of events*, which share and transmit specific characteristics. A stone, for example, is a society of similar actual occasions, which linearly inherit their data and ways of reacting from one another. This explains why, over a short period of time, the stone retains, more or less, the same color, hardness, etc.

To establish a bridge between substance and event, we can hypothesize that the event is a kind of molecular substance, miniaturized and fragmented until it is reduced to a point-like act. Similarly, substance would be nothing more than the appearance of a society of events, a coordinated multitude of microexperiences crudely aggregated into the image of a "thing," that is, a molar event. As durable as they might seem, can't the most stable things always be interpreted as events with respect to a duration that surpasses them, like the existence of a mountain when seen from the perspective of the history of the Earth? I can obviously

reverse this argument by asking: Is an event anything more than the fading away or sudden appearance of a substance, even a fading substance? Perhaps the dualism of substance and event should be seen in terms of the yin and yang of classical Chinese philosophy—there is a transition, a continuous transformation of one into the other. Each of them expresses a permanent and complementary aspect of phenomena, like the wave and particle of quantum physics.



Epilogue
Welcome to the Virtual

I love that which is fragile, evanescent, unique, carnal. I appreciate singular and irreplaceable beings and locations, an atmosphere that is forever associated with a situation or moment. I am convinced that a major element of our morality consists simply in the acceptance of being in the world, in not fleeing it, in *being there* for others and for oneself. But since the subject of this book is virtualization, I have written about virtualization. This does not imply that I have forgotten the other aspects of being, and I would ask the reader not to neglect them either. For the actual is so precious that we must, and at once, attempt to recognize and acclimate the virtualization that destabilizes it. I am convinced that the suffering that arises from submitting to virtualization without understanding it is one of the major causes of the madness and violence of our time.

In this book I have tried to show that it is through the process of virtualization that our species was formed and continues to create itself. Yet, virtualization is often experienced as something inhuman, dehumanizing, as one of the most terrifying manifestations of alterity around us. By analyzing it, thinking about it, and occasionally praising it, I have tried to humanize virtualization, for my own benefit as well. A number of contemporary intellectuals, proud of their role as critics, believe they are doing the right thing by spreading

a sense of disarray and panic about the emerging civilization. For my own part, by manipulating words, constructing concepts, and adapting to cultural change, I have attempted to follow some of my contemporaries in their attempt to live without fear and resentment. I have tried, by means of a cartography of the virtual, to supply the necessary tools to those who, like me, are struggling to become active participants.

Virtuality has absolutely nothing to do with its image, as supplied by television. It does not refer to some false or imaginary world. On the contrary, virtualization is the very dynamic of a shared world; it is that through which we share a reality. Rather than circumscribing a realm of lies, the virtual is the mode of existence from which both truth and lies arise. There is no sense of truth or falsehood among ants, fish, or wolves; theirs is a world of tracks and bait. Animals do not think in terms of propositions. Truth and falsehood are inseparable from articulated utterance, and each utterance underlies a question. The act of questioning is accompanied by a strange mental tension, unknown to animals. This active hollow, this seminal void is the very essence of the virtual. I believe that each leap into a new mode of virtualization, each enlargement of the field of problems, opens new spaces to truth and, consequently, falsehood. I am referring to logical truth, which depends on language and writing (two of the major instruments of virtualization), but there are other, perhaps more essential, forms of truth as well: those expressed by poetry, art, religion, philosophy, science, technology, and, of course, the humble and vital truths each of us experiences in our daily life. Among the contemporary avenues of artistic exploration, one of the most interesting is the discovery and exploration of the new forms of truth that accompany, although obscurely, the dynamic of virtualization.

Art can make the vertiginous leap into virtualization, which we so often undertake blindly and unwillingly, perceptible and accessible to our senses and emotions. But art can also intervene in, or interfere with, the process. Isn't the fundamental architecture and design of our epoch based on the hyperbody, the hypercortex, the new economy of events and abundance, the fluctuating space of knowledge? Artists have been encouraged to express themselves only for a very short period in the history of art. Much contemporary aesthetic research references archaic practices that revolve around providing a voice for cosmic creativity. It is less a question of the artist interpreting the world than of allowing existing or hypothetical biological processes, mathematical structures, social or collective dynamics, to speak directly. In this sense art no longer involves the composition of a "message" but the creation of a mechanism that would enable the still silent component of cosmic creativity to give voice to its song. A new type of artist appears, one who no longer relates the course of historical events. This new artist is an architect of the space of events, an engineer of worlds for billions of future histories, a sculptor of the virtual.

I mention art and aesthetics because, like many of us, I am deeply troubled whenever I turn my attention to traditional political institutions. In the end, what is important is our ability to promote a sense of *artistic concern*, genuinely aesthetic criteria (like those I have been discussing), a spirit of creation within the very heart of political action, as in the most "purely technical" branches of engineering, or—and why not?—economic practices.

Why should such a lateral art actively intervene in the dynamic of virtualization? Because actualization often overflows into realization. Because heterogenesis can degenerate into alienation. Because the creation of

a new velocity can easily collapse into simple acceleration. Because virtualization sometimes involves the disqualification of the actual. Because sharing, the characteristic activity of virtualization, too often veers toward confiscation and exclusion. We need an artistic sensibility in order to grasp these differences, these shifts, as they emerge within concrete situations. When the possible destroys the virtual, when substance smothers event, the role of a living art (or art of life) is to reestablish a sense of balance.

The speed and force of contemporary virtualization are so great that they exile beings and their attendant knowledge, alienate them from their identity, skills, and homeland. People are herded along highways, piled on top of one another in boats, pushed and shoved in airports. Others, more numerous still, the true immigrants of subjectivity, are forced to wander within. How can we respond to this situation? Do we resist virtualization, converge on the threatened territories and identities? This would be a fatal error, one we must avoid at all costs. The only possible outcome would be to unleash some sudden violence, like those devastating earthquakes that arise from the lack of flexibility and long-term obstruction of a tectonic plate beneath the earth's crust. It is important that we try to accompany and give meaning to virtualization, while creating a new art of hospitality. In this moment of wide-scale deterritorialization, the supreme morality of the nomad must evolve toward a new aesthetic dimension, the very essence of creation. Art, and thus the philosophy, politics, and technology that it inspires and intersects, must confront the perverted virtualization that excludes and disqualifies with a requalifying virtualization, one that is inclusive and hospitable.

Listen to the call of this art, this philosophy, this unheard of politics: "My people, wherever you come

from, you who have been swept along on the great wave of deterritorialization, you who have been grafted to the hyperbody of humanity and whose pulse echoes its powerful heartbeat, you who think, reunited and dispersed throughout the hypercortex of nations, or live, captive, torn asunder, within this immense event in a world that continuously doubles back and recreates itself, you who have been thrown alive into the virtual, overtaken by our species's great leap into the headwaters of being, know that in the very heart of this strange maelstrom, you are at home. Welcome to humanity's new home. Welcome to the virtual...."

Annotated Bibliography

Auroux, Sylvain, *La Révolution technologique de la grammatisation*. Liège: Mardaga, 1994. A careful analysis of the operations of externalization and formalization associated with communicative acts by a historian of linguistics.

Authier, Michel and Lévy, Pierre, *Les Arbres de connaissances*. Paris: La Découverte, 1992. How do we associate duality and the freedom of the virtual with the recognition of knowledge? The knowledge tree is a registered trademark of the TriVium corporation.

Authier, Michel, "Il ne manque que le ballon!" Université de France, 1991, 4 pages, photocopy. An astonishing text that contains the germ of the idea of the knowledge tree as a "quasi-object" of contemporary societies and provides an outline for a "general equivalent" of knowledge.

Balpe, Jean-Pierre, *Hyperdocuments, hypertextes, hypermédias*. Paris: Eyrolles, 1990. A modern classic on hypertext by one of the best specialists in France.

Bateson, Gregory, *Steps to an Ecology of Mind*. New York: Ballantine Books, 1972.

Bateson, Gregory, *Mind and Nature: A Necessary Unity*. New York: Dutton, 1979. Gregory Bateson, anthropologist, cyberneticist, epistemologist, was one of the first to consider the ecological dimension of the mind. His work has profoundly influenced the contemporary school of family therapy.

Berardi, Franco, *Mutazione e cyberpunk*. Genoa: Costa & Nolan, 1994. An original analysis of the contemporary cultural mutation associated with the development of cyberspace. Franco Berardi illustrates the radically new aspect of our contemporary relation to information.

Debray, Régis, *Manifestes médiologiques*. Paris: Gallimard, 1994. An argument for an awareness of the "material" dimensions of ideas and culture.

De Kerckhove, Derrick, *Brainframes, Technology, Mind and Business*. Utrecht: Bosh & Keuning BSO/ORIGIN, 1991. A brilliant essay on psychotechnology by the worthy successor to Marshall McLuhan. De Kerckhove teaches at the University of Toronto.

De Rosnay, Joël, *L'Homme symbiotique*. Paris: Éditions du Seuil, 1995. An insightful description of the emergence of a collective intelligence within digital communications networks. The author's extensive use of biological metaphors unfortunately prevents him from clearly identifying the specifically human dimension of collective intelligence. The difference between the ant colony and human culture is more than a matter of degree.

Deleuze, Gilles, *Différence et Répétition*. Paris: PUF, 1968. It was in Deleuze's work where I first encountered the distinction between the possible and the virtual. See pages 169 to 176.

Deleuze, Gilles and Guattari, Félix, *L'Anti-Œdipe*, Paris: Éditions du Minuit, 1972.

Deleuze, Gilles and Guattari, Félix, *Milles Plateaux*. Paris: Éditions du Minuit, 1980. *L'Anti-Œdipe* and *Milles Plateaux* are two of the great philosophical works of the twentieth century. In them Deleuze and Guattari developed the concepts of the rhizome, deterritorialization, and the distinction between molar and molecular processes, which I have used in several of my own books.

Descola, Philippe, *Les Lances du crépuscule*. Paris: Plon, 1993. A beautiful study of the Jivaro. From shrunken heads to the enemy as precursor of the soccer ball.

Edelman, Gerald, *Biologie de la conscience*. Paris: Odile Jacob, 1992, republished by Éditions du Seuil in 1994. Originally published as *Bright Air, Brilliant Fire: On the Matter of Mind* by Basic Books, 1992. Neuronal Darwinism explained by one of its creators, winner of the Nobel Prize for Medicine.

Ettighoffer, Denis, *L'Entreprise virtuelle ou les nouveaux modes de travail*. Paris: Odile Jacob, 1992. Telecommuting and the networked corporation.

Eurotechnopolis Institute under the direction of Gérard Blanc, *Le Travail au XXIe siècle*. Paris: Dunod, 1995. A book about the contemporary changes in the way we work.

Goldfinger, Charles, *L'Utile et le Futile. L'économie de l'immatériel*. Paris: Odile Jacob, 1994. A remarkably well documented book about the current changes in the economy. My chapter on the virtualization of the economy owes a great deal to Goldfinger's book. I do, however, disagree with the concept of "immateriality" he provides, which seems to rely on a metaphysics that is incapable of fully comprehending the ongoing evolutions.

Goody, Jack, *The Domestication of the Savage Mind*. New York: Cambridge University Press, 1977.

Goody, Jack, *The Logic of Writing and the Organization of Society*. Cambridge: Cambridge University Press, 1986. In *The Domestication of the Savage Mind* and *The Logic of Writing,* Goody analyzes the cultural changes associated with the transition from orality to writing. A great anthropologist, Goody is the author of the concept of "intellectual technology."

Guattari, Félix, *Chaosmose*. Paris: Galilée, 1992. This small book contains the description of the system (previously

introduced in *Cartographies schizo-analytiques*) of the "four ontological functors," which is based on the intersection of the virtual, the actual, the real, and the possible.

	Actual	Virtual
Possible	Technological phyla, or mechanical discursiveness	Universe of values and reference, or incorporeal complexity
Real	Flux, or energetic-spatio-temporal discursiveness	Existential territories, or chaosmic incarnation

Heidegger, Martin, *Être et Temps* (French translation by François Vezin). Paris: Gallimard, 1986. First German edition: *Sein und Zeit*, 1927. Existence conceived as "being-there." Heidegger's ontology has been challenged by Michel Serres in *Atlas*.

Huitéma, Christian, *Et Dieu créa l'Internet*. Paris: Eyrolles, 1995. A joyous demystification of the network of networks by one of its most knowledgeable users.

Latour, Bruno, *La Science en action*. Paris: La Découverte, 1989 [English translation *Science in Action*, Harvard University Press]. A classic of the new anthropology of science and technology. It is worthwhile comparing the notion of "immutable mobiles" developed in *La Science en action* with the notion of the object presented here.

Latour, Bruno, *La Clef de Berlin*. Paris: La Découverte, 1993. Anthropological studies of science and technology by one of its most skilled practitioners. The first two chapters are primarily concerned with the operations of substitution and combination as applied to technology.

Leopoldseder, Hannes and Schöpf, Christine, *Prix Ars electronica 95, International Compendium of the Computer Arts*. Linz: ORF, 1995. Among this collection of articles is a piece by Roy Ascott, pioneer of computer-mediated art, entitled "Pour une esthétique de l'apparition," as well as an article by Derrick De Kerckhove analyzing the art of the World Wide Web and the Web as art.

Leroi-Gourhan, André, *Le Geste et la Parole*, volumes 1 and 2. Paris: Albin Michel, 1965. An essential reference for anthropology and the philosophy of technology. I owe a great deal to the author's description of the evolution of language and technology during the course of hominization. His conception of the tool as an extension of our organs, however, is much too simplistic.

Lévy, Pierre, *De la programmation considérée comme un des beaux-arts*. Paris: La Découverte, 1992. A collection of empirical studies on cognitive ecology. The book presents a detailed analysis, based on four concrete examples, of the inventiveness and creativity of computer programming.

Lévy, Pierre, *Les Technologies de l'intelligence. L'avenir de la pensée à l'ère informatique*. Paris: La Découverte, 1990. Republished by Éditions du Seuil in 1993. A philosophical approach to hypertext, groupware, and simulation. The book analyzes the relationships between intellectual technologies and cultural forms from the point of view of cognitive science, and outlines a research program for a "cognitive ecology."

Lévy, Pierre, *Collective Intelligence: Mankind's Emerging World in Cyberspace*. New York: Plenum Press, 1997. Collective intelligence as a civilizing trend, seen from the perspective of a theory of the four anthropological spaces: earth, territory, commodity, and knowledge.

Mayere, Anne, *Pour une économie de l'information*. Paris: Éditions du CNRS, 1990. The economy of information as seen by documentalists and librarians.

McLuhan, Marshall, *The Gutenberg Galaxy: The Making of Typographic Man*. Toronto: University of Toronto Press, 1962. One of the books that helped us understand the important role played by communications technology in cultural evolution and the formation of the psyche. I find McLuhan's approach to media as an "extension of the senses" far too one-sided, however.

Rastier, François, "La triade sémiotique, le trivium et la sémantique linguistique," *Nouveaux Actes sémiotiques*, 9 (1990): 54. Written by one of the best of today's French linguists, Rastier's book is a scholarly study of the analogy between our modern classification between syntax, semantics, and pragmatics, and the medieval trivium of grammar, dialectics, and rhetoric. Rastier demonstrates the relationship between these divisions and the fundamental semiotic triad of signifier, signified, and referent, or *vox*, *conceptus*, and *res*. My own understanding of the anthropological trivium is based on this article.

Reichholf, Josef, *Mouvement animal et évolution. Courir, voler, nager, sauter*. Paris: Flammarion, 1994. Original German edition published by Deutscher Taschenbücher Verlag, Munich, 1992. Movement, locomotion, and speed in the animal and living world. Virtualization through mobility.

Rheingold, Howard, *Virtual Communities*, New York: Addison Wesley, 1993. Howard Rheingold was a participant in a virtual community for ten years. The book contains an important historical account of computer-mediated communication and an interesting study of the MUD phenomenon.

Rheingold, Howard, *Virtual Reality*, New York: Simon and Schuster, 1991. One of the best works on the subject for the mass market. A technical popularization, including a historical overview and introduction of the major players in the field.

Serres, Michel, *Le Parasite*. Paris: Grasset, 1980. A great work of philosophical anthropology. Serres discusses social and biological relationships along with communications theory and metaphysics. It is in *Le Parasite* that he first introduces the theory of the quasi-object, which, by circulating, creates the community.

Serres, Michel, *Statues*, Paris: François Bourin, 1987. A brilliant meditation on the continuous transition between object and subject, subject and object.

Serres, Michel, *Atlas*, Paris: Julliard, 1994. A beautiful book on the new civilization associated with information technology and the change in communications. The work also provides an interesting analysis of the virtual as the "beyond." Unfortunately Serres failed to distinguish between the different means of communication, and the effects of television are often mixed up with those associated with the Internet.

Shapin, Steven and Schaffer, Simon, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life*. Princeton: Princeton University Press, 1985. A book about the events that led to the construction of the "experimentalist" community in the seventeenth century. The book shows how modern science was formed through the use of shared objects.

Sperber, Dan, "Anthropology and Psychology: Towards an Epidemiology of Representations," *Man*, new series, no. 20, 73–89. Provides an analogy between viruses and mental representations. The epidemiology of representation obviously varies with the type of communications system present in the cultural environment. This article led to my conception of material technology and psychic functions from the point of view of a single "plane of immanence."

Stengers, Isabelle, *L'Invention des sciences modernes*. Paris: La Découverte, 1993. Science as the invention of proofs capable of establishing a community. Stengers's book enables us to appreciate the unique value of modern science without discrediting other modes of knowledge or interrogations of reality. Humor as the foundationless foundation of the ethics of knowledge.

Stengers, Isabelle (under the direction of), *L'Effet Whitehead*. Paris: Vrin, 1994. A collective work that provides a good introduction to Whitehead, including an important contribution to the philosophy of the event and creativity.

Toffler, Alvin, *Powershift: Knowledge, Wealth, and Violence at the End of the 21st Century*, New York: Bantam Books, 1990. Slightly confused but full of information about the contemporary virtualization of the economy and society.

Toffler, Alvin and Toffler, Heidi, *War and Anti-War: Survival at the Dawn of the Twenty-First Century*. New York: Little Brown, 1993. The virtualization of war as an indicator of the current process of mutation.

Whitehead, Alfred North, *Adventures of Ideas*. Macmillan, 1933. Civilization's progress seen as the victory of persuasion and force. Includes a summary of the author's metaphysical system.

Whitehead, Alfred North, *Process and Reality*, Macmillan, 1929. The actual occasion, elementary event, drop of experience, and microscopic flux of affective perception (distinct from conscious sensation) as the ultimate reality. The philosophy of the event and cosmic creativity.

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