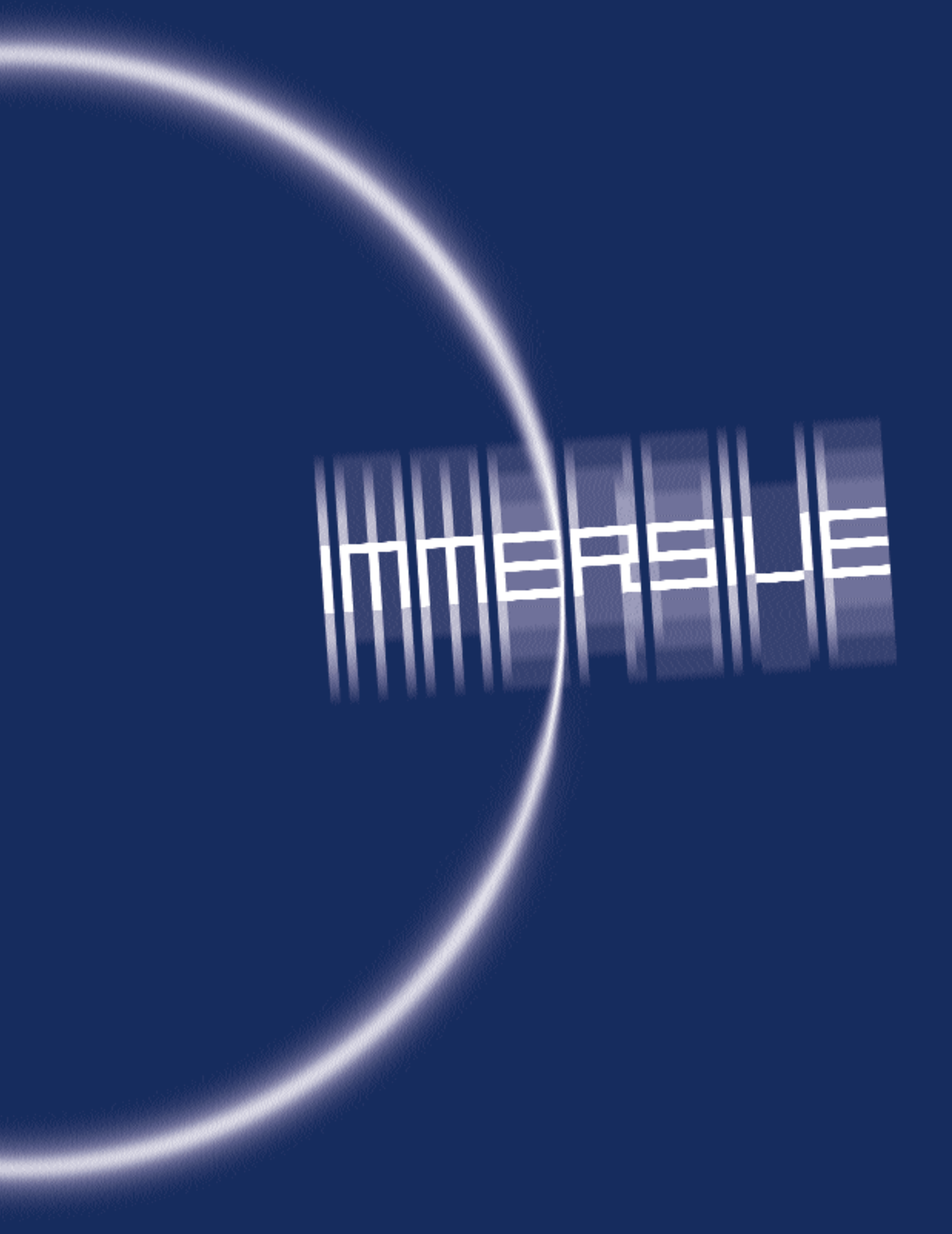

IMMERSIVE

Philippe Codognet

Artificial Nature and Natural Artifice

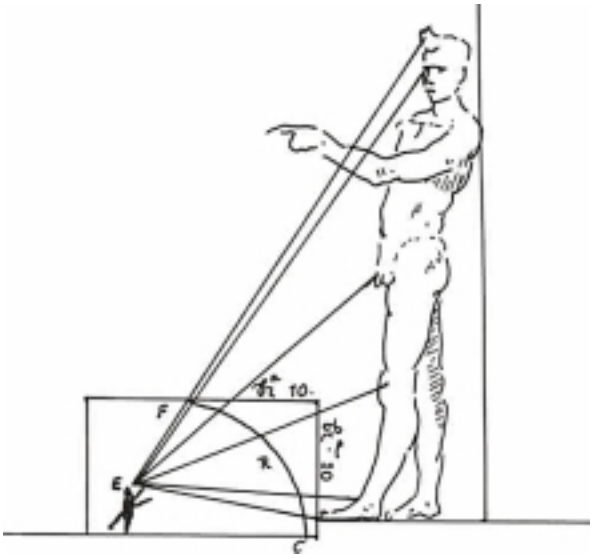
The title of this essay is borrowed from Claudio Tolomei, a sixteenth-century Italian humanist from Siena, who used these words to describe the Mannerist gardens where natural vegetation was intermixed with human constructions and technological devices: not only interactive waterworks but also statues, grottos and "follies." This time was the heyday of the "double oxymoron," linguistic mirror of the stylistic boldness of the Mannerist painters.[1] The oxymoron is today revived in the contemporary buzzword "Virtual-Reality."

Immersive work uses 3-D technology which compels the spectator to enter within the story instead of just watching it from the outside, as a mere series of photographs or a predefined movie. Artists have been experimenting with Virtual-Reality immersive art installations for about a decade now. They have been using visualization technologies such as the CAVE systems, an immersive system created by the EVL group at the University of Illinois in 1991, or Head Mounted Displays (HMDs) which were first created at NASA in 1984 following the original ideas of Ivan Sutherland (1968) and the forgotten pioneering work of Morton Heilig. It was Heilig who first proposed, in 1960, putting two small TV monitors in front of one's eyes.[2] Following earlier experiments using projection screens and real-time computer-generated images in the late 1980s, artists such as Jeffrey Shaw, Ulrike Gabriel, Char Davies and Maurice Benayoun (to name just a few) took VR technologies in their hands in the 1990s to produce immersive artworks. But let us now briefly investigate the historical background of these apparatuses as a fruitful link between Art and Science, in particular the Renaissance.

I The Prehistory of VR

A remote ancestor of the CAVE is the *castellum umbrarum*, castle of shadows, designed by the Venetian engineer Giovanni Fontana in his manuscript *bellicorum instrumentum liber* (1420).[3] This is a precise description and depiction of a room with walls made of folded translucent parchments lighted from behind, creating therefore an environment of moving images. Fontana also designed some kind of magic lantern to project on walls life-size images of devils or beasts. The use of projected images on walls was developed more than two centuries later by one of the major figures of baroque humanism, the Jesuit father Athanasius Kircher, "master of a thousand arts," in his book *Ars magna luce et umbrae* (1646).

The second historical background of virtual environments can be found in *trompe l'œil* frescoes in Venetian, Florentine or Roman villas in the Renaissance. For instance the "Perspective Room" by Baldassare Peruzzi in the Villa Farnesina (Rome, 1510), the "Giants Room" by Giulio Romano in the Palazzo Te (Mantua, 1530–1532) or the frescoes of the Villa Barbaro by Paolo Veronese (near Treviso, 1561). In the Perspective Room, false windows open on a fictitious painted landscape, creating a vertex of perspectivist/illusionist virtuosity. Leonardo himself also worked on such pictorial schemes.[4] One of his codex contains a drawing describing how to craftily project a painting onto a cubic volume in order to recreate a non-distorted image – a device put to use much later in electronic fashion in the CAVE immersive 3-D system.



Martin Kemp
drawing after
Leonardo da Vinci,
codex urbinas, 139r
in Martin Kemp, *The science of Art. Optical themes in Western Art from Brunelleschi to Seurat*, Yale University Press, 1990
© Martin Kemp

One should nevertheless distinguish between the two apparatuses mentioned here, the CAVE and the HMD, as they seem to be used for different purposes in immersive artworks. CAVE-like environments are used to represent virtual (but Euclidean) spaces (for example, *Place – a user's manual* by Jeffrey Shaw), whereas works using HMDs are more oriented towards abstraction (for example, Ulrike Gabriel's *Perceptual Arena*). With the HMD, the viewer is totally cut from the real world and immersed within the fictitious space that is projected on two small monitors in front of the eyes. This device became the allegorical emblem of virtual reality, the symbol of high-tech art for the general public. The idea is that the viewer is immersed *within himself*, recalling thus the Leibnizian concept of the monad, is certainly not alien to the success of the HMD as an icon of VR. Gilles Deleuze, in his study of Gottfried Wilhelm Leibniz,[5] considered the image of a closed room, without any windows, to

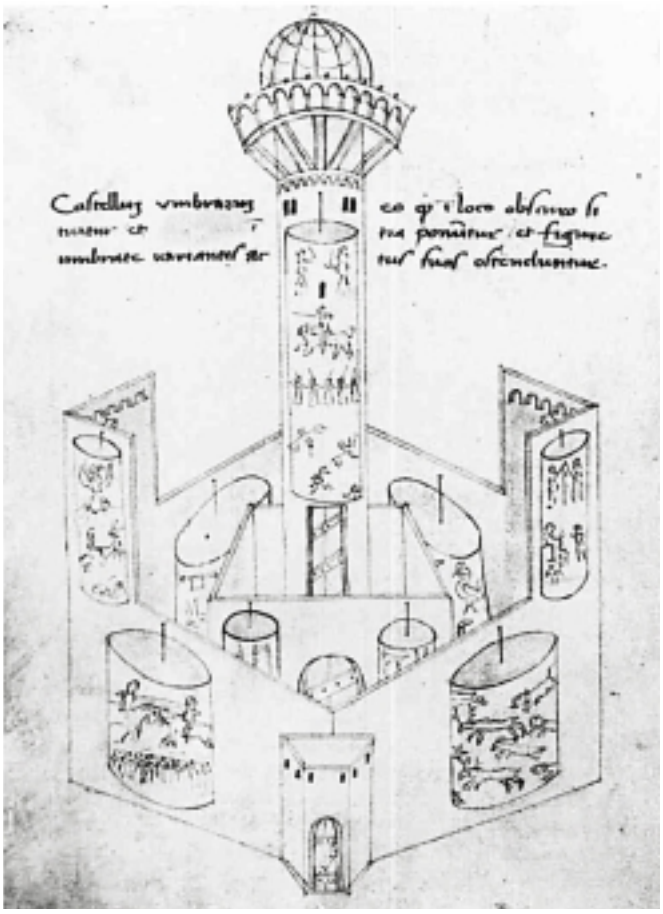
1 See Antonio Pinelli, *La Bella maniera*, Einaudi, Torino, 1993. French translation: LGF, Paris, 1996.

2 He even got a US patent on this device.

3 Samuel Y. Edgerton, *The heritage of Giotto's geometry, art and science on the eve of the scientific revolution*, Cornell University Press, Uthaca, 1991.

4 M. Kemp, *The Science of Art: optical themes in western art from Brunelleschi to Seurat*, Yale University Press, New Haven, 1990, in particular the drawing on p. 50.

5 Gilles Deleuze, *Le pli, Leibniz et le baroque*, Les Éditions de Minuit, Paris, 1988.



Giovanni Fontana
Castellum umbrarum
drawing, fol. 67v
in Giovanni Fontana, *Bellicorum instrumentum liber, com figuris et fictitys litoris conscriptus*,
manuscript, 1420
courtesy Bayerische Staatsbibliothek, Munich

Giovanni Fontana
Apparentia nocturna
drawing, fol. 70r
in Giovanni Fontana, *Bellicorum instrumentum liber, com figuris et fictitys litoris conscriptus*,
manuscript, 1420
courtesy Bayerische Staatsbibliothek, Munich

be the best visualization of the Leibnizian concept of the monad (see *Monadology*, 1714). A monad is an entity, a soul "without doors nor windows" containing the whole world "folded" within itself, representing thus "a subject as metaphysical point," to use Deleuze's own words. In a similar manner, the Renaissance studiolo contains the whole world (metaphorically) painted on its walls.

Is therefore the use of different VR devices pointing out a deep philosophical dichotomy between a perspectivist outside space and an inner abstract self?

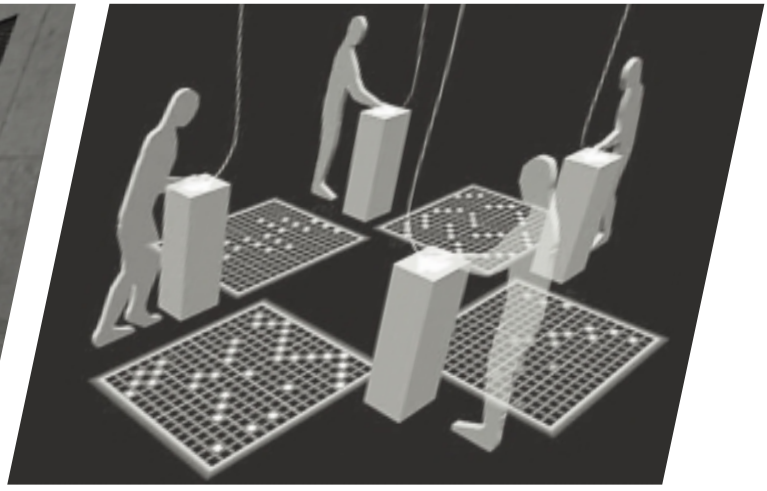
II The Spectator's Point of View

An important characteristic of virtual environments is the possibility for the spectator to interactively move within such spaces and perceive the virtual world as through a subjective camera. This moving, first-person perspective is for some artists a rejoinder to critics who detect in their work elements of a modern perspectivism and "realism." An important point to note here is that we are changing from the cartographic to the *ichnographic* paradigm.[6] The idea of the "cartographic eye in art" appeared recently to reconsider modern art in the twentieth century.[7] This concept is especially relevant for late and postmodernism in America (Jasper Johns, Robert Morris, Robert Smithson). But with virtual worlds we are moving away from the metaphor of the map to that of the path, from the third-person point of view ("God's eye") to the first-person point of view. As Morpheus said to Neo in the blockbuster movie *The Matrix* (1999), "There is a difference between knowing the path and walking the path." We are thus leaving, in the virtual *experience* and exploration of an unknown artificial world, the Cartesian paradigm of the Euclidean, homogeneous and objective space in which points could be described in an allocentric manner by triple (x, y, z) co-ordinates for a new paradigm of a more constructive, egocentric, and indeed subjective space. This is somehow backtracking to the ideas of the French mathematician Henri Poincaré, founder of modern topology, who considered that a point in space should be described by the transformation that has to be applied to reach it. Hence space is represented as a set of situated actions. No one knows the totality of the map; no one can picture or order the territory in any comprehensive way, even abstractly. The complexity of the structure ("graph" to follow the word of Michel Serres, "rhizome" for Deleuze, or "network" in the contemporary terminology) cannot be conceptually apprehended nor depicted. It is worth noticing that, by moving from a 2-D to a 3-D model, some information is in some way lost. Lost first, because there is never a comprehensive, full-blown representation – such as in the map.

6 That is, based on the notion of *path*.

7 See Christine Buci-Glucksmann, *L'œil cartographique de l'art*, Galilée, 1996, and *Mapping*, exhib. cat., Museum of Modern Art, New York, 1994.

Half Life
1998
video game, PC version
screenshot
© Valve Software/Sienna



Toshio Iwai
Resonance of 4
1994
interactive audio-visual
installation
four computers
and video projectors,
custom-made software
400 x 400 cm
general scheme of
the installation
© Toshio Iwai

Secondly, 3-D implies hidden surfaces, that is, a "*part maudite*" (Bataille) – the devil's part – which will always be unknown. There is never light without shadows nor life without death; as in the Baroque world.

This *paradigm shift* also appears in the works of some contemporary video artists such as Pipilotti Rist (such as *Pickelporno,* 1995, or *Ever is Over All*, Venice Biennial, 1997).

Another domain showing the same paradigm shift is that of video games.[8] The subjective camera also revolutionized the world of computer games a few years ago with DOOM (PC CD-ROM, 1994).[9] Although the game was incredibly simple (hunt-and-kill) and the computer graphics quite poor, the immersive effect was fully operational – even too much so for some people. The user/spectator was completely involved mentally, not to say physically, within the Virtual Environment. However, recent developments in blockbuster games like the Tomb Raider series suggest that the gaming industry is moving one step back from subjectivity. In Tomb Raider the player is behind a camera that follows the heroine (cyber star Lara Croft) – as in a cartoon. He is not playing himself.[10] Similar third-person, TV-like, camera controls are also hardwired into systems such as Sony's Playstation or Nintendo 64 console.[11] Considering the history of cinema, one has to admit that the subjective camera device has been used very scarcely since the 1940s, and was never well received by the general public. Indeed, the most celebrated film in this genre, Robert Montgomery's *Lady in the Lake* (1947), is, in fact, the only one to have entered cinema anthologies.[12] Let us hope that the use of the first-person point of view in VR artwork will have a better fate. But perhaps we are bound, in today's societies of the hegemonic spectacle, to what Jean Baudrillard has called (more than thirty years ago)[13] the myth of the consumed vertigo ("Mythe du vertige consommé"). That is to say, the allure of the second-hand experience.

Nevertheless, if a moving viewpoint might be richer than a classical one-point perspective viewpoint, we should not forget the importance of simultaneous viewpoints or privileged viewpoints. For Leibniz, if there are multiple ways of perceiving reality (as in the multiple perspective views of a city) corresponding to different "truths," there is always a particular point of view from which to best understand the whole. For instance, in geometry there is the apex of the cone from which all the conic curves are intelligible. This idea of a specific viewpoint is also at work in Baroque perspective art, such as in the famous ceiling frescoes by Andrea Pozzo in the Church of Sant'Ignazio in Rome (1691–1694). This magnificent painting was designed to be viewed from a particular point inscribed on the floor of the church. In other positions the illusionist effects depicted tumble into incoherent strands and seem close to collapse. Some authors have proposed a detailed analysis showing why this perceptually differs from classical perspective paintings on canvas.[14] But what is important here again is the presence of a precise point where everything is in order and makes sense. This point is where the illusion is perfect, and might be the point where one understands the lure of representation and maybe the fragility of reality. In contemporary art, artists to some extent use simultaneous, fragmented, and multiple viewpoints to show the complexity of their discourse. An immediate example of this is Joseph Kosuth's well-known work *one and three hammers* (1965), which shows a hammer, a photograph of the same hammer, and a dictionary definition of a hammer. The simultaneous viewpoints of objects might be contradictory – all the better to ask the spectator about the "reality" of the depicted object. Another classical example is René Magritte's famous *Ceci n'est pas une pipe* (1926).

That approach, however, forgets that immersion is cognitive before being perceptive. The "reality" of immersive work is distinctly invented and recreated by the viewer – and not just perceived and undergone.

8 On Art and Video Games, see Philippe Codognet, "Njijkon Fetchi," in C*atalogue de la Biennale de Lyon,* exhib. cat., Réunion des Musées Nationaux, 2001.

9 Although we should not forget the fabulous arcade game Battlezone, back in 1980.

10 Interestingly, this demands a schizophrenic choice: one has to choose at the beginning of the game if sound is to be calculated from the gamer's point of view or from Lara's …

11 This point has been developed by Lev Manovich in *Proceedings of the Imagina Conference*, Monte Carlo, 1998, and in *The Language of New Media*, The MIT Press, Cambridge, MA, 2001.

12 In experimental cinema, one should also mention the great Constructivist film *Man with a Movie Camera* (1929) by Russian director Dziga Vertov (Denis Arkadievitch Kaufman, 1896–1954).

13 Jean Baudrillard, *La Société de Consommation: ses mythes, ses structure*, S.G.P.P., Paris, 1970.

14 See Michael Kubovy, *The Psychology of Perspective and Renaissance art,* Cambridge University Press, Cambridge, MA, 1986.

III Emergent Artworks

In the past few years a growing number of artists have been interested in Artificial Life and the idea of "art as a living form,"[15] that is, the artist as some demiurge who sets up a world where artificial creatures interact with each other and with the spectators. Thus the basic task of the artist is to set up a playground with a coherent set of rules – the resulting artwork being indeterminate and evolutive, dynamic rather than static, always in progress and never finished. Following the pioneering works of Karl Sims in computer graphics (1994), Artificial Intelligence techniques such as genetic algorithms have therefore been used in an attempt to introduce evolutionary processes into artworks. Current endeavors, both theoretical and technological, aim at applying those issues to interactive storytelling or video games, and in creating virtual worlds where a coherent story would emerge from the interaction of autonomous characters and a few human-controlled avatars. Here characters will evolve, a story will emerge, and new narrative feelings will be experimented with.

There is indeed the hidden hope that new interesting features can appear through some possibly random and small changes in the basic vocabulary of the artificial world,[16] in the combinatorial process of exploring the huge (although not infinite) meta-universe of variations in story lines that can be composed by assembling small, predefined bits in every feasible arrangement. Interestingly, the fascination of combinatorics as a source of invention has been a cornerstone of both the philosophical and scientific work of Leibniz. The idea of performing within a given symbol system operations on symbolic objects in a purely syntactical manner without reference to their usual meaning or *modus operandi* (for instance because their meaning is unknown) was proposed by Leibniz and considered by him to be an important source for scientific discovery. This activity was dubbed *cogitatio coeca* ("blind thought"). Leibniz uses this paradigm in mathematics where combinatorial systems are treated as *ars inventendi*, and for laying the grounds of modern semiotic systems. But the roots of these concepts have to be dug out further back in the groundbreaking work of the Franciscan monk Ramon Llull in the thirteenth century. Llull was the first to consider a real combinatorial system – one which he envisioned as a universal language capable of producing all the "truths" found in the universe.

But most of the time the exhaustive exploration of combinatorial structures is impossible (because the different possibilities are just too numerous) and search has to be approximated by using randomness. So, this means randomness as an artistic principle of invention? Why not? Marcel Duchamp, for instance, used chance as a major source of creation in order to refrain from intentional choice, as in *3 stoppages-étalon* (1913-1914) or in the choice of other ready-mades. Randomness can indeed create some lure of complexity and, as Rodney Brooks would say, "intelligence is in the eye of the beholder."[17] Or, as Marcel Duchamp put it, "Ce sont les regardeurs qui font l'oeuvre" (the viewers make the artwork).

But if this strategy is effective for conceptual art, it could hardly be applied *per se* for creating narrative or complex interactive virtual worlds, which require a careful tuning of structural rules and evolutionary strategies in order to enable the spectator to enjoy some non-trivial experiences. In most examples of "interactive art," there is only a limited and predefined dialog between the spectator and the artwork. Could we have new modalities of interaction? Could we go beyond (or below) the mediation of language or of simple gestures? Music, and intuitive game-rules, are simple examples of more complex activities where spectators/users may have a rich and fruitful interaction with artificial autonomous creatures. Perhaps this could be the next step, but it is not easy to achieve.

An example of complex interaction, not with synthetic agents but within the spectators themselves, is the installation *Resonance of 4* by Toshio Iwai (1994), where the key issue is the dynamics that can be created among spectators/users by using a simple interactive scheme such as music. The essential meaning of the artwork is thus an emergent behavior. We therefore have to find new models and new concepts for thinking this about complex self-organization – one with emergent properties and autopoiesis (see the work of the late Francisco Varela[18]). Precisely, one key idea is the contingency of cognition: "living systems are cognitive systems, and living as a process is a process of cognition."[19] Varela proposed the concept of *enaction* as a further step after the notion of emergence. In the enactive paradigm, the subject is always conceived as situated and interacting with his environment, and cognition is thus inseparable from the experience of the world. Cognition is conceived as an embodied action. We should also remember, in the same line of thought, the words of the cybernetician Heinz von Foerster, one of the theoreticians who influenced the school of Constructivist psychology: "If you desire to see, learn how to act."[20] For him, "perceiving is making" and all perception is therefore created by the subject's action upon his environment; perception is active. Experiments have shown that sensory organs (in animals and humans) can be trained to better perceive expected signals before the brain considers them. Therefore, by analogy, it would not be unreasonable to think that a key issue in understanding experiences in virtual worlds would be the ability to perform actions and observe their consequences in order to learn the rules governing the artificial environment – maybe simply by trial and error. This is obviously easier to do in a virtual world than in the real one, and this cognitive process is therefore put to use in many computer games and now intuitively performed by video-game-educated kids. It might be possible that this ability to develop cognition by action is indeed gradually replacing the more classical humanist tradition of learning by books and letters ...

Revised version of the essay "Nature Artificielle et Artifice Naturel," first published in French in *L'art à l'âge du virtuel*, C. Buci-Glucksmann (ed.), L'Harmattan, Paris, 2003.

15 See *Art@Science*, Christa Sommerer and Laurent Mignonneau (eds), Springer-Verlag, Vienna, 1998.

16 Changes such as mutations in the synthetic DNA of some virtual creature, as in Karl Sims' works or in the *Evolva* computer game, 2000.

17 Rodney Brooks (researcher at MIT) is a pioneer of so-called reactive robotics, a major paradigm shift in AI in the mid-1980s.

18 See for instance Humberto Maturana and Francisco Varela, *Autopoiesis and Cognition: The realisation of the living*, Reidel, Dordrecht, 1980, and Francisco Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive science and human experience*, The MIT Press, Cambridge, MA, 1991.

19 Maturana and Varela, *op. cit.*, p. 13.

20 Heinz von Foerster, *Observing Systems*, Intersystems Publications, Salinas, Calif., 1984.