

# The Box of Digital Images: The World as Computer Theater

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## Frames

In 1934 the Belgian artist René Magritte painted a room with a view. On an easel in front of the window stands a painting depicting the very piece of landscape blocked from sight. Magritte named his painting *La Condition Humaine* ("The Human Condition"), which is quite apt, for the life of everyone is determined by windows, doors, mirrors and many other frames. Indeed, to avert anxiety, one actually cultivates social behavior born of the fear of being "outside the frame." Because of this apprehension, we organize all reality into a series of preestablished frames.

The point of reference for the sociological application of the notion of frame lies in the analogy between life and theater, which in the eighteenth century inspired Rousseau to compare city life to a kaleidoscopic theatre. Most contemporary theories of role-playing, such as Goffman's theory in *The Presentation of Self in Everyday Life* (1959) and *Frame Analysis* (1974), derive from the tradition of Rousseau. It has recently been revived in studies of "interface design" by Brenda Laurel in *Computers as Theatre* (1991), where the analogy, in a way, becomes threefold: life is a theater, computers are theaters, and so it follows that computers are life, although the author is careful not to draw this conclusion.

The eighteenth century developed a rather formalistic interpretation of the theater metaphor. The theory of the picturesque determined the framework of Baroque illusionistic theater. Painting and literature, architecture and landscape gardens grew out of the notion of the frame, and gave rise to a universal picturesque model for the representation of the world and society (Mohr, 1992). Marvin Minsky's essay "A Framework for Representing Knowledge" is part of this tradition. Meanwhile, research into artificial intelligence (AI) underscores the real problem of the very

ficial intelligence (AI) underscores the real problem of the very notion of frame (Pylyshyn, 1987), a problem which, according to American philosopher Daniel C. Dennett, had already been broached, but not solved, by Plato (Dennett, 1988, p. 292).

Brenca Laurel's recourse to the metaphor of the theater, as well as the reactualization of the problem of the frame by Minsky, are attempts to apprehend a new means of expression through the use of preexisting media. All new means of expression are created from those that preceded them and eventually go beyond them: the first books with moveable type imitated calligraphy; photography was a parasite of painting, as cinema was of literature; Serge M. Eisenstein discovered the cinematographic aspect of the painting of El Greco; the first television set displayed publicly in Germany was based on optics, not electronics.

By the same token, the universe of the personal computer (PC) draws its inspiration from the magic lantern, the baroque illusionistic theater, and the camera obscura. A Japanese company recently put a computer on the market that looks like a magic lantern (DelVision, MagicVision, D-Vision), while the American variant is called OmniView. Given that the means of expression in frames already dominated the mode of perception in the eighteenth century, one can rightly speak today of a renaissance of that century. To better understand the problems of our own century, one must search for the keys in that epoch. Without this glance backwards, a vision of the world of today would be unthinkable.

### **Brenda Laurel: Interface as Drama**

#### *From Tactile Interface to Cerebral Interface*

Brenda Laurel uses the metaphor of the theater to resolve several problems of mental interfacing. As long as tactile interfaces (keyboard, mouse, light pen) permit a dialogue with the computer, communication is easy, for a great majority of humans know how to read and write. But as soon as the computer changes from a typewriter into an autonomous means of expression, ideas on the best human-computer interface becomes problematic. A doorknob, the prototype of an interface, according to Laurel (Laurel & Mountford, 1990, p. XII), illustrates this example perfectly. The knob is the mediator between the door and the person who uses the door. The *interface design* would thus be the "art" of positioning

the handle correctly – neither too high nor too low – for most people. What designer would loop the handle with barbed wire, or make it so large or so small that it could only be manipulated by either a giant or midget? None. He would be more likely to choose an agreeable material and give the knob an ergonomic form easily adaptable to the average human hand. However, despite all the care taken in the development of this handle, there will be categories of people who will not easily be able to manipulate it: children and the handicapped. In order to take their needs into account, the designer might install supplementary sensors near the door.

It happens, as well, that at times tactile interfaces are poorly built, even if, like doorknobs, they are relatively easy to standardize. The average height of the world population varies about fifty centimeters. But what does fifty centimeters represent in a mental dimension? What is the mental average? This question will arise when computers are no longer manipulated manually, but by thought (Minsky, 1991, p. 14).

According to Minsky's diagnosis, the future will be bound up in parapsychology. Humans will control computers solely by thought, "without hands, light pens, keyboards, or mice," by tapping into a small cerebral connection. By attaching a conduit of information into their cerebral interface, they will *download a human being into a computer*. This radical solution to the problem of mental interfacing still seems unrealistic, but it is envisioned favorably by Minsky, and especially by his friend and former colleague from MIT, Hans Moravec (1988).

Laurel's theatrical interface offers a "milder" solution, whose greatest asset lies in its vagueness (Laurel, 1991, p. 24). Whereas films reproduce a series of always identical images each time they are projected, theatrical performances are different each time; the mood of the actors, the composition and reaction of the audience, as well as other factors of chance, can disturb a production, which is standardized in terms of the schema of the *mise-en-scène* but imprecise and "different" in the details. Similarly, the user of a dramatic interface is in a position to vary the programmed stereotypes at will. Life furnishes him or her with stereotypes, for, more than any other means of expression, the theater embraces a vast panoply of human actions. The theater is *fuzzy* (Laurel, 1991, p. 23); and so "fuzzy logic" also governs the dialogue between human and computer. In a kind of virtual *arena*, human and machine cause

agents, humanoid actors in a stage production, to evolve. The treatment of data thus becomes a theater of data.

*From Aristotle to Video Games*

Brenda Laurel rightly postulates that the humanization of the machine facilitates communication with it. A paragraph in her study *Interface Agents* is entitled "In defense of anthropomorphism" (Laurel, 1991, p. 358). In *Computers as Theatre*, Laurel attempts to refute her detractors and clarify her positions (Laurel, 1991, p. 143).

At first Joseph Weizenbaum cautioned against the anthropomorphization of the computer (Weizenbaum, 1976, p. 205), perhaps because of the unexpected repercussions of his program for the analysis of language, carried out in the sixties. This program simulated the behavior of a psychiatrist in dialogue with a patient. It sent back the information given by the human interlocutor with slight variations, at times in the form of a question, at times as straight repetition. The patients felt extremely well understood, and many psychiatrists began to believe in the advent of automated psychotherapy. Weizenbaum explained the enormous impact of this program (baptized ELIZA, after the *Pygmalion* character of G.B. Shaw) through a theatrical metaphor. ELIZA was like "an actress who commanded a set of techniques but who had nothing of her own to say. . . . People who knew very well that they were conversing with a machine soon forgot that fact, just as theatergoers, in the grip of suspended disbelief, soon forget that the action they are witnessing is not 'real'" (Weizenbaum, 1976, p. 188). The banal typewriter that conveyed the dialogue presented no obstacle to the theatrical illusion.

In *L'Echange symbolique et la mort* (1976), Jean Baudrillard presents the philosophical and cultural arguments against an application of the theatrical metaphor in the context of the logic of simulation. According to him, the theater belongs to the first order of "simulacrum," which is to say, "imitation." According to his theory, simulation is a simulacrum of the third order. It does not imitate, it produces. Hence the imitative illusion produced by the baroque theater must be different than simulation. Unfortunately a great number of its imitators seem to ignore this fact.

Derrick de Kerckhove also comes out against the analogy of simulation and, in the present case, against the comparison between

“virtual reality” (VR) and the theater: “But theatre and VR differ significantly: in the theatre, we look into a comprehensive world from which we are personally excluded. We are outside looking in (which, by the way, is the standard response of the Western man to reality anyway.) But with VR, we stand in the middle looking out: (de Kerckhove, 1990, p. 172).

For Laurel, frontal perspective presents no obstacle to the application of a dramatic interface. She points out the tendencies in contemporary theater to strive to go beyond the space of the stage – the epic theater of Bertolt Brecht, the Living Theatre, Robert Wilson, to name but a few. She does not align herself with any of these models of classic avant-garde contemporary theater. Rather she looks to the poetics of Aristotle and the book *La Technique du drame* (1863), by Gustave Freytag, which presents a simplistic and aesthetically weak analysis based on the theory of a bourgeois theater primarily interested in action. Laurel’s affinities show clearly that her ideas are drawn from the dramaturgy of video games (Laurel, 1991, p. 53).

The most important part of her investigations is devoted to the six elements of the Aristotelian theater, which she tries to apply to *interface design*. Seduced perhaps by the fact that in ancient theater the communication between actors and the public did not take place face-to-face, but through an interface in the literal sense of the term – that is, “an intermediary face,” the mask of Dionysus, which the actors held before their faces – she interprets Greek drama as a technique with which to create virtual spaces. In this respect she differs from de Kerckhove on this matter: “From the plays of ancient Greece to the ritual dances of the Anasazi to the concerts of the Grateful Dead, realtime experience is the Dionysian dimension of art. Recall that in the Greek theatre, actors were the priests of Dionysus, the god of ecstasy and rebirth, and during the act of performance they felt themselves to be in possession of the God. Their audiences were transported and illuminated by the divine presence. Dionysian experience is being in the living presence of not only the artist but also huge spiritual forces” (Laurel, 1991, p. 196).

### **Marvin Minsky: A Framework for Representing Knowledge**

According to Laurel (1991, p. 197) *interface design* reinvents the sacred space “where we collaborate with reality in order to trans-

form it and ourselves." Like her, Minsky is convinced of the advent of the spiritual. With Moravec it was even a question of digital transmigration, of the survival of the human as a purely spiritual entity (Moravec, 1988, p. 108). But the consensus stops there, for, contrary to Laurel (and Moravec), Minsky refers to a formalistic tradition of the theatrical metaphor. We shall look into this in more depth presently.

The most cited passage of *A Framework for Representing Knowledge* is the following: "Whenever one encounters a new situation (or makes a substantial change in one's viewpoint) he selects from memory a structure called a frame: a remembered framework to be adapted to fit reality by changing details as necessary. A frame is a data-structure for representing a stereotyped situation, like being in a certain kind of living room, or going to a child's birthday party. Attached to each frame are several kinds of information. Some of this information is about how to use the frame. Some is about what one can expect to happen next. Some is about what to do if these expectations are not confirmed" (Minsky, 1974, Abstract).

This definition does not help to clarify things at all. Rather it has become the take-off point for various interpretations. For Umberto Eco, "remembered framework" corresponds to "recollected image fragments," which is to say visual structures, or scenographies. This optical concept of the "frame" is distinguished from older textual "frames," such as those he believes to have uncovered in Bateson and Goffman (Eco, 1990, p. 284). The "scripts" of Roger Schank, types of scenarios for a computer theater, are often compared to Minsky's "frames," but correspond, rather, to its textual variant. The Dreyfus brothers, encouraged by the notion of the frame as defined in *Meditations cartésiennes*, claim to find the entire philosophy of Husserl in Minsky's concept of the "frame" (Dreyfus and Dreyfus, 1988, p. 28). They speak ironically of the naiveté of Minsky, who had no idea he was close to Husserl (1988, p. 30). Elsewhere they confuse Schank's "scripts" with Minsky's "frames" (1987, p. 106).

This vacillation between a visual and textual interpretation of frames was reinforced by the declarations of Minsky, who himself admits being unable to develop a true theory (Minsky, 1974, p. 3); but on the other hand, his objective was unequivocal. His essay criticized attempts to "simulate sense perception by using logistic systems" (Minsky, 1974, p. 74), and he reproached logicians for neglecting to take into account the fundamental truth that "think-

ing begins first with suggestive but defective plans and images, that are slowly (if ever) refined and replaced by better ones" (Minsky, 1974, p. 78). This sentence ends his essay, but one finds it, or variations thereof, from the first pages on. Nevertheless, this typographic differentiation underscores its relevance, for it creates, so to speak, the frame within which Minsky's argument evolves. Thus plans and frames are two entirely different things.

For Minsky, the "image" is neither a copy of the real in the mind, nor a mental snapshot. Pylyshyn, in 1973, had already refuted the belief according to which a person has at his or her disposal a sort of warehouse or repository of pictorial representations of the external world. On the other hand, John Haugeland admits that it is becoming more and more difficult to assert that mental images do not exist (Haugeland, 1987, p. 91). Taking into account the works of Pylyshyn, Minsky (1974, p. 7) proposes to conceive of mental images as active structures, or frames, with the help of which we organize reality. While criticizing Minsky, the Dreyfus brothers agree that this idea constitutes a progress "from a passive model of information processing to one that tries to take account of the interactions between a knower and the world" (1988, p. 28).

#### *Ars memoriae and the Theater of Memory*

Minsky formulated his idea in 1974, at the same time, or almost the same time, as Goffman. But Goffman was referring to the frame of Baroque illusionistic theater, while Minsky was thinking of a theater of memory. The reference to the theater of memory is implicit. Certainly the definition of frame revolves around memory (*an individual selects from memory a structure called a frame: a remembered framework*), but the fundamental mystery is revealed through a geographical analogy. Minsky interprets our mental universe as a network of different places, just as each place has houses that form blocks of houses and streets that permit access from one to the other: thoroughfares, streets, very personal routes. Maps and address books manage access. There are small towns, big towns, cities, and capitals. Countries, nations, the Earth, and the whole Universe make up the largest units.

According to Minsky, human knowledge is stocked with such imaginary, topological, and visual "memory networks" (1974, p. 50–52). His position recalls that of Wittgenstein when he compares language to an old city: "Ein Gewinkel von Gasschen und Platzen,

alten und neuen Hausern, und Hausern mit Zubauten aus verschiedenen Zeiten; und dies umgeben von einer Menge neuer Vororte mit geraden und regelmässigen Strassen und mit einformigen Hausern" (Wittgenstein, 1963, p. 296) ("A labyrinth of bystreets and little squares and new houses, and houses enlarged at different times; and all this surrounded by a number of new suburbs with rectilinear borders of uniform houses").

But while Minsky's texts on the mental universe mention Wittgenstein, it is likely he is referring more directly to the tradition that also nurtured the metaphor of Wittgenstein's town, that of the *ars memoriae*.

The *ars memoriae* is the production of archives of images in the mind. The theoreticians of antiquity postulated that the memorization of words and things was considerably facilitated by the utilization of images. Remembered images are deposited in imaginary places, scenes, details of the city environment, houses, walls, portals. In this way the interesting sites of any voyage are excellent repositories of memory.

The art of memory was part of the teaching of rhetoric and was supposed to facilitate improvised speaking. The *topoi* or commonplaces of speech were the places in an imaginary house with which the orator was filled. Speech was formed during the memorized crossing of the rooms of this house and the simultaneous recall of stored images. This system could be enlarged at will. In the sixteenth century, Giulio Camillo created a gigantic mnemo-technical theater. The fictive *Città del Sole* of Campanella consisted of many rings of houses constructed in concentric circles around a temple, on which were painted all the knowledge of the world, so that the inhabitants could use their town as a local system of memorization or as a book (Yates, 1966, p. 298).

From the time of the publications, in 1966, of the already classic *The Art of Memory*, by Frances Yates, the ancient technique of memory has inspired research on artificial intelligence. Donald A. Norman, who in 1969 published excerpts of this book, estimated that the theory of memorized images and places was not only important, but also very useful in the representation of knowledge (Norman, 1976, p. 153). The Yates passages Norman cited treat the three levels of meaning of ancient mnemonic images (*imagines agentes*), which lead to Minsky's concept of the frame.

As *formae*, the mnemonic images are precise mental copies of the environment. It is indispensable, in the computer universe, that a



house have a specific address, for otherwise it could not serve as a repository of data. Under no circumstances can it be vague. At the same time, this house is part of a block of houses, gives on to a street, and bears a number that puts it in relation to other places in the memory-city. In this respect the mnemonic images are *notae* ("references"). In another respect, the house exists only in the realm of the imaginary: it is a simulated house, a phantom house. However, in spite of this precision, mental images are still *simulacra*, and remain diffused. These are schematic images, stereotypes that refer to commonplaces (*topoi*), to empty virtual images, that is, to frames.

*Minsky and Ernst H. Gombrich: The Stereotypes of Perception*

Minsky's theory of the frame likewise derives from Ernst H. Gombrich's important research on the stereotypes of perception and pictorial models, presented in the second chapter of his book *Art and Illusion* (1969, p. 11).

Starting from the opinions of several psychologists according to whom the cognitive processes are hypotheses of the organism eliciting positive or negative responses in the form of ever-renewed experiences, Gombrich (p. 29) understands *portrayal* as the modification and adaptation of a stereotyped model to represented objects (*adapted stereotype*), such as a schema "for [the adaptation of] churches to a particular building through the addition of a number of distinctive features" (p. 72).

The artist transcribes, so to speak, the specific data into a preestablished formula or model (p. 73). For no one can create a *faithful image* from nothing: "You must have learned the trick if only from other pictures you have seen" (p. 83). The acquired formulae and models precede perception and, according to Gombrich, keep us from being shipwrecked in the multitude of impressions. Like language, they structure our universe (p. 88). Thus learning, through a half-erratic, half-planned experience, or through an empirical process (*trial and error*), amounts to adapting these models to reality and conforming entirely to these formulae. This principle, borrowed from Karl Popper, allows for the construction of self-regulating machines (*servomechanisms*) that learn by reacting to the success or failure of their movements, and by determining environmental factors in a branching manner (p. 88).

Gombrich's concept of flexible stereotypes no doubt corresponds

to Minsky's idea that the frame is a stereotyped information structure before it is adapted to any given situation. One also encounters the motif of divination in Minsky: when a *matching process* fails, a more appropriate frame is selected according to certain preestablished guidelines (1974, p. 2). The definition of Minsky's frame can therefore be very well illustrated with the help of Gombrich's concept and mnemonics. One can also show that Minsky's study addresses not only the issue of the frame, but also the issue of mental images.

But the author has complicated matters a great deal. There exist two versions of his work on frames: the 1974 version and the greatly abridged version of 1981. Those who, like Eco, are familiar with the longer version are tempted to conclude that it treats the notion of frame from a pictorial point of reference, which for the readers of the 1981 version is undoubtedly an aberration, since Minsky suppressed all references to Gombrich and the problems of perception.

Originally, one part of the work treated the representation of knowledge, and the other its acquisition. The part concerning the theory of perception is totally absent from the abridged version, but nevertheless remains very important to the elaboration of the metaphor of the frame. In this part of his study, Minsky develops his system of *Global Space Frame* (Minsky, 1974, p. 66) and analyzes the evolution of perception from a philogenetic and ontogenetic point of view, by differentiating between a Ptolomeian schema and a Copernician schema. The Ptolomeian schema is a schema of egocentric, preadult perception. For the infant, the world is structured according to his or her field of vision, whose perimeters are those of the world. The world revolves around the infant as the sun revolves around the earth in the Ptolomeian universe. During the course of intellectual socialization these *self-centered schemata* are gradually abandoned and replaced by a *space-centered imagery* – the Copernican system – for, once he has become an adult, man rids himself of the certainty that the world ends at the boundaries of his individual perception. The body and the legs are part of the visual sense: When the adult goes through a door, he imagines that there is a space behind this door. Without ever having seen this space, he knows that it will be related to other spaces or that it will lead him outside. He has learned to use a flexible schema of central perception.

### **Brief Cultural History of the Frame**

This reference to Minsky's speculations on the theory of perception is not intended to generate a critical rereading of later versions of the theory of frames, or even to criticize it. Rather, the point is to situate the problem of the frame in the history of culture, a question which, according to Daniel C. Dennett, represents a new and essentially epistemological approach, "accessible in principle but unnoticed by generations of philosophers – brought to light by the novel methods of AI, and still far from being solved" (Dennett, 1988, p. 42). As Minsky so aptly demonstrates, these problems are neither old nor new: "it's important to see where the novelty is and where it isn't" (Glymour, 1987, p. 65). Had Dennett deigned to glance at the cultural history of the frame, he would have been less emphatic in his declaration of a new philosophical problem.

With his 1934 dissertation *Anschauungsformen der deutschen Dichtung des 18. Jahrhunderts*, German researcher August Langen was one of the first to present an important theory of the frame. He has the distinction of having intuitively understood the important influence of the magic lantern, the Baroque illusionistic theater, the camera obscura, and other framelike means of expression in the mode of modern perception, and of having supported it with very copious documentation. According to him, perception and imaginary activity take place on a small inner stage where the head itself acts as a magic lantern in perspective, which allows only the perception of a reduced and highly framed visual field. Through this opening, limited to a fragmented vision, the outside world or imaginary powers insert images or allow them to file past. The imagined "picture" is clear and neat from up close, small and condensed from afar. The scenes vary, the place and scenery change, one small scenic image is replaced by another, a chain of images files past in the magic lantern of the mind (Langen, 1934, p. 19).

According to Langen, this chain of images, which he calls *Rahmenschau* ("frame vision") – Eco would call them "scenographies" – are fixed formulae with the help of which modern writers can describe psychological states.

Langen's findings were corroborated by the study of Jonathan Crary in *Techniques of the Observer*, published in 1990. Without being familiar with Langen's book, Crary arrives at a similar conclusion, that in the eighteenth century perception unfolded according to a stereotyped model, "the paradigm of the camera obscura" (Crary,

1990, p. 29). These two studies have a common weakness: the cognitive process is considered a passive act and not a constructive variation on previously acquired basic structure. Moreover, Langen neglects to situate the vision of the frame in an historical context, explaining it through physiological constraints (Langen, 1934, p. 5).

*The Myth of the "Edge of the Earth"*

The research of Albrecht Koschorke in *Geschichte des Horizonts* (1990) has filled in this lacuna. Koschorke's analysis takes off from the myth of the "edge of the earth" (the earth is imagined as a perfectly round disk, demarcated by Hell and Heaven, overhung by a roof, a tent, or a veil: the sky). This myth is precisely what Minsky calls a Ptolemeian schema of perception: the limits of vision correspond to the limits of the world. The Copernican system is at the opposite pole, for anyone who displaces himself in space and perceives the limit of vision as an ever-renewed frontier can never see the edge, only the horizon.

The Copernican revolution did not, however, sweep aside the myth of the edge of the earth. For Minsky, the Ptolemeian schema is but a stage in the development of humanity. In his tale "Sun Dog," the American author Stephen King illustrates very well the longevity of this idea. The photographs of a defective Polaroid Sun 660 show all the characteristics of a world that ends at an edge, where objects fall off and monsters are coughed up from an adjacent Hell: "The camera made its squidgy little whine and spat out what would be a Polaroid picture – perfectly adequate but somehow lacking; a picture that was all surface depicting a world where ships undoubtedly would sail off the fuming and monster-riddled edge of the earth if they went far enough west." (King, 1990, p. 781).

We also find such fantasies of the "edge of the earth" in the works of Edgar Allan Poe, when Arthur Gordon Pym is hurled into the craters of the ocean, and in *Frankenstein or the Modern Prometheus*, by Mary Shelley, where a failed writer sails to the edges of the earth, listens to the tale of an android, and assists in his destruction.

The aesthetics of horror draws inspiration from the reduction of perception to Ptolemeian structures, and from the recriminations of infantile fears. Flat, pure superficiality, without depth, the photographs of the fictive Polaroid Sun 660 are frightening because they threaten the structures of Copernican perception. They are two-dimensional, lacking in spatial illusion, without foreground or

background, and they renounce anything that might constitute the organization of an image according to the criteria of perspective. They present the same singularity as the painting of the pre-Copernican era, in which things are arranged in a "flat" manner, according to hierarchical criteria, without perspective and thus without depth. Even when placed in the background of a painting, a figure of Christ will always be larger than the figures in the foreground, thus respecting his sacred significance.

*Central Perspective and the Paradigm of the Camera Obscura*

During the Renaissance, the discovery of central perspective transformed the sacred distance into an empirical distance (Koschorke, 1990, p. 55). At the back of the painting one now finds a virtual space, an imaginary visual perspective receding according to the distance at which the viewer is placed. The objects in the painting are organized according to their placement on this pyramid. The frame of the painting becomes a window "through which the beholder looks into the world of the picture" (Gombrich, 1969, p. 152). According to Gombrich, the schema of "perspective" is born of this alteration of the function of the frame. The method is to divide space into squares, which allow for the organization of reality in perspective and its reproduction on paper (Koschorke, 1990, p. 73). The window itself is a graticulated frame, which calls to mind Magritte's ironic play on the ambiguity of the frame in *La Condition Humaine* several centuries later.

Central perspective simulates an idealized and especially monocular visual situation, untouched by the personal intervention of the viewer. The images, seen through an eye opened wide, fall directly, so to speak, into the consciousness of the subject as into a camera obscura (Koschorke, 1990, p. 64): "For, methinks, the understanding is not much unlike a closet wholly shut from light, with only some little openings left, to let in external visible resemblances, or ideas of things without (would the pictures coming into such a dark room but stay there), and lie so orderly as to be found upon occasion, it would very much resemble the understanding of a man, in reference to all objects of sight, and the ideas of them" (Locke, 1959 [1671], p. 212).

Thus does John Locke formulate "the bucket theory of the mind" (Gombrich, 1969, p. 28) – much derided by Popper – according to which an observer is like a bucket into which fall objects from the outside world, which are then treated by the same observer. The

logic of Locke's representation presupposes a strict separation between the observer and the thing observed, between the inside and the outside. The observing subject is separated from the objects of the external world by an imaginary partition of an imaginary camera obscura.

Popper, on the other hand, favors a "searchlight theory" to explain the creativity of human perception. Indeed, in the eighteenth century people not only used framelike means of expression such as buckets to represent the processing of sensorial information, but literally used reflectors to provoke specific phenomena: they observed nature in round, convex, tinted mirrors, where reflections gave the impression of reproducing the canvases of the landscape painter Claude Lorrain. They would use them aboard moving coaches, or would transform their carriages into a camera obscura. Fortunately, most travelers did not need such cinematographic apparatus. They were happy with the window of the carriage through which they perceived nature as a fluid sequence of confused and framed images.

Central perspective does not consist merely of the idea of a fictive and mathematical space in optical perception. It has, as well, strong social and political implications. In his analysis of a painting by Velazquez, Foucault demonstrates that the perspective leads to the king, thereby organizing the space of power (1966). The theater also reserves the optically and mathematically ideal perspective for the king. The "Baroque" stage consists of the foot of an imaginary visual pyramid, perceived from the position of the king. In 1787, the panopticon of Jeremy Bentham transposed this theatrical principle to architecture. The panopticon was to be a circular building with many floors subdivided into cells with windows, giving onto the inside, which could be observed from a tower situated in the center of the building, that is, from a central perspective turned to stone. Were each cell provided with another window giving onto the exterior, it would have functioned like a mechanism of projection, a magic lantern, and transformed the inhabitants into silhouettes and theatrical actors. The only spectator would be an anonymous king, or power itself (Foucault, 1975).

### *Gardens, Theatres of Reality*

The panopticon was a mechanism conceived for the virtualization of bodies in every domain of social life: hospitals, schools, prisons, factories, everywhere that individuals coexist in a reduced space.

The panopticon schema applied the techniques of the frame, which had already been tested on nature, to the human body.

Conceived in 1749 in Kulmbach/Bayreuth in Germany, the rock garden of Sanspareil was an utterly remarkable construction, of which Fenelon's *Aventures de Telemazue* provided the plan. The garden was made up of a series of dramatic, lyric, and epic scenes whose apotheosis was a theater of ruins and grottoes, erected on a pile of rocks, artificially aged, jumbled together and staggered in perspective. In the mid-eighteenth century, Sanspareil symbolized the desire for a virtual reality in the real, that is, the desire for a representation of reality itself and its theatrical double.

In addition to its literary model, Sanspareil drew inspiration from the baroque illusionistic theater. The dramaturgy of the garden had already led to the model of the pictorial frame characteristic of the English garden. Many kinds of frames – buildings, hedges, arches, bridges, etc. – represented ideal nature in three-dimensional paintings inside of which one could walk around (von Buttlar, 1989, p. 14). The English garden also offered *trompe l'oeil*, which produced a very refined two-dimensional pictorial effect and used veils discretely integrated into the landscape to give the illusion that the painted perspectives were real.

The difference between illusion and reality thus became wittingly confused. The most prolific of English landscape artists, Lancelot Brown, constructed his gardens according to criteria that were primarily grammatical, but botanical as well. The bushes, the groups of trees and facades, were used as periods, commas, and hyphens. His antipode William Chambers, on the other hand, cultivated a semantic approach. He constructed gardens according to the themes and rules of the Gothic novel (von Buttlar, 1989, p. 60ff.).

Such a treatment of nature went against the mathematico-physical and cosmological order of the Baroque garden. The style of the Baroque garden was part of the theory of "physico-theology," to use the title of a book by Thomas Derham which appeared in 1713. This book, whose assumptions were generally accepted in England at the beginning of the eighteenth century, stipulated that behind the apparent disorder of nature and the world were natural laws and rational mechanisms: humanity was destined to produce reason (Mohr, 1992, p. 368). The logic of representation, according to Locke, corresponds to this vision of the world. Insofar as the subjects address themselves passively and without personal interven-

tion to nature, the divine images of reason automatically fall into the camera obscura of consciousness.

The influence of "physico-theology" begins to fade toward the end of the eighteenth century, making way for a constructive utilization of framelike means of expression. Sanspareil is an example of this. The German writer Berthold Hinrich Brockes was already vacillating between the idea of the "bucket" and the "searchlight." His collection of poems *Irdisches Vergnügen in Gott, bestehend in physikalisch-moralischen Gedichten* (1721/1748) borrows from "physico-theology" in praising the inherent rationality of divine nature and the ability of modern optical instruments to capture it and make it visible. Elsewhere, Brockes presents a new visual experience: In holding his hands in such a way that they form a frame, he was able to transform a single landscape into thousands of landscapes (*bewahrtes Mittel für die Augen*). This hand, folded to give perspective, helped him develop an O-shape model for active cognitive processes (*Grösse der Seelen*).

Around 1750 this "physico-theology," upheld ideologically by the Whigs, found itself transformed into a picturesque and bourgeois vision of the world and society (Mohr, 1992). The manifest rationality of the world had to give way to individual aesthetic experience (Mohr, 1992, p. 378). Visually influenced by the aesthetic of the English garden, people traveled to find the landscaped stereotypes of their own environment in nature's wilderness. In this manner a veritable mass tourism of the picturesque was born. These picturesque journeys were not necessarily to far-off countries; more often they led to the discovery of nearby places, hills, and rivers, and included even recently industrialized areas. The travelers used Lorrain's mirror in the window of the carriage as a frame. But for many of them the physical frame was not indispensable, for as the pictorial dimension began to fade it was replaced by a vocabulary of stereotyped ideas, framed in syntactical parentheses (Koschorke, 1990, p. 71). It is thus not by chance that the hero of a parody of the picturesque voyage of 1810 was called "Dr. Syntax" (Gombrich, 1969, p. 352).

### *Romantic Perception: The Camera Obscura in the Picturesque Era*

Starting from the negation of the beautiful, W. Gilpin was one of the first to develop a vocabulary of the pictorial values of the English garden in notional formulae. When the beautiful was



defined by *smoothness* or *neatness*, the ideas of *roughness* or *ruggedness* became, in contrast, picturesque schemata (Lobsien, 1986, p. 170). Uvedal Price made a point of differentiating the picturesque from the beautiful and the sublime, and used as a guideline the work of Edmund Burke, *A Philosophical Enquiry into the Origin of the Sublime and the Beautiful* (1757) which makes no mention of the picturesque: "Gegen das Schöne läßt sich das Pittoreske in Oppositionen wie *smoothness/roughness, gradual/sudden variation, ideas of youth and freshness of age and decay* fassen, gegenüber dem Erhabenen in Oppositionen wie *greatness of dimension/no connection with dimension, principles of awe and terror/grandest or gayest scenery, infinity/shape and disposition of its boundaries, uniformity/variety and intricacy*" (Lobsien, 1986, p. 173) ("In relation to the beautiful, the picturesque may be expressed with opposite notions such as smoothness/roughness, gradual/sudden variation, ideas of youth and freshness of age and decay, and in relation to the sublime with opposite notions such as greatness of dimension/no connection with dimension, principles of awe and terror/grandest or gayest scenery, infinity/shape and disposition of its boundaries, uniformity/variety and intricacy").

The picturesque arises from the negation of two notional fields, and is not the fruit of contemplation. In itself it is nothing, existing only to the extent that it is neither beautiful nor sublime: (-) beautiful or (-) sublime. Uvedal Price made use of the lacuna in Burke's aesthetics to catalogue all the motifs not produced by man, and which, consequently, may be considered as transformed into a model of perception whose relevance in relation to reality must be corroborated through a *trial and error method*: "So sieht sich das Wahrnehmungsbewusstsein im pittoresken Prozess in seinen basale Operationen beschäftigt; es findet sich in einem Testfeld, in dem ihm die Chance der Selbstreflexion eröffnet ist" (Lobsien, 1986, p. 173). In other words, the picturesque model serves as a *searchlight*: it organizes and classifies diffuse nature as it did previously with "physico-theology." Comparable in this way to the "view frames" of Minsky's Global Space Frame (Minsky, 1974, p. 66), the picturesque is an information-processing structure, a structure of perception, and not a physical frame.

According to Jonathan Crary, the formalization of the picturesque involves the almost simultaneous collapse of the paradigm of the camera obscura and the bucket theory of "physico-theology": "By the beginning of the nineteenth century the camera

obscura is no longer synonymous with the production of truth and with an observer positioned to see truthfully" (Crary, 1990, p. 32). The logic of representation was thus replaced with picturesque structures.

According to Crary, this disappearance is explained by the intervention of the body in the process of perception. After Goethe, in his work *Farbenlehre* ("A theory of colors") – in contrast to Newton's objective experiments with the camera obscura – called for an accounting of the physiological aspect of perception, and after a good number of researchers lost their sight from staring at the sun in an attempt to produce subliminal images artificially ("the presence of sensation in the absence of a stimulus" Crary, 1990, p. 98) and thereby produce empirical proof of an independent activity of the eye, Crary maintains that it was the writings of the German physiologist Johannes Müller, which appeared in the 1820s, that were the basis for the collapse of the "paradigm of the camera obscura." Müller used as his starting point a specific sensorial energy that codified only the intensity of a stimulation and not the physical or chimerical nature of the source. The signals of the outside world were received, so to speak, in gray, and then converted into colored, sonorous, or olfactory "images."

The makers of optical illusion mechanisms knew how to use the temporal distance between the stimulus and its visual codification, between the object and the eye. The "Thaumatrope," presented in 1825, was a good application of the difference observed between a repeated stimulation and a codification barely arrested in time. When a disk painted on both sides was turned rapidly, the bird painted on the recto suddenly was found in the cage painted on the verso, a bald man suddenly had hair, a rider became seated on his horse. In order to boost his thesis of the collapse of the "paradigm of the camera obscura" and thus the advent of a new constructive theory of sight, Crary mentions other objects, such as the protocinematic grinders Phenakistiscope and Zootrop, the Kaleidoscope, and especially the stereoscope, which put an end to monocular vision.

Crary's assertion that "Müller's paradigm" would quickly replace the "paradigm of the camera obscura" belongs to the realm of scientific myth: any changes in paradigm take place over a long period of time, and it took Müller's "sensorial energy" more than a hundred years to be considered a serious hypothesis by contemporary neurophysiology (von Foerster, 1989, p. 35). The deep-rooted-

ness of the concept of the "paradigm of the camera obscura" in nineteenth-century science is demonstrated by the fact that scientific terminology vacillated for a long time between the older interpretation of the frame as a pictorial and physical frame and the more modern interpretation of the picturesque schema. The statistical classification of the visual process established by Jan Purkinje bears witness to this terminological hesitation, which extends to the definition of the field of analysis itself. When Purkinje divided the surface of the eye into different pictorial territories, which he measured, he was thinking according to the logic of representation, even when the images no longer originated inside but adhered to the retina like a picturesque engraving. The mention Cray makes of Helmholtz, who compared nerves to a system of telegraph wires, proves the sturdiness of traditional framelike means of expression: at the end of a telegraph wire is always a screen or a typewriter.

Moreover, Cray fails to mention the constructive function of framelike means of expression. To erect a rocky frame in nature also means making what lies inside the frame unique, distinguishing it, by the very act of delimitation, from a multiplicity of phenomena, and thereby making sure of its identity (Dunkelsbuhler, 1991, p. 54).

The German author E.T.A. Hoffmann, in one of his last tales, *Das Vettters Eckfenster* ("The Cousin's Corner Window," 1822), published in the age of the so-called disaster of the camera obscura, crystallized the power of identification of the framed gaze. In this story a cousin is paralyzed. His only distraction is to be seated at the window and to look at the marketplace through a pair of opera glasses. It is thus the classic situation of the observer in the camera obscura: a rigid body isolated from an environment perceived as a pictorial representation. He explains to his visitors that it is not a matter of seeing, but of "looking." He breaks up events into little scenes like the engravings of Callot and Chodowiecki. The act of looking consists of producing, according to its methods, a stage-scene, with the help of which the world allows itself to be organized. The cousin then spins little tales about the people who go to the market, the desires and destinies he imagines for them. The outside world is represented in a syntactically well-formed framework, which is to say, in *frames* and *scripts*.

The contrast with older, more physical concepts of the picturesque is clear. Sanspareil and the gardens of Brown and Chambers created novels through architecture. With Hoffmann the real becomes romance, it is – in the language of the romantics –

“romanticized.” And yet, the visual situation of the cousin remains rooted in the eighteenth century to the extent that the body is excluded from the process of observation, whereas the modern observer intervenes and his point of view is itinerant.

Poe analyzes this new type of observer in “The Man of the Crowd” (1840), basing his tale on the classic vision of the frame (*Rahmenschau*): Through the window of a cafe a convalescent watches the crowd outside, rises suddenly in order to follow a passerby for whom, as we learn later, the most difficult thing in the world is to be alone. This irruption into the outside world opens up a new universe to the observer. He no longer looks toward the outside through frames, but toward the inside, through shop windows. The observer becomes a bum (Benjamin, 1974, p. 123). The displays of the streets offer themselves to his view, as in Emile Zola’s *Au bonheur des dames* (1883), where Zola treats the theme of the modification of the direction of the gaze. It is significant that the novel begins with the description of the marvelous world of shop windows.

But the perception of that world, the gaze cast on shop windows, is conditioned by conventional stereotypes. In Oskar Panizza’s story *Der Corsetten-Fritz* (1893), the young hero, a provincial who has received a very strict Protestant education, does not have at his disposal a visual schema adapted to the large city. The shop window of a lingerie seller is, for him, the copy of a reality that really exists. For him, corsets are skinless cadavers, representations of real creatures that cause him to fantasize. In his heart of hearts he decodes the decoration according to a logic of representation inspired by theology (“physico-theology”).

In contrast, the young Felix Krull, a character in the Thomas Mann novel of the same name, uses the shop windows in the commercial district of his home town quite differently. For him they represent a field of application and verification of the schemata of perception proposed by society. They serve as references to day-to-day life: What should I wear? What should I eat? How should I furnish my home? For the shop windows in big cities classify the exposed merchandise in syntagmas and paradigms, in metonymies and metaphors. Thus prepared through a detailed reading of shop windows, Felix Krull is able correctly to order from a menu or choose an elegant suit (syntagma, metonymy) and select from various headgear an appropriate hat (paradigm, metaphor). He owes his career as an impostor to his ingenious and flexible play with a multitude of preestablished frames.

*The Current Status of the Paradigm*

An analysis of the constructive function of the frame technique for the establishment of semantic fields – according to Eco, the American semanticist Charles Sanders Peirce (1839–1914) was the first to elaborate the concept of the frame such as it was later to be applied to artificial intelligence (Eco, 1985, p. 112) – was able to convince Crary of the longevity of the “paradigm of the camera obscura.” He is obliged to admit that at the end of the century the new stereoscopic and binocular vision must make way for the photomonicular device (Crary, 1990, p. 133).

Indeed, photography unleashes a great wave of repicturalization. Photographers begin to frame their works for exhibition, with the result that they are granted a homogeneous visual aspect and are affirmed as works of art distinct from other products made in series (Rosen, 1991, p. 28). Magritte, in his painting *La Condition Humaine*, constructed his frames with dual function: physical window and picturesque schema. “Physico-theology” still existed then. For the psychologist of perception Rudolph Arnheim, the idea of frame is profoundly marked by the theory of the bucket (Rosen, 1991, p. 20). In 1937, the great director Sergei M. Eisenstein, in his essay on El Greco, analyzes the logic of the frame in painting. El Greco interests him because of the cinematographic exacerbation of the frame, which results in the fragmentation of the painting itself (Paech, 1989, p. 35). This subject will be taken up again in Jean-Luc Godard’s film *Passion* (1982).

Toward the end of the seventies a surprising number of works treating the problem of the frame appeared, such as Jacques Derrida’s theory of the Parergon (*La Vérité en Peinture*, 1978); Gilles Deleuze’s “Cinema 1. L’Image-mouvement” (1989); and “Hyperframes” by Collins and Milazzo (Rosen, 1991, p. 20ff, 30). Without going into the details of these texts, one can nevertheless note that they waver between metaphorical and physical representations of the frame without really taking sides. The publishing boom around the theme of the frame confirms that the “paradigm of the camera obscura” remains viable today. For von Foerster, the question is always the same: “Am I separate from the universe? (which is to say I see the universe unfolding before my eyes through a key-hole)” or “Am I part of the universe? (which is to say that when I speak of the universe I am also speaking of myself)” (von Foerster, 1989, p. 30).

## The Box of Digital Optics

Minsky's theory of the frame has resisted the tendencies of repictorialization. Even if at the beginning of his research he believed in the physical concept of the frame, his later works (such as *Society of Mind* [1988]) gave birth to a series of other stores of data: spatial, pictorial, dramatic, paranomes, *knowledge lines*, *K-lines*, and so forth. He takes pains to differentiate his constructive application of the metaphor of the frame from the idea of the *homuncula mysteriosa* (von Foerster, 1989, p. 33) and the contemporary concepts of the bucket and the camera obscura. The former imagines that one's head shelters a remote-controlled homunculus, a miniature human being installed behind a terminal, who reads the sensorial data that arrive (Input) on at least four screens (for data concerning the auditory, visual, and olfactory-gustatory systems, and the upper and lower limbs), in order to retransmit the output to the bus (Minsky, 1988, p. 50). According to Minsky, there is no one inside the human head, and were there anything it would be a multitude of little animals representing the emotions, which he calls "agents," each of which would be assigned a specific duty. The framework has become a neural network. Interpretations of Minsky's work such as Umberto Eco's in *Lector in Fabula* give in to the apparently irresistible tendency to abandon the physical interpretation of the frame for a pictorial reformulation. The concept of the "frame" developed by Minsky is valuable for an analysis of art because it is, in essence, a picturesque schema, and it ceases to be exploitable as such if taken merely as a neural network.

Contrary to Minsky's positions, Laurel's dramatic interface goes back to a physical notion of the frame. Here, as if inside a camera obscura, are representations generated by the computer and by the human, anthropomorphized homunculi, not little animals. Emotions, which Minsky imagines as micro-computers, are for Laurel physical manifestations of the human body, which she describes by drawing upon the Aristotelian notion of "catharsis" (Laurel, 1991, p. 40ff). She conceives of the frame in the sense that Goffman understood it, as a cultural, political, and social structure that computers would break apart. Human identity would then explode in *Cyberspace*. Laurel describes virtual reality as a Dionysian experience. On the screen one can participate in the cutting up of one's own body, like that of Dionysus on the stage of an ancient Greek theater.

Derrick de Kerckhove speaks of a similar emotional experience in cybernetic space. But unlike Laurel he is convinced that the computer will have definitively broken away from central perspective and will thus no longer be comparable to other means of expression, not even to the theater, for the user will be able, through virtual reality, to interchange perspectives as well as the inner and outer world at will: "The fundamental difference between VR and any other media experience is that it enables the user to externalize his or her imaginary skill in a dynamic process. With VR, there is an effective interaction between the dreamer and the dreamed: the dream becomes real, as if Hegel's most cherished theories of matter turning into spirit were reversed" (de Kerckhove, 1990, p. 172).

Access to *Cyberspace* is possible only for one who transforms himself or herself into a living camera obscura: he or she must put on videostereoscopic glasses with two screens (EyePhone) full of receptors that project onto each eye an image generated by the computer; gloves, connected to the computer (DataGlove), whose displacements and movements permit the manipulation of virtual objects; a suit (DataSuit), also connected to the computer, which transfers the organic body to the screen, thereby transforming it into a data-processing structure. The EyePhone obliges the wearer to relinquish – with eyes staring and opened wide – the representation of objects in his or her externalized interiority, representations which then are touched and captured by the DataGlove. This is exactly how Descartes, Berkeley, Diderot, and other defenders of the "paradigm of the camera obscura" imagined inner vision, as mental data-processing (Crary, 1990, p. 59ff).

Kerckhove's hymn to the externalization of the inner world, the materialization of the mind in virtual space, thus celebrates an old story. Jaron Lanier, a creator of the magic panoply VR, never speaks of a world of dreams which would appear with VR, but of a world of memory. In an interview he mentions the palaces of memory in the *ars memoriae* (Lanier, 1989). The mnemonics of Antiquity thus prove their surprising vitality. Their importance was capital, not only for Minsky, but also for the development of the PC. They enjoyed a veritable renaissance with Nicholas Negroponte and Richard Bolt, who, in a work on "spatial data management," analyze the metaphor of *desktop* based on the principles of mnemonics (Brand, 1987, p. 138). In this context the "Architecture Machine Group" from MIT constructed a memory landscape that bears the name "dataland" (Fischer, 1990, p. 436). Moravec justifies his

recourse to *ars memoriae* by its ability to create a virtual space. The fusion of mnemonics and data processing is for him the ideal interface of human-computer. To illustrate this idea he imagines an introductory course in elementary physics: in virtual space the student meets Isaac Newton, his teacher, and with him studies, in a landscape full of apple trees, the laws of gravity (Moravec, 1988, p. 96ff.)

Moravec's little theater for students is completely compatible with Brenda Laurel's dramatic interface. This warm welcome to *ars memoriae* lies in sharp contrast to the thesis of Paul Virilio, according to which modernity would be subject to a kind of topographic amnesia for which the apparent disappearance of the art of memory would be responsible.

According to Mark Weiser, head of the data laboratory at the XEROX research center in Palo Alto, where the Macintosh interface was invented, virtual reality is an obstacle to the liberation of the computer from the PC yoke, for it obliges the user to stare at the screen, at the box of images. According to him, the future of computers will see the disappearance of the personal computer. Miniaturization during the first industrial revolution made the gigantic steam turbines and electric motors practically invisible. The second industrial revolution will see an omnipresent but invisible machine. Only when "things disappear in this way are we freed to use them without thinking and so to focus beyond them on new goals" (Weiser, 1991, p. 94). Nevertheless this gaze turned toward new objectives greatly resembles a glance backwards. The landscape painters and architects of the eighteenth century, Lancelot Brown, William Chambers, and Jeremy Bentham, were already constructing virtual reality, first with the help of physical frames and then by using picturesque schemas.

The most technically advanced variant of "embodied virtuality" is "body virtuality." Moravec begins with the premise that a series of catastrophes would spark a struggle for survival between humans and robots. To be able to survive humanity must eliminate the body and become purely cerebral, for as the organic "jelly" weakens the individual, the virtualization of the organism will become necessary. According to Moravec, humanity, thanks to the magic wardrobe of VR and microsurgery, will store itself in a computer and survive the destruction of the physical world as a mental clone in a virtual computer theater. Let us hope that no robot gets the idea of cutting off the current.

*Translated from the French by Sophie Hawkes*



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