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TELEPRESENCE AND TRANSGENIC ART

PhD thesis

by

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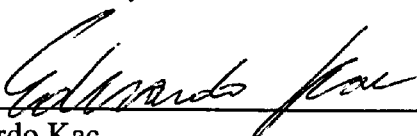
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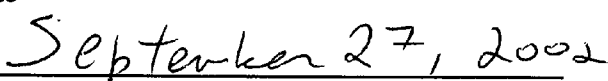
A Thesis submitted to the University of Wales for the Degree of
Doctor of Philosophy (Ph.D)

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SUMMARY

Telepresence and Transgenic Art is an exploration of issues surrounding, on the one hand, the coupling of telematic networks with robotics and biology, and on the other, the exploration of genetic engineering, as an art medium. The integration between telepresence and genetic engineering is also investigated. The discussion is carried out in light of a series of artworks created by the author between 1998 and 2001: *Teleporting An Unknown State-Web version* (1998), *Uirapuru* (1999), *Genesis* (1999), *GFP Bunny* (2000), and *The Eighth Day* (2001). The key concept uniting all works is the investigation, in art, of new modes of communication based on unconventional operations of existing media, systems, and processes. Particular emphasis is given to the author's transformation of monologic systems of production into dialogic forms of experience. All works result from extensive technical, historical, and creative research.

The first section presents comprehensive research in the history and theory of the artistic use of telecommunications media, from the beginning of the twentieth century to the Internet. This section also introduces concepts of dialogism in art. The second section focuses on issues relevant to Telepresence, such as teleoperation in real time, and includes a conceptual and practical discussion of *Teleporting An Unknown State-Web version* and *Uirapuru*. The third section focuses on the cultural impact of biotechnology and includes an exegesis of *Genesis*, *GFP Bunny*, and *The Eighth Day*.

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INTRODUCTION

In this dissertation that accompanies my practical thesis, I investigate new modes of communication and interaction in art through a series of artworks I created between 1998 and 2001. In the discussion that follows, particular emphasis is given to works that represent the research and the results of my practical thesis. These works were created in collaboration with research institutions in Europe, Asia, and the United States under the auspices of the Centre for Advanced Inquiry in the Interactive Arts, University of Wales College, Newport, United Kingdom, namely: *Teleporting An Unknown State – Web Version* (1998-2001), *Uirapuru* (1999), *Genesis* (1999-2001), *GFP Bunny* (2000), and *The Eighth Day* (2001).

This document is organized in three sections. The first section, entitled “Telecommunications, Dialogism, and Internet Art,” covers works created with telecommunications media, remote interactive systems, and the Internet. The second section, “Telepresence Art,” consists of chapters that document my development of an aesthetic of telepresence based on the coupling of telematics, robotics, and biology. The third section, “Transgenic Art,” address the question of the creation of (and responsibility for) new life forms in art. Following is a summary of each chapter:

Chapter 1 – “The Aesthetics of Telecommunications,” discusses historical examples of pioneering telecommunications work, covering a period of approximately seventy years, from 1922 to 1992.

Chapter 2 - “The Dialogic Imagination in Electronic Art,” articulates the notion that telecommunications media enable the creation of truly dialogical art, which I define as art that invents new kinds of interactive propositions based on the unpredictable nature of responsive and improvisational exchanges among subjects.

Chapter 3 - “Networking from Mail Art to the Internet,” bridges historical examples of pioneering networking and telecommunications work with contemporary Internet strategies. The Internet is examined in the larger context of the history of telecommunications art.

Chapter 4 - “Telepresence Art: Theoretical Background,” explores the multiple implications of an art form predicated on enabling the participant to have a sense of his or her own presence in a remote environment.

Chapter 5 - “Telepresence Art: Practical Research,” focuses on the conceptual and practical aspects of the artworks *Teleporting An Unknown State – Web Version* (1998-2001) and *Uirapuru* (1999).

Chapter 6 – “Art and Biotechnology” introduces the idea of literal creation of life in the context of art. This chapter discusses ethical implications of transgenic art against the historical background of selective breeding as an agricultural practice and the cultural heritage of the notion of the chimera.

Chapter 7 – “Genesis” covers the investigation of Genomics and Proteomics as art media. The premise is that new art forms emerge through the creation of new genes and proteins that have artistic (philosophical, social, perceptual, political, symbolic) content instead of scientific function.

Chapter 8 - “GFP Bunny” delves into the multiple implications of creating a transgenic mammal in the context of art. The work seeks to highlight the fact that transgenic animals are subjects (and not objects of any sort) and that they have an emotional and cognitive life that must be recognized and respected.

Chapter 9 - “The Eighth Day” presents the last transgenic artwork of my practical thesis component. This work brings together many of the issues, methods, systems, and processes explored in previous chapters and art works, such as the cohabitation of transgenic beings, the integration of biology and telematics, and the remote experience of presence via telerobotics on the Internet.

The research and the results (the art works) discussed herein reflect my merger of multiple media and biological processes to create hybrids from the conventional operations of existing communications systems. My submission seeks to achieve a balance between theoretical background and a practice that often relies on the indefinite suspension of closure and the intervention of the participant. My creative practice seeks to encourage dialogical interaction and to

confront issues concerning identity, agency, responsibility, and the very possibility of communication.

My submission consists of a DVD and a CD-ROM with documentation of *Teleporting An Unknown State – Web Version* (1998-2001), *Uirapuru* (1999), *Genesis* (1999-2001), *GFP Bunny* (2000), and *The Eighth Day* (2001), as well as this supporting text.

METHODOLOGY

The methodology I have employed in preparing this thesis has several steps. First I produce several notes and sketches to try to visualize the research I wish to carry out. Once this is accomplished, I consult with professionals from multiple disciplines to receive their feedback on the feasibility of the project. I consult often with molecular biologists, engineers, and programmers in different countries. Once the feasibility is ascertained, I proceed to break down the project in its most fundamental, basic steps, and set clear goals. I organize the steps in the proper sequence, set priorities and streamline the investigation. Each module of the research is carried out, often in specialized laboratories. Once the discrete components are produced, the next step is their integration. In an effort to integrate the discrete parts as planned, I carry out several tests. Often new discoveries take place during this stage, leading to reorganization of priorities and further research. More notes are taken and more sketches are produced. Once this phase is satisfactorily completed, I proceed to test the research in a public setting through the public presentation of the work. I then observe the reaction of the public and incorporate the lessons learned throughout the whole process in preparation for the next research cycle.

SECTION I:
TELECOMMUNICATIONS,
DIALOGISM, AND INTERNET ART

Chapter I - THE AESTHETICS OF TELECOMMUNICATIONS

Throughout the twentieth century increasing numbers of artists around the world worked with telecommunications to create experimental and often interactive works. In 1993 the Web opened a new realm for artistic investigation by establishing a new global network infrastructure. In order to identify the aesthetic issues raised by the use of telecommunications in art before the Web, in this chapter I will study the development of artistic use of telecommunications media in the twentieth century up to 1992. This chapter surveys the history of the field and discusses art events that were either motivated by, or conceived specifically for, telecommunications media, with the purpose of showing the transition from the early stages, when the telephone and radio provided writers and artists with a new spatio-temporal paradigm, to a second stage in which new telecommunications media, including computer networks, became more accessible, enabling artists to create events, sometimes of global proportions, in which the communication process itself became the work.

Artists who employed telecommunications media before the Web often created exchanges of texts and images in which what was received was transformed before being sent back to the transmitter. These texts and images were not created as the ultimate goal or the final product as is common in literature and the fine arts. Employing computers, video, modems, and other devices, these artists used visual images as part of a much larger interactive, bi-directional communication context. Images and graphics were created not simply to be transmitted by an artist from one point to another, but to spark a

multidirectional, visual dialogue with other artists and participants in remote locations. This visual dialogue assumes that images will be changed and transformed throughout the process just as speech is interrupted, complemented, altered, and reconfigured in a spontaneous face-to-face conversation. Once an event is over, images and graphics stand *not as the result*, but as documentation of the process of visual dialogue promoted by the participants.

This experimentation with images and graphics develops and expands the notion of visual thinking by relying primarily on the exchange and manipulation of visual materials as a means of communication. The art events created by telematic or telecommunications artists take place as a movement that animates and sets off balance networks structured with relatively accessible interactive media such as telephones, facsimile (fax) machines, personal computers, modems, and slow-scan television (SSTV). More rarely, communication takes place via less accessible means such as radio, live television, videophones, and satellites..

Ultimately, telecommunications art¹ is a culmination of the reduction of the role of the art object in the aesthetic experience epitomized by Duchamp and pursued worldwide by artists associated with the conceptual art movement who embrace mass media. In telecommunications art the object is totally eliminated (since telecommunications exchanges by artists focus on audiovisual information such as text, sound and images) and the artists are absent as well (since they work remotely). Therefore, the work is based on the relationships and interactions between members of a network.

ART AND TELECOMMUNICATIONS

Electronic media permeates contemporary society. As the flux of information becomes the very fabric of reality, artists reevaluate traditional aesthetics and open the field for new developments. To address the aesthetics of telecommunications is to investigate to what extent the context for a new art is created by the merger of computers and telecommunications. The new material which artists work can be identified at the intersection between the new electronic processes of visual and linguistic virtualisation brought irreversibly by telecommunications and the personal computer (word-processing, graphic programs, animation programs, fax/modems, satellites, teleconferencing) and the residual forms that resulted from the process of dematerialization of the art object, from Duchamp to conceptual art (language, video, electronic displays, printing techniques, happenings, mail art).

This new art is collaborative and interactive and abolishes the state of unidirectionality traditionally characteristic of literature and art. Its elements are text, sound, image, and eventually, virtual touch based on force-feedback devices. These elements are signs that shift as gestures, as eye contact, as transfigurations of perpetually unfulfilled meaning. What is commuted is changed, re-changed, ex-changed. The forum in which this new art operates is not the materially stable pictorial space of painting nor the Euclidean space of sculptural form; it is the electronic virtual space of telematics where signs are afloat, where interactivity destroys the contemplative notion of beholder or *connoisseur* and replaces it with the experiential notion of user or participant. The aesthetics of telecommunications privileges communicational experiences over pictorial representation.

Two of the most interesting forms of communication that seem to do away with the old addresser-addressee model proposed by Shannon and Weaver² and reinforced by Jakobson³ are online message boards and conference calling. With online message boards, a user can write a message and send it adrift in electronic space without necessarily sending it to a specific addressee. Then another user, or several other users at the same time, can access this message and answer it, or change it, or add a comment or incorporate this message into a larger and new context in a process that has no end. The closed message as identity of the subject is potentially dissolved and lost in the signifying vortex of the network. If real time is not crucial for posting messages, the same cannot be said about conference calling, where three or more people engage in exchanges that don't have to be limited to voice.⁴ If the linear model goes as far as allowing for addresser to become addressee when the poles are reverted, this multidirectional and interconnected model melts the boundaries that used to separate sender and receiver. It configures a space with no linear poles in which discussion replaces alternate monologues, a space with nodes that point in several directions where everyone is simultaneously (and not alternately) both addresser and addressee. This is not a pictorial or volumetric space, but an aporetic space of information in flux, a disseminated hyperspace that eliminates the topological rigidity of the linear model. It shares the properties of non-linear systems, such as found in hypermedia or in the statistical self-similarity of fractals, as opposed to the linear surfaces of painting.

By creating a literal distancing mechanism, telecommunications allows us to see how artist and audience are constructed in a play of differences. If the mass-produced, printed book would generate both the notions of author and

audience, the disseminated play of meaning of telematic networks potentially dissolves both without fully establishing the integrated, harmonized, aural global village dreamed of McLuhan (McLuhan, *The Medium is the Massage*, 63). If telecommunication is that which brings people closer, it also is that which keeps them apart. If telematics is that which makes information accessible to everyone at any moment regardless of geographic frontiers, it also is that which makes certain kinds of data generated by particular groups in certain formats accessible to people involved with specific institutions. Telematics is also that which affirms certain values implicit in the framing of the question. If there is no end to this play, to this motion, then there must be an awareness of the context that is not removed from this motion through which it is also configured.

To the linear model of communication, which privileges the artist as the codifier of messages (paintings, sculptures, texts, photographs), telematics opposes a multidirectional model of communication, one where the artist is creator of contexts, facilitator of interactions. If in the linear model messages have physical and semiological integrity and are open only to the extent they allow for different interpretations, in the multi-directional model, it is not mere semantic ambivalence that characterizes the signification openness. The openness of the multi-directional model second case is that which strives to neutralize closed systems of meaning and provide the former viewer (now transformed into user, participant, or network member) with the same manipulation tools and codes at the artist's disposal so that the meaning can be negotiated between both. This is not a simple inversion of poles, as proposed by Enzensberger,⁵ but an attempt to acknowledge and operate within a signification process that is dynamic, destabilized and multi-vocal, within a signification

process not based on the opposition artist/audience but on the differences and identities they share. Messages are not “works” but part of larger communicational context, and can be changed, altered and manipulated virtually by anyone.

One of the problematic issues here is that the dissolution of the artist in the user undermines the artist’s privileged position as senders or addressers because there is no more message or work of art as such. It is clear that most artists are not willing to give up this privileged position because it undermines the practice of art as a profitable activity and the social distinction associated with notions such as skill, craft, individuality, artistic genius, inspiration, and personality. The artist, after all, is someone who sees himself or herself as an individual who should be heard, as a person who has something important to say, something important to transmit to society.⁶ On the other hand, one can ask to what extent artists that create telecommunication events restore the same hierarchy they seem to negate by presenting themselves as the organizers or directors or creators of the events they promote—in other words, as the central figure from which meaning is generated. In much the same way that a television director works in collaborative fashion with tens or hundreds of people without ever giving up the responsibility for the outcome of the work, the artist (context creator) that produces telecommunication events initiates a network without fully controlling the flux of signs through it. The artist working with telecommunication media gives up his or her responsibility for the “work,” to present the event as that which restores, or tries to restore, the responsibility (in Baudrillard’s sense) of the media.⁷

Many artists who work with telecommunications have expressed, both through their work and in writing, a combination of enthusiasm (for the new

possibilities afforded by the new media) and criticism (of the philosophical, ideological, or art historical reception of telecommunications). This position is identifiable in the writings of other artists that address the aesthetics of communications at large, and of telecommunications or telematics in particular. Such authors include Roy Ascott,⁸ Bruce Breland,⁹ Karen O'Rourke,¹⁰ Eric Gidney,¹¹ and Fred Forest¹². Artists are endowed with instruments with which they reflect on contemporary issues such as cultural relativism, scientific indeterminacy, the political economy of the information age, literary deconstruction, and decentralization of knowledge; artists are able to respond to these issues with the same material (hardware) and immaterial (software) means that other social spheres employ in their activities, in their communion, and in their isolation. Just as actual walls have fallen (Berlin Wall, Iron Curtain), metaphorical walls (telematic space, virtual reality, telepresence) are also dissolving. One cannot simply overlook or underestimate these historical and technical achievements. It is not with sheer enthusiasm for new tools that the artist will work with communication technologies, but with a critical, sceptical approach concerning the logic of mediation they entail. This means not ignoring that utopias of ubiquitous electronically mediated communication necessarily exclude those cultures and countries that, usually for political and economic reasons, don't have the same or compatible technologies and therefore cannot participate in any global exchange.¹³

Let's suppose that in a not so distant future Jaron Lanier's dream of "post-symbolic" communication becomes possible.¹⁴ This hypothetical situation could be a viable approach to the problem of linguistic barriers (including language impairment), but it would be no different from other cases of economic

segregation, given that even basic telephone technology is full of serious problems in most developing countries. If telecommunications art will not simply neglect the contradictions inherent in media and other technological monopolies present in late capitalist societies, I like to think that freer forms of communication can emerge out of new interactive artistic practices that make the process of symbolic exchange the very realm of its experience.

DISEMBODIED VOICES

An assessment of the parallel development of telecommunications media and new art forms throughout the twentieth-century reveals an interesting transition: one first sees the impact of new media on much older forms, such as radio influencing theatre while later it is possible to detect experimental uses of these media. In this perspective, radio is the first electronic mass communications medium used by artists.

In the late 1920s, commercialisation of airwaves was in its infancy. Radio was a new medium that captured the imagination of the listeners with an auditory space capable of evoking mental images with no spatio-temporal limits. A remote and undetected source of sound dissociated from optical images, radio opened listeners to their own mindscapes, enveloping them in an acoustic space that could provide both socialization and private experiences. Radio was also the first true electronic mass medium, capable of remotely addressing millions at once, as opposed to newspapers and cinema, for example, which were only available to a local audience.

In 1928, German filmmaker Walter Ruttmann (1887-1941) was invited by the Berlin Broadcasting System to create a piece for radio. Ruttmann had already achieved international recognition for his abstract animated films, such as *Opus I, II, III* and *IV*, which pioneered the genre and anticipated computer animation by half a century. His experimental documentary, *Berlin, Symphony of a Great City* (1927), was also acclaimed worldwide and inspired a whole generation of film makers who then created filmic “city symphonies” (Schobert 30).¹⁵ In addition to his contribution to film making, Ruttmann’s innovative work for radio would open the air waves to the aesthetics of the avant-garde, challenging the standardization of programming imposed by commercial imperatives

In order to create the commissioned piece, Ruttmann was given access to what was one of the best recording systems for film in the world, the “Trierigon” process. Coming from the world of cinema, Ruttmann decided to create *Weekend*, a movie without images, a discontinuous narrative based on the mental images projected by the sounds alone. He recorded the sound track in the reel, as he would have employed the frame to record images. *Weekend* lasts about fifteen minutes and creates an aural atmosphere that portrays workers leaving the city and going to the countryside after a working day. Initially, saws, cars, and trains produce the predominant sounds, while later in the reel sounds of birds chirping and children speaking are increasingly heard. As he had done with *Symphony of a Great City*, Ruttmann edited this pictureless film in experimental fashion: splicing the reel and with it the sound track, repeating certain sounds, reorganizing the sequence, and the duration of sounds. He edited sound like one edits film. (Schobert 42)

Weekend as a sound montage, conceived for a recording medium, for radio transmission, opened new venues and anticipated the aesthetics of movements such as Concrete Music and of artists such as John Cage and Karlheinz Stockhausen. If Ruttmann defined his abstract films as “optical music,” one would not hesitate to describe *Weekend* as the first “acoustic film” created for radio. During the rise of Germany’s National Socialism (Nazism), while other members of the German avant-garde left the country (Oskar Fischinger, for example) or stayed in Germany but did not collaborate with the regime (Hannah Höch, for example), Ruttmann placed his talents at the service of Hitler’s Minister of Propaganda, Joseph Goebbels, for whom he made films such as *Deutsche Panzer* (*German Tanks*, 1940). In 1935 he also contributed to Leni Riefenstahl’s *Triumph of the Will*. Ruttmann died in 1941 in Berlin from an injury suffered in the Russian front while filming combat and war activities. (Russett and Starr 41)

As it became more popular throughout the 1920s, radio inspired and attracted professionals from different backgrounds, including artists, performers, and writers. German playwright Bertolt Brecht (1898-1956) found in radio a means for expanding the aesthetics and the audience of theatre. Between 1928 and 1929, Brecht wrote the first of his didactic plays (Lehrstücke), *Lindbergh’s Flight* (*Der Flug der Lindbergh*), based on the 1927 Charles Lindbergh’s first flight over the Atlantic. The play was first presented in 1929, at the Baden-Baden Music Festival in Germany. Lindbergh made history when he took off in New York and flew for over thirty-three hours without sleep and with little food in a small, light-weight plane of his own design, *The Spirit of St. Louis*, before landing in Paris to the astonishment of the whole world. In 1938, Lindbergh accepted a German medal of honor from Hermann Goering, Commander-in-Chief of the

Luftwaffe, President of the Reichstag, Prime Minister of Prussia and Hitler's designated successor. In 1950, in response to Lindbergh's sympathy for Nazism, Brecht changed the name of the play to *Ocean Flight* (*Der Ozeanflug*). (Heinzelmann 21)

In a Germany struck by economical and political crisis, Brecht became increasingly sympathetic to socialist ideas in hope for a solution. His pedagogic plays did not aim to entertain the audience, but to educate it, to raise its awareness about the social and economic conditions in which they lived. *Lindbergh's Flight* is, in Brecht's words, "an object of instruction" ("An Example of Paedagogics" 31). For Brecht, participation in a play or broadcast was the best way to learn political and moral lessons. Brecht's Marxist aesthetic is clear in his attempt to portray the pilot's feat not as the result of the heroism of an individual, but as the consequence of a collective effort. Instead of a single male actor, Brecht employs a chorus to interpret the pilot's character. Attempting to communicate more directly with the audience, Brecht's style became devoid of any excessive ornament, making use of factual language (Esslin 118). The chorus introduces itself in an economic way emptied of any glamour:

My name is Charles Lindbergh
I am twenty-five years old
My grandmother was Swedish
I am American.
I have picked my aircraft myself
Its name is "Spirit of St. Louis"
The Ryan Aircraft works in San Diego
Have built it in sixty days . . . (Esslin 119)

Brecht wanted to change the social role of theatre and the structure of radio, converting theatre into an educational tool and transforming radio from medium of transmission of information to a medium of communication. Perhaps

the most significant contribution of *Lindbergh's Flight* is its proposal of interaction between listener and apparatus, giving the listener the opportunity to answer the apparatus. Brecht described this interactivity:

The first part (songs of the elements, choruses, sounds of water and motors, etc.) is meant to help the exercise, i.e., introduce it and interrupt it -- which is best done by an apparatus. The other, pedagogical part (the Flier's part) is the text for the exercise: the participant listens to the one part and speaks the other. In this way a collaboration develops between participant and apparatus, in which expression is more important than accuracy. The text is to be spoken and sung mechanically; a break must be made at the end of each line of verse; the part listened to is to be mechanically followed. [...]

Der Flug der Lindberghs is not intended to be of use to the present-day radio but to alter it. The increasing concentration of mechanical means and the increasingly specialized training--tendencies that should be accelerated -- call for a kind of resistance by the listener, and for his mobilization and redrafting as a producer. [...]

The employment of *Der Flug der Lindberghs* and the use of radio in its changed form was shown by a demonstration at the Baden-Baden music festival of 1929. On the left of the platform the radio orchestra was placed with its apparatus and singers, on the right the listener, who performed the Flier's part, i.e., the pedagogical part, with a score in front of him. He read the sections to be spoken without identifying his own feelings with those contained in the text, pausing at the end of each line; in other words, in the spirit of an *exercise*. (Willet 31-32)

Brecht's demonstration cited above was not realized on radio. Instead, his staged performance functioned as a suggestion that radio could be different from its unidirectional standard. Eventhough the "listener" who sang the part of Lindbergh in this first performance was Josef Witt (Heinzelmann 20), Brecht actually meant it as an educational exercise for boys and girls. In theatrical performances, deemed "false" (Willett 32) by the playwright because they were not realized on radio as intended, in order to preserve the collective aspect of the experience, Brecht thought that "at least the part of the aviator must be sung by a

chorus in order that the spirit of the whole should not be completely destroyed.”
(Willett 32) The play was staged several times but received only one radio
production (Hill 62), that of Berlin Radio in 1930. The Berlin Radio broadcast of
March 18, 1930 was followed by a retransmission by the BBC on May 7, 1930.
(Heinzelmann 22)

Brecht’s play was meant not to simply serve radio in its contemporary
form, but to change it, to provide a new model for interaction in which the listener
becomes a participant, a producer. Having embraced Communism, Brecht
brought a political message to his radio work. The listener should resist the
unidirectional flow of messages, because it equated the unidirectional persuasive
messages sent constantly by the State to the citizens. As Brecht saw it, the
performance of *Lindbergh’s Flight* was an exercise in freedom and discipline, and
for him it would only serve the individual if it would also serve the state. (Brecht,
“An Example of Paedagogics,” 32) With the ascension of the Nazi Party, it
became ever more difficult for Brecht to work. He left Germany in 1933 and
returned to Europe only in 1947. (Esslin 285)

If the strengthening of Fascism prevented left-wing artists like Brecht from
working in Europe, it facilitated the work of other artists that publicly associated
themselves with it, such as the Italian Futurists. Since the very beginning of
Futurism in 1909, Marinetti and his supporters promoted the surpassing of
traditional forms and the invention of new ones at the same time that they
celebrated technological militarisation and war. Abandoning the Anarchist
leanings that originally influenced Futurism, Marinetti became a Fascist and
collaborated closely with Mussolini’s regime. In 1929, Marinetti became a
member of the Italian Academy, founded by Mussolini and in 1939 he served in a

commission organized by the fascist regime to censor undesired books, including those written by Jewish authors. In 1935, he left as a volunteer to the war in Ethiopia, and in 1942, he left again, this time as a volunteer to the Russian front. (Lista 195)

The futurists' last cry for a new art form came in September-October of 1933, with the "Manifesto Della Radio" or "La Radia," signed by Marinetti and Pino Masnata and published both in *Gazzetta del Popolo*, Torino, September 22, and in their own periodical entitled *Futurismo*, Rome, October 1 (Caruso 255-256). The manifesto was drafted two years after Masnata wrote the libretto for the radio opera *Tum Tum Lullaby (Wanda's Heart)*.

In the manifesto, they proposed that radio be freed from artistic and literary tradition and that the art of radio begins where theatre and movies stop. Clearly, their project for an art of sounds and silences evolved from Luigi Russolo's art of noises, and like Russolo, they tried to expand the spectrum of sources the artist can use in radio. Marinetti and Masnata proposed the reception, amplification, and transfiguration of vibrations emitted by living beings and matter. This proposal was furthered by the mixture of concrete and abstract noises and "the singing" of inanimate objects such as flowers and diamonds. They claimed that the radio artist ("radiasta") would create "words-in-freedom" ("parole in libertà"), making a phonetic transposition of the absolute typographic liberty explored by Futurist writers in the visual composition of their poems. But even if the radio artist would not air words-in-freedom, his broadcasts still must be "in the parolibero style (derived from our words-in-freedom) that already circulates in avant-garde novels and in the newspapers; a style typically fast, dashing, simultaneous and synthetic" (Caruso 256).

Futurist radio could employ isolated words and repeat verbs in the infinitive. It could explore the “music” of gastronomy, gymnastics, and lovemaking, as well as use simultaneously sounds, noises, harmonies, clusters, and silences to compose gradations of crescendo and diminuendo. It could make the interference between stations a part of the work, or create “geometric” constructions of silence. At last, Futurist radio, by addressing the masses, would eliminate the concept and the prestige of the specialized public, which always had “a deforming and denigrating influence” (Caruso 256). On November 24, 1933, Fortunato Depero and Marinetti made the first futurist transmissions over Radio Milano (Hulten 546).

In 1941, Marinetti published an anthology of Futurist theatre with a long title, *The futurist theatre synthetic (dynamic-illogical-autonomous-simultaneous-visionistic) surprising aeroradiotelevisual music-hall radiophonic (without criticisms but with Misurazioni)*, in which he compiled nine of Masnata’s and five of his own radio works (“radiophonic synthesis”).¹⁶

Although Marinetti has been credited as the author of these pieces, it seems reasonable to believe that Masnata wrote them. In *La Poésie Futuriste Italien*, Noëmi Blumenkranz-Onimus points out that in Marinetti’s posthumously published autobiography, *La Grande Milano Tradizionale e futurista*, published in Milan, he clearly indicated that these pieces were Masnata’s (Blumenkranz-Onimus 178). Marinetti wrote: “Masnata, at home, offers us radio pieces entitled Drama of distances, silences talk among themselves, a landscape heard, and The Construction of a silence” (Blumenkranz 178 My Translation).

Regardless of who is the real author of these pieces, they are a document of a pioneer effort towards the invention of an authentic art of radio. In this

regard, they anticipate future experimental music forms (*musique concrète*, for example) as well as the work of innovative composers such as John Cage.

Throughout the 1930s, radio not only became technically reliable, but also tuneable, allowing the listener to choose among several programming options. Radio could now receive short, medium, and long waves from considerable distances. Whether enjoyed for entertainment or hailed as tool for political propaganda, radio became a domestic convergence point. Listening to radio became a generalized habit in the 1930s when the world was at the verge of another global conflict.

In October 30, 1938, the Sunday program, *The Mercury Theatre in The Air*, directed by 23-year-old Orson Welles and aired by Columbia Broadcasting System in New Jersey, would present another adaptation of a literary text, this time to celebrate Halloween. Writer Howard Koch adapted the novel chosen by Orson Welles, *The War of The Worlds* (1898) by Herbert George Wells (1866-1946), updating the story and transposing the action to a virtually unknown but real place, Grovers Mill, in New Jersey. This adaptation was done collaboratively, with active contributions by Welles and producer John Houseman. The choice was accidental but convenient, since it was close to the Princeton Observatory where Koch placed the fictitious astronomy authority, Professor Pierson. More importantly, Koch structured the story, following Welles specific instructions, intercalating it with news bulletins, so that it seemed that the music was being interrupted every now and then because of strange events and news flashes that reported them live. (Brady 164)

In Orson Welles' dramatic voice, listeners became aware, little by little, that the initial explosions observed on the surface of Mars turned out to be

disturbances caused by unidentified flying objects that landed in Grovers Mill. Next, the monstrous Martian invaders started to use their “heat ray” and project its “parallel beam” against everything surrounding them, burning people alive and destroying cars, houses, cities. Despite several announcements during the program that it was fictitious, the news format of the broadcast caught casual listeners by surprise. At the end, when Professor Pierson read his diary and revealed that terrestrial microorganisms had defeated the Martians, it was too late. (Koch 77-80)

With nervous voices, Mercury Theatre actors and actresses depicted the landing of Martian war machines, the fire ignited by the deadly rays, and the panic of witnesses. The public reacted with anguish and despair. Nobody died but several people were injured, miscarriages occurred, houses were left behind without a second thought, roads were caught in huge traffic jams, and police officers and fire-fighters were mobilized against the invisible menace. In New York City, many residents loaded their cars and drove away from New Jersey. Calls from the East overloaded the telephone lines in the South-western United States and in Newark, New Jersey, hundreds of doctors and nurses called hospitals to volunteer their services. In Concrete, Washington, an accidental blackout happened exactly at the point in the transmission when the Martians were taking control over the country’s power system. In the South, people sought refuge in local churches and in Pennsylvania a woman was saved from suicide by the timely return home of her husband. Angry listeners filed lawsuits against Welles and CBS without major consequences. Welles’ contract made him not responsible for consequences of any of the program’s broadcasts, and CBS could not be penalized

since there was no previous similar case to base an evaluation of the incident on.
(Koch 86)

Welles' simulated Martian invasion revealed, for the first time, the true power of radio. It exhibited the unique ability of radio to play with the breath of speech and the plastic sonority of its special effects to excite the imagination of the listener. It showed how the technical reliability of the medium built its credibility, giving veracity to news transmitted through it. It also explored unique temporal rhythms, mixing real-time (the transmission lasted about one hour) and dramatized time (Professor Pierson tells us at the end that the whole event happened in a few days). The silence between the cuts (from music to news and vice-versa) was not simply an absence of sound, as in a musical pause; it was presented to the listener as the actual waiting time to link the reporter at the scene of the landing to the crew in the studio. Even more significant was the fact that during the transmission, the panic felt by thousand of listeners was very real. The invasion was an event that happened in the medium of radio and this medium was already so much part of the lives of the listeners that it was transparent and the transmission was not experienced as a representation or enactment. It was "hyperreal" in Baudrillard's sense of the word, an experience in which signs not grounded in reality are so real that they become more real than the real.¹⁷ Welles made explicit the pseudo-transparency of the mass media by unveiling the mechanisms by which the media tries to make itself a clear window to truth, the way it pretends to ignore its own mediation and the influence it has on the collective unconsciousness of society. No doubt, Welles attracted the rage of lawmakers with a propensity to censorship. Radio and electronic media would never be the same after the simulated invasion from Mars.

TELEPHONE PICTURES, SPATIALIST TV, CONCEPTUAL TELEX

The telegraph, the telephone, the automobile, the airplane and, of course, radio, were for the avant-garde artists of the first decades of the twentieth century a symbol of modern life in which technology could extend human perception and capabilities. The Dadaists, however, deviated from the general enthusiasm for scientific rationalism and criticized technology's destructive power. In 1920, in the *Dada-Almanac*, edited in Berlin by Richard Huelsenbeck, they published the irreverent proposal that a painter could now order pictures by telephone and have them made by a cabinet-maker.¹⁸ This idea appeared in the *Almanac* as a pun and a provocation. Constructivist Hungarian artist Laszlo Moholy-Nagy (1895-1946) arrived in Berlin in January 1921, but it is not possible to ascertain whether or not he read it at the time. What is certain is that the soon-to-be member of the Bauhaus believed that intellectual motivations were as valid as emotional ones in creating art and decided to prove it to himself. Years later, the artist wrote:

In 1922 I ordered by telephone from a sign factory five paintings in porcelain enamel. I had the factory's color chart before me and I sketched my paintings on graph paper. At the other end of the telephone the factory supervisor had the same kind of paper, divided into squares. He took down the dictated shapes in the correct position. (It was like playing chess by correspondence.) One of the pictures was delivered in three different sizes, so that I could study the subtle differences in the color relations caused by the enlargement and reduction. (Moholy-Nagy, *The New Vision and Abstract of an Artist*, 79).

With the three telephone pictures described above, which were shown in his first one-man shown in 1924 at the gallery Der Sturm in Berlin, the artist was taking his Constructivist ideas several steps further. First, he had to determine precisely the position of forms in the picture plane with the minute squares in the

graph paper as the grid through which the pictorial elements structured themselves. This process of pixellation in a sense anticipated the methods of digital art. In order to explain the composition over the phone, Moholy had to convert the artwork from a physical entity to a description of the object, establishing a relationship of semiotic equivalence. This procedure antedates concerns set forth by conceptual art in the 1960s. Next, Moholy transmitted the pictorial data making the process of transmission a significant part of the overall experience. The transmission dramatized the idea that the modern artist can be subjectively distant, and that h/she can be personally removed from the work. It also expanded the notion that the art object does not have to be the direct result of the hand or the craft of the artist. Moholy's decision to call a sign factory capable of providing industrial finishing and scientific precision instead of, say, an amateur painter, attests to his motives. Furthermore, the multiplication of the final object in three variations destroyed the notion of the "original" work, pointing towards the new art forms that emerge in the age of mechanical reproduction. Unlike Monet's sequential paintings, the three similar telephone pictures are not a series. They are copies without an original. Another interesting aspect of the work is that scale, a fundamental aspect of any art piece, becomes relative and secondary. The work becomes volatized, being able to be embodied in different sizes. Needless to say, relative scale is a characteristic of digital art, where the work exists in the virtual space of the screen and can be embodied in a small print and in a mural of gigantic proportions.

Despite all the interesting ideas it announces, the case of the telephone pictures is controversial. Moholy's first wife, Lucia, with whom he was living at the time, states that in fact he ordered them in person. In her account of the

experience, she recalls that he was so enthusiastic when the enamel paintings were delivered that he exclaimed: “I might even have done it over the phone!” (Passuth 33). The third personal record of the event, and to the best of my knowledge there are only three, comes from Sybil Moholy-Nagy, the artist’s second wife:

He had to prove to himself the supra-individualism of the Constructivist concept, the existence of objective visual values, independent of the artist’s inspiration and his specific *peinture*. He dictated his paintings to the foreman of a sign factory, using a color chart and an order blank of graph paper to specify the location of form elements and their exact hue. The transmitted sketch was executed in three different sizes to demonstrate through modifications of density and space relations the importance of structure and its varying emotional impact. (Sybil Moholy-Nagy XV)

We are left with the question, usually set aside by commentators, of whether Moholy actually employed the telephone or not. Although apparently irrelevant, since the three works were actually painted by an employee of a sign factory according to the artist’s specifications and were named *Telephone Pictures* by Moholy-Nagy himself, this question cannot be totally disregarded or answered. Lucia seems to remember the event clearly, but the artist’s account, in the absence of proofs that state otherwise, would have to be preponderant. One tends to assume they could have been ordered over the phone because Moholy was an enthusiast of new technologies in general and of telecommunications in particular. Throughout the 1920s, a facsimile system developed by German researcher Arthur Korn’s was used in Germany (Zielinski 136).

In the book *Painting, Photography, Film* originally published in 1925, Moholy reproduced two “wireless telegraphed photographs” and a sequence of two images he described as examples of “telegraphed cinema”—all by Arthur

Korn. Still in *Painting, Photography, Film*, Moholy-Nagy issued an early call for new art forms to emerge out of the age of telecommunications:

Men still kill one another, they have not yet understood how they live, why they live; politicians fail to observe that the earth is an entity, yet television has been invented: the 'Far Seer'—tomorrow we shall be able to look into the heart of our fellow-man, be everywhere and yet be alone. [...] With the development of photo-telegraphy, which enables reproductions and accurate illustrations to be made instantaneously, even philosophical works will presumably use the same means — though on a higher plane — as the present day American magazines. (*Painting, Photography, Film* 38-39)

From the perspective of the development of electronic art, Moholy-Nagy is the most important artist of the avant-garde of the first half of the twentieth century. His contribution is as relevant for electronic art as Picasso's is for the new figure, Duchamp's is for conceptualism, and Kandinsky's is for non-referential art. Articulating with astonishing clarity in his works, articles, and books that new technologies are contemporary art making media, Moholy-Nagy produced a body of work that forms an outstanding legacy for electronic, media, and digital art. Moholy-Nagy's conviction that telecommunications media could open a new field of artistic experimentation remained strong throughout his life. In 1930, he finished the construction of his groundbreaking kinetic sculpture *Light-Space Modulator*, after eight years of development. In an article discussing the *Light-Space Modulator* published the same year of its completion, the artist wrote, "It may even be predicted that such light displays will be relayed by the radio, partly as tele-projection and partly as real light shows, when radio receivers have their own illuminating device with regulatable electric color filters to be controlled from the center at long distance" ("Light Space Modulator" 310).

Moholy-Nagy was absolutely current in his understanding of state-of-the-art television research. In 1923, the same year that he joined the Bauhaus, the Hungarian Dénes von Mihály, working in Berlin, published the first book about television, entitled *Das elektrische Fernsehen und das Telehor (Electric Television)*. This nascent technology experienced enormous growth throughout the 1920s and into the early 1930s, with occasional public demonstrations such as the landmark 1925 *First Public Display of Television*, realized by John Logie Baird at Selfridge's Department Store in London. In the United States, in 1928 Francis Jenkins started regular broadcasts of his "Radiomovies." Viewers could purchase or build themselves the "Radiovisor Receiver" and see animated silhouettes transmitted by Jenkins via radio. This successful pioneering effort, which Jenkins dubbed *Pantomime Pictures by Radio for Home Entertainment*, jump-started the incipient American television industry. (Fisher and Fisher 49)

Moholy-Nagy concluded that such developments would lead to experimental art with the moving image transmitted at a distance and that this image stream "relayed by the radio" would be combined with "real light shows" taking place locally in a physical environment. (Moholy_Nagy, "Light-Space Modulator," 310)

This hybrid of the virtual and remote with the physical and local imagined by Moholy-Nagy anticipated possibilities that would only start to materialize decades later. In 1952, Lucio Fontana, founder of the Spatialist art movement, realized a pioneering live television broadcast in Milan that is the true beginning of video art. In this broadcast, he used his perforated paintings to create dynamic light and shadow patterns on the air.¹⁹ More concretely, Moholy-Nagy's vision would start to be systematically investigated in the 1960s and afterwards, when new

generations of artists embraced video recorders, video synthesizers, satellites, cable TV, and video installations.

Moholy-Nagy proposed that an art that emerges out of television must reject reproduction of reality and favor the production of new realities based on the unique possibilities of the medium. Realizing that electronics would afford an experimental program not circumscribed by the optical limits of cinema, Moholy-Nagy stated that this new art must reject the conventions of film and invent its own possibilities. Thus in 1930 he criticized Theremin for “imitating the old orchestral music by his new ether wave instrument” instead of fostering a new music. (Moholy-Nagy, “Problems of the Modern Film,” 311) Paving the way for a future art form, Moholy-Nagy asserted:

The more the technical equipment of the film and of other related forms of communication and expression (wireless and television with all their manifold possibilities) is perfected, the greater will be the responsibility for elaborating a rational program of work. (...) A new program of research would lead to the discovery of an entirely new, so far unprecedented form of expression and entirely new possibilities of artistic creation. (“Problems of the Modern Film” 712-719)

With Moholy-Nagy’s three telephone pictures, we saw the artist acknowledging the conceptualization power of the telephone exchange. This first experience was recognized by The Museum of Contemporary Art, in Chicago, as a forerunner of the conceptual art of the 1960s with the November 1-December 14, 1969, exhibit *Art by Telephone*. Thirty-six artists were asked to place a phone call to the Museum, or to answer the Museum’s call, and then to instruct Museum staff about what their contribution to the show would be. The Museum then produced the pieces and displayed them. Additionally, a record-catalogue was

produced with recordings of the phone engagements between artists and Museum. The Director of the Museum, Jan van der Marck, believed that no group exhibition had tested the aesthetic possibilities of remote-control creation, stating, “Making the telephone ancillary to creation and employing it as a link between mind and hand has never been attempted in any formal fashion” (*Art by Telephone*). *Art by telephone* was not meant as a telecommunications art event. It was a group exhibition of works produced by an unusual method: telephone descriptions followed by curators’ own implementations. The artist was to be, as in the case of Moholy, physically absent from the process. Marck saw this as an expansion of the syncretism between language, performance, and visual arts characteristic of the decade. Conceptual art set the framework for the emergence of telecommunications art by emphasizing that *cosa mentale* that Duchamp had already defended against the purely visual result of retinal painting. Marck wrote of the participants:

They want to get away from the interpretation of art as specific, handcrafted, precious object. They value process over product and experience over possession. They are more concerned about time and place than about space and form. They are fascinated with the object quality of words and the literary connotation of images. They reject illusion, subjectivity, formalist treatment and a hierarchy of values in art. (*Art by Telephone*)

This exhibit’s pioneering status in the development of the aesthetics of telecommunications was counterbalanced by many artists’ rather shy response to the challenge of making creative use of the telephone. The majority of the participants never worked with communications or telecommunications before, but what is noticeable is that their response to this unique opportunity was still bound by the notion that the work of art is embodied in tangible matter—even if matter without durable substance. Most artists duplicated Moholy-Nagy’s original

telephonic intervention and used the telephone in an ordinary way, providing instructions for the making of objects and installations; only a few dared to transform an actual communication experience in the work itself, the most notable of whom are Iain Baxter, Stan VanDerBeek, Joseph Kosuth, James Lee Byars and Robert Huot. (*Art by Telephone*)

Iain Baxter founded the N. E. Thing Company (NETCO), a conceptual art group active from 1966 to 1978 that was registered as a business and functioned like one in a parodic and critical mode. Operating out of Vancouver like a real company, Iain Baxter was able to gain access to telecommunications equipment otherwise unavailable for private use. He started to work with telecommunications media in 1968 when he had telecopier and telex equipment installed in his home.²⁰ As early as 1968, Baxter used the telex network to send irreverent “messages” to members of the network, which was composed exclusively of businesses, corporations, and cultural organizations. Occasionally office personnel responded to the unsolicited telexes in playful ways. Upon installation, Baxter was able to send telexes for free for 24 hours, so the artist “advertised” N. E. Thing Company to network members. Baxter often telegraphed or telexed conceptual art propositions and visual poems, such as *Trans-VSI Number 12* (1970), a patterned rectangular form (eight inches across and five inches down) organized in three vertical blocks, each composed respectively of the letters S, K, and Y, and sent it to the exhibition, *Information*, realized in 1970 at the Museum of Modern Art (MoMA) in New York. All NETCO works were received and instantly hung on Moma’s walls. For the *Art by Telephone* exhibition, Baxter faxed the museum images of worldwide objects,

persons, and events that received the N. E. Thing Company “seal of approval” (*Art by Telephone*).

At the time of the exhibition, Stan VanDerBeek had produced theatrical, multimedia pieces, and pioneering computer animations. In 1966, he completed the *Movie-Drome*, in Stony Point, New York, near his house. In this dome-shaped environment, audiences laid down while still and moving images were projected on all surfaces above them. VanDerBeek had also experimented with the transmission of pictures from one source to several distant cities. For *Art by Telephone* he devised a closed-circuit version of his current work, allowing visitors at one end of the galleries to feed a fax machine with some of the artist’s collages and have it reappear at the other end. In turn, Joseph Kosuth used the context of the show to give continuity to one of his projects, which consisted of distribution of information through the mass media. At that point, Kosuth was working on an exhibition that he planned to place in fifteen cities around the world that would require museums or galleries to place ads in local newspapers. The Chicago contribution to the project was an ad in the Panorama section of the *Chicago Daily News* on November 1. In the exhibition space, visitors saw nothing but labels indicating the cities involved in the project. (*Art by Telephone*)

Only Lee Byars and Robert Huot used the telephone to generate a communication experience. Byars’s piece contradicted the idea of the show at the same time that it took it literally, in that the artist was scheduled to appear November 13 in the museum and engage in a short silent phone call with French writer Alain Robbe-Grillet. Byars informed the Museum that it would be their first meeting. “To me this is an incredible dramatization of a first meeting” (*Art by Telephone*), said the artist. But perhaps even more dramatic if not more literal

was Huot's interactive proposal. It potentially involved all visitors of the museum and attempted to generate unexpected first meetings by employing chance and anonymity. Twenty-six cities in America were chosen, each starting with a letter of the alphabet, and twenty-six men named Arthur were selected, one in each city. Each Arthur's last name was the first listing under the initial letter of the city (Arthur Bacon, in Baltimore, for instance). The Museum displayed a list of all cities and names, and invited visitors to call and ask for "Art." The work was the unexpected conversation between "Art" and the visitor, and its development totally up to them. Huot's piece, whether intended as a pun on the title of the show or not, presents the artist as the creator of an active context—not a passive experience. It disregards pictorial representation, gives up control over the work, and takes advantage of the real-time and interactive qualities of the telephone. The piece was meant to spark relationships, and by doing so anticipated much of the telecommunications work of the next two decades.

If Baxter was among the first to employ telegraphy as an art medium in the context of conceptual art in the 1960s, it must be noted that one of the earliest telegrams by artists on record was a Dada telegram sent in 1919 by Richard Huelsenbeck, Johannes Baader, and George Grosz, from Berlin to Milan. The telegram, addressed to the Italian writer and soldier Gabriele D'Annunzio, and sent to the Italian newspaper *Corriere della sera*, was in response to an unexpected and isolated military move by D'Annunzio who, in the company of volunteers (which included Futurism activists) invaded and annexed the city of Fiume, today, Rijeka (Croatia). D'Annunzio's illegal occupation and dictatorial government, which was opposed by Italy and the rest of Europe, lasted until January of 1921. (Clark 203-262) The telegram was reproduced in the *Dada*

Almanach, published in 1920, and read: “Please phone the Club Dada, Berlin, if the allies protest. Conquest a great Dadaist action, and will employ all means to ensure its recognition. The dadaist world atlas *Dadaco*, already recognises Fiume as an Italian city” (Huelsenbeck 121). Telegraphy progressively found its way into contemporary art practice, with interest increasing from the late 1960s to the mid 1980s. In 1970, the Japanese artist On Kawara started his *I am still Alive* series of telegrams. From 1970 to 1977, he routinely sent telegrams to art-world personalities with the statement “I am still Alive.” In Brazil, Paulo Bruscky started sending telexes as works of art in 1973. Known for his work in xerography, fax, and mail art, Bruscky was awarded a Guggenheim fellowship in 1981. In a telex sent in collaboration with Daniel Santiago to the exhibition *30th Salão Paranaense de Arte*, Curitiba, Brazil in 1973, Bruscky described three exhibition proposals:

First proposal: Pile in a corner all crates sent to the exhibition. Title: Art is packed as one pleases. Second proposal: In a room, hang a feather duster from the ceiling, one meter off the floor. Place nearby a bucket with water, a broom, a rag, and additional materials used to clean the museum. Title: A clean museum is a developed museum. Third proposal: On a chair, two meters away from the walls, place nails, hammer, stapler, and a roll of adhesive tape. Material used in setting up the exhibition. (Bruscky and Santiago)

Undoubtedly, the telegram itself (and its transmission) must be seen as an artwork. Moreover, the text it contained elucidates Bruscky’s strategies of intervention and critique. While the first and third proposals challenged ordinary categories seen in official art salons, such as painting and sculpture, the second proposal was a direct and acid critique of the military dictatorship’s public health campaign, represented by the slogan “Povo limpo é povo desenvolvido” (A clean people is a developed people). (Bruscky and Santiago) In another telex sent in 1983 to an exhibition

realized at the Núcleo de Arte e Cultura da UFRN/Universidade Federal do Rio Grande do Norte (Center of Art and Culture, Federal University of Rio Grande do Norte), Natal, Brazil, Bruscky transmitted: “Art of my time. I’m in a hurry” (Bruscky My Translation). Also in 1983, Guy Bleus organized a telegraphy exhibition at the Provincial Museum, Hasselt, Belgium, which included the participation of Paulo Bruscky, Eugenio Dittborn, Carl Andre, Les Levine, Daniel Graham, Eduardo Kac, Achille Cavellini, and many others. (Bleus) This exhibition can be seen as providing a sense of closure to the telegram as an art medium, at a time when the use of telegraphy started to decline due to the rise of digital networks.

FROM VISUAL TELEPHONICS TO MEDIA ART

In the beginning, telephone pioneers explored both the conversational and transmissive aspects of the medium. Thus, early telephony suggested the artistic merits of the telephone based on its capacity of transmitting sound over long distances, that is, its resemblance to what we know as radio. Antonio Meucci, Bell, and other pioneers hoped it would be possible to listen to operas, news, concerts and plays over the phone. In Bell’s earliest lectures and performances, when the two-wayness of the medium was still a technical obstacle, Watson would play the organ and sing over the phone to entertain the audience and demonstrate the possibilities of the new device. (Brooks, “Telephone,” 54)

Several decades later, if business over the telephone multiplied transactions, its use in the coziness of the household provoked mixed reactions. John Brooks points out in his essay, “The First and Only Century of Telephone Literature,” that

in *Experiment in Autobiography* (1934) H. G. Wells complained about the invasion of privacy spawned by the telephone. Wells expressed his desire for “a one-way telephone, so that when we wanted news we could ask for it, and when we were not in a state to receive and digest news, we should not have it forced upon us” (Brooks 220).

Wells was conjuring an image of a future, all-news radio station, the creation of which, as McLuhan also noticed, would later result from television’s impact on radio. More importantly, Wells was reacting to the intrusion of that “destinal alarm” that Ronell refers to, to that “disconnecting force” of the telephone that is so disturbing and attractive, so unsettling and arresting. When Wells stresses that the telephone provides news even when he does not desire it, he promotes notice of that projective trait of the telephone, which is the launching of speech, and speech alone, in the direction of the other and in constant demand for immediate readiness. This demand takes place in the linguistic domain and is properly answered by a question that is at the same time a dubious answer: “yes?”

Perhaps what is unique about ordinary telephony is that in its circuitry only spoken language circulates. As Robert Hopper has suggested, the telephone emphasizes the linearity of signs by splitting sound off from all other senses, by isolating the vocal element of communication from its natural congruity with the facial and the gestural (Hopper 221). By cutting the audile out of its interrelation with the visual and the tactile, and by separating interlocutors from the speech community, the telephone abstracts communication processes and reinforces Western phonocentrism,²¹ now translated into an outreaching telephonocentrism. It is to destabilize this phonocentrism, and subsequently to contribute to undoing hierarchies and centralization of meaning, knowledge, and experience, that

theorists like Ronell and telecommunications artists invest their calls. In the twentieth-century, what Derrida calls phonocentrism can be traced back to Saussure, and Hopper cautiously finds Saussure bound to the telephone. Hopper supports his argument with evidence that Saussure lived in Paris when the city saw the boom of telephony. But more than that, he reminds us that the telephone was developed by a speech teacher of the deaf (Bell), and he stresses the acute resemblance of Saussure's speaking-circuit to telephonic communication.²² In the almost scientific vocal isolation of telephony and in the presence of absent speakers, speech speaks loudly of its linear structure and offers itself for theoretical (and artistic) investigation.

Being an entity that excludes all that is different from vocal immediacy, the telephone speaks volumes of its platonic metaphysical framework. But when zeroing in on several particulars of telematic experience, one instantiates new insights on the telephonic structure that contribute to a possible deconstruction of that framework. Perhaps the most relevant aspect of the new telephonic syntax is its technical absorption of the graphic element. It is technically possible not only to talk, but also to write over the phone (chat, email, mobile phone messaging), to print over the phone (fax, remote printing), to produce and to record sound and video (answering machine, slow-scan TV, videophone) over the phone. As we have seen, it is also very likely that in the future fiber optics will give us access to telecyberspace. The telephone is becoming the medium par excellence of that "enlarged and radicalized" writing that signals Derrida, but contrary to what one would otherwise hypothesize, the more the telephone becomes speechless the more central its role becomes in our lives. It is clear that the telephone is slowly but continuously ceasing to owe its existence exclusively to orality, but the

cultural implications of this new aspect of contemporary life remains to be further elaborated as an aesthetic experience.

If the artist can have a unique encounter with technology because he or she is an expert aware of the changes in sense perception, as McLuhan purported,²³ then it is the artist who will instigate the discovery of new realms of experience beyond ordinary cognition. A radical departure towards telecommunications art took place worldwide in the 1960s, when artists privileged action over aura and process over product. I mentioned above the exhibition *Art by Telephone* as one example of this break with tradition, but there are other equally significant examples. In synchrony with (if not in anticipation of) the international movement towards the dematerialization of the art object,²⁴ between 1966 and 1968 Argentinean artists such as Eduardo Costa, Marta Minujin, and Roberto Jacoby created in Buenos Aires communications and mass media works. (Masotta 51-137) In her collaborative *Simultaneidad en simultaneidad (Simultaneity in Simultaneity)* (1966), Minujin proposed to collapse time by integrating media such as telephone, radio, television, and telegraphy.²⁵ Also in 1966, Eduardo Costa, Roberto Jacoby, and Raúl Escari published the manifesto entitled *Un Arte de los Medios de Comunicación (A Media Art)*.²⁶ In this manifesto they proposed to “take on the ultimate characteristic of the media: the de-realization of objects. In this way, the moment of transmission of the work of art is more privileged than its production” (Masotta 122). Their 1966 piece, *Primera obra de un arte de los medios de comunicación (First work of media art)* consisted of distributing to the media (and getting published by them) precise verbal and visual information (press release, photographs) about an event that did not take place—but without telling the media the information was false. They were successful: one newspaper

and six magazines published articles and pictures based on the fake press release. (Masotta 117) Writing at the same time, sociologist Eliseo Verón noted that the work created “the unusual image of communications media operating in a void” and that he believed that “the art of the future postindustrial society will be more similar to this experience by Costa, Escari, and Jacoby than to a Picasso painting: an art of objects that we might not be able to imagine, the material of which is social and not physical, and the form of which is constituted of systematic transformations of communications structures” (Glusberg 81).

Also in 1966, Eduardo Costa, giving continuation to the Media Art program, started his *Fashion Fiction* series, which he would intermittently develop until the late 1980s.²⁷ *Fashion Fiction I* was first published in *Vogue* in 1968 (New York), and then in the magazine *Caballero* in 1969 (Mexico City). For this work, Costa produced one-of-a-kind objects that were photographed and published as if they were mass produced fashion accessories. The objects included gold fingers, gold toes, gold hair strands, and gold ears. Worn by models and photographed professionally, these props yielded lush images, which through their seductive power, led readers to think they were widely available in the world at large. However, these objects and their photographs were the vehicle through which the artist investigated how the mass media creates—rather than reproduces—reality. (Ramírez 410-411)

In 1968, also giving continuity to the Media Art concept, Jacoby presented at the Instituto Di Tella, in Buenos Aires, the installation *Mensaje (Message)*. The work consisted of three elements: a photograph of an African-American man holding the sign “I Am A Man,”²⁸ a teletype machine²⁹ from the France-Press Agency constantly transmitting daily news, and a poster displaying a text written

by Jacoby in which he stated that “all phenomena from social life have been converted into mass media.” By presenting three different kinds of political messages, the artist revealed the material reality of concepts and stories circulated by communications media. He also pointed out, that just as artists could work with traditional media it was also possible to work with “ideological content, with social communications structures” (Rizzo 56).

These pioneering works find resonance in the telecommunications art created in the 1980s and 1990s. A small number of artists motivated by a spirit of genuine artistic inquiry have turned their back on accepted conventions and committed themselves to creating events in the placeless place of networking, where digital processing meets telecommunications.

NETWORKING AND TELEMATICS

One of the earliest telematic events of global proportions was Roy Ascott’s *Terminal Art*, realized in 1980 with Jacque Vallee’s *Infomedia Notepad* computer conferencing system. Ascott described the experience:

I set up my first international networking project, mailing portable terminals to a group of artists in California, New York, and Wales to participate in collectively generating ideas from their studios. One of the artists, Don Burgy, chose to take his terminal wherever he was visiting and log-on from there. . . . The possibilities of the medium began to unfold. (Ascott, “Art and Telematics,” 27)

Ascott’s next telematic work was *La Plissure du Texte* (*The Pleating of the Text*), realized in the context of the 1983 exhibition *Electra*, organized by Frank Popper for the Museum of Modern Art, Paris. The title of the work alludes to Roland Barthes’s book *Le Plaisir du Texte* (*The Pleasure of the Text*). Ascott’s project was an asynchronous fairy tale, created by multiple participants around the

world through the I. P. Sharp time-sharing system: participants logged on with portable terminals and posted their contributions, made from the perspective of the role or identity they selected from the repertoire of fairy tales. These were later assembled in the order they were received by some of the remote participants. Although different versions exist, together the messages form an experimental book worthy of publication as an important document of the period.³⁰ Ascott published a statement in the *Electra* catalogue in which he asserted:

Telecommunications and computer systems when they converge create an electronic space which presents radically new possibilities for the artist. It is an interactive space in which the locations of the participants are irrelevant. The message system is not simply "send-receive"; meaning is generated out of the negotiations between participants in the system who, because of computer mediation, can access this new information space asynchronously—that is without constraints of time or space such that times of access, of input and retrieval need not be linear. (*Electra* 398)

Roy Ascott also organized, with Tom Sherman and Don Foresta, the *Ubiqua* telecommunications lab at the 42nd Biennale de Venezia (1986), which enabled participation with multiple media, including text (I. P. Sharp network), slow-scan TV, and fax.³¹ Among the many international groups who participated in *Ubiqua* was the Pittsburgh-based Dax (Digital Art Exchange) group, originally formed by Bruce Breland in 1982 and now based in Bellingham, Washington. One of the first activities of the Dax group was participation in "The World in 24 Hours" (1982), a global network organized by Robert Adrian for *Ars Eletronica*, in Linz, Austria, which linked artists and groups in Vienna, Frankfurt, Amsterdam, Bath, Wellfleet, Pittsburgh, Toronto, San Francisco, Vancouver, Honolulu, Tokyo, Sydney, Istanbul and Athens. Artists participated with Slow-scan TV, Fax, Computer Mailbox (email) or telephone sound. (Adrian 145-158)

Three years later, Dax stretched the notion of worldwide interaction with *The Ultimate Contact*, a slow-scan TV piece created over FM radio in collaboration with the space shuttle Challenger, in orbit around the Earth. In 1990, they collaborated with African artists in a telecommunications event. On July of that year they created *Dax Dakar d'Accord*, a slow-scan TV exchange with artists in Pittsburgh and Dakar, Senegal, as part of a Senegalese five-year commemoration of the African Diaspora, the *Goree-Almadies Memorial*. Participants from Dakar included Bruce Breland, Matt Wrbican, Bruce Taylor, Mor Gueye (glass paintings), Serigne Saliou Mbacke (sand paintings), Les Ambassadeurs (dance and music), Le Ballet Unité Africaine (dance and music), and Fanta Mbacke Kouyate performing *Goree Song*, which makes reference to Goree Island in Dakar Harbour, holding and embarkation place for the slave trade that took place over a four-hundred year period.³²

In Brazil, or perhaps I should say, in and out of Brazil, artists such as Mario Ramiro, Carlos Fadon, Otávio Donasci, and Gilberto Prado (a member of the French Art Reseaux group), have worked with telecommunications since the early or mid-1980s. All four artists live and work in São Paulo. The events created by these artists, some of whom have occasionally worked together, encompassed exchanges both on a national and international scale.

Mario Ramiro is also a sculptor who works with zero gravity and infrared radiation. He has initiated and participated in a number of telecommunications events with fax, slow-scan TV, videotext, live television broadcasts and radio. *Altamira*, for example, was an installation-performance created for a connection via telephone and Slow Scan TV between São Paulo and Cambridge, Massachusetts in 1986. Behind a large projection screen, dancer Laly

Krotoszynski performed, illuminated by spots and flashes, to the sound of electronic percussion. Her movements were reminiscent of a ritual dance around a bonfire. The images were captured with a video camera and transmitted live to Cambridge via Slow Scan TV.³³ Ramiro has also written extensively on the subject of telecommunications art.

Carlos Fadon is a photographer and artist whose work is part of several international collections. One of his most original slow-scan TV pieces is *Natureza Morta ao Vivo (Still Life/Alive)* in 1988. This work proposes that once one artist (A) sends an image to another (B), the image received becomes the background for a still life created live. The artist (B) places objects in front of the electronic image and the combination of both object and image is captured as a video still which is now sent back to the artist (A). This artist now uses this new image as the background for a new composition with new objects and sends it to the artist (B). This process is repeated with no terminus, so that the generation of a still life remains a work-in-progress through which a visual dialogue takes place. The piece was first realized in 1988, in a live exchange between São Paulo and Pittsburgh, which included other artists and different projects.³⁴

Otávio Donaschi also participated in this São Paulo/Pittsburgh event. Since 1980, Donaschi has been creating what he calls “videotheatre,” a new kind of performance art based on the “replacement” of the head of the performer with electronic imaging devices (mostly screens of different sorts) that can expand the expressive possibilities of the human face. The performer wears a structure supporting a screen above the shoulder or directly on the head. The viewer does not see the structure, which creates the impression of a seamless hybrid, a cyborg with electronic head and human body. Donaschi calls this hybrid “videocreature.”

The artist has employed his video creatures in telecommunications projects of different kinds. For the São Paulo/Pittsburgh event, he instructed his remote collaborators to send images of a human head from Pittsburgh via Slow Scan TV. He embodied these images in São Paulo as a video creature, improvising a performance as the images arrived. The result was a being, constructed in real time, with a local body and a head transmitted from thousands of miles away. Donasci's performance was transmitted back, completing the cycle.³⁵

In another dramatic instance in 1990, Donasci invited a São Paulo television host to interview people on the street in real time without leaving the TV station. The program, *Matéria Prima (Raw Material)*, broadcast by TV Cultura in São Paulo, was hosted by Sergio Groissman. Groissman donned a special helmet designed by Donasci and transmitted his face, as he hosted the program, via a microwave link to Donasci's body in the center of São Paulo. Donasci performed his video creature live on television, hosting Groissman's head in real time on his body. The result was that it seemed that Groissman was physically present both in the center of São Paulo and back at the TV station. Donasci improvised his bodily expression in space as Groissman interacted with passersby through Donasci's body. Television viewers at home could see both sites (the TV studio and São Paulo downtown) alternately, as the program cut from one to the other in real time. This experimental interactive broadcast created by Donasci enabled an improvisational approach to television that is highly unusual. The free play between all involved (host, performer, interviewees) and the unexpected and uncontrollable development of the interaction are evocative of the very early days of television when all broadcasts were live improvisations. However, the dialogical nature of Donasci's experience, in which participants

engaged in an intersubjective encounter in real time, imbued the event with an intimate quality hardly conceivable in standard broadcasts.

In Paris, France, the Art Reseaux group, formed in 1988 by Karen O'Rourke, Gilberto Prado, Isabelle Millet, Christophe Le François and others, developed elaborate projects such as O'Rourke's *City Portraits* which called for participants in a global network to travel in real or imaginary cities by means of exchange of fax images. The project, which was realized several times between 1988 and 1991, involved the initial creation of a pair of images, the departure and the arrival. Artists created departures and arrivals using images of the cities they live in or by manipulating other images to form synthetic landscapes, blending aspects of direct and imagined experiences of the urban environment. These images were taken by remote artists at the extremes of the route they explored. Artists who received departure and arrival faxes improvised routes between these images and transmitted the new images back to the originating city. Through the metamorphosis and fusion of images exchanged over the telephone line, artists from France, Brazil, Spain, United States, and other countries developed a strong sense of proximity. They collaboratively reimagined their local environments as part of a new global space.³⁶

Gilberto Prado created *Connect* (1991), an interactive fax piece that involved at least two sites and two fax machines at each site. The first exchange was between Paris (Art-Réseaux / Université de Paris I - Centre Saint Charles) and Pittsburgh (Carnegie Mellon University - Studio for Creative Inquiry). Artists in each site are asked not to cut the roll of thermal paper in the machine when fax images start to appear. Instead, they are asked to feed that roll into another fax machine and interfere in the images in the process. A loop is then

formed, connecting not only the artists but also the machines themselves. This new configuration forms a circle in electronic space, linking an imaginary topology of cities that can be as far apart as Paris and Pittsburgh. As an example of possible systems of interaction beyond linear models, Prado designed a circular diagram in which the hands (and not the mouths or the ears of the interlocutors) are the organs used for communication. The diagram places particular emphasis in graphic communication over the telephone. (Prado 226).

In Le François' project, *Infest* (1992), artists were invited to investigate aesthetically that aspect of contemporary life, which is the deterioration of images and documents due to contamination and infection by computer viruses. During the exchanges, images suffered manipulations that attempted to destroy and reconstruct them (infection/disinfection), pointing to the condition of electronic decay in the world of digital epidemiology.

As the metaphors of human existence continue to intermingle with those of cybernetic existence, designers learn how to cope with issues of interfacing and artists compare remote communication to face-to-face interaction.

Acknowledging the place of telephony in art, Karen O'Rourke reflected on the nature of fax exchanges as an artistic practice:

Most of us today have taken not painting (nor even photography) as a starting point for our images, but the telephone itself. We use it not only to send images but to receive them as well. This nearly instantaneous feedback transforms the nature of the messages we send, just as the presence of a live audience inflects the way in which actors interpret their roles or musicians their scores. (O'Rourke 24)

Stephen Wilson explored a different realm of telephone interaction by merging telephony with the premise of the Turing test, named after scientist Alan Turing, who in 1950 suggested that computers would one day have abilities

rivalling human intelligence. Turing proposed an 'imitation game', in which a human being would interrogate both a computer and another human through written messages, not knowing which was which. For Turing, if the interrogator could not tell them apart, then the computer could be deemed "intelligent". In a 1992 piece entitled *Is Anyone There?*, Wilson had a telemarketing device call pay telephones in San Francisco. When passersby answered the phone, a remote computer engaged the respondent in a conversation about life in the city and recorded the conversation. Wilson wrote, "The drama of their dialogue with the computer system is an essential aesthetic focus" (Wilson 106).³⁷ Wilson recorded video showing life near the selected payphones and produced a database with the audio recordings of the conversations and the video clips. This database was experienced months later as an interactive installation. Periodically, when viewers accessed the database in a gallery, the system placed a call to a local public telephone, engaging the viewer in a live conversation with a stranger.

Traditionally, as in the sign/idea relationship, representation is that which takes place as absence (the sign is that which evokes the object in its absence). Likewise, experience is that which takes place as presence (one only experiences something when this something is present in the field of perception). In telecommunications art, presence and absence are engaged in a long-distance call that upsets the poles of representation and experience. The telephone is in constant displacement; it is logocentric, but its phonetic space, now in congruity with inscription systems (fax, email) signifies in the absence more typically associated with writing (absence of sender, absence of receiver). The telephone momentarily displaces presence and absence to instantiate experience not as pure

presence, but, as Derrida wrote, “chains of differential marks” (Derrida, *Limited Inc*, 10).

The new aesthetics outlined in the previous pages escapes from the traditional rubric of *fine arts*. The roles of artists and audience become intertwined, the exhibition qua forum where physical objects engage the perception of the viewer loses its central position, the very notion of meaning and representation in the visual arts, associated with the presence of the artist and stable semio-linguistic conventions, is revised and neutralized by the experiential setting of communications. Or, as Roy Ascott stated:

The aesthetics in this transformative [interactive] work lies in the behavior of the observer. The artist sets the initial conditions, establishes the larger context, provides the requisite variety, the necessary and sufficient complexity, and then constructs points of entry into the system he has created which will give the observer access to this transformative field. (Ascott, “The Art of Intelligent Systems,” 26)

Our traditional notions about symbolic exchanges have been relativised by new technologies, from answering machines to cellular telephony, from cash stations to voice-interface computers, from surveillance systems to satellites, from radio to wireless modems, from broadcast networks to email networks, from telegraphy to free-space communications. Nothing in these promoters of social intercourse authorizes either sheer optimism nor bleak neglect; they call for a disengagement from the concept of communication as transmission of a message, as expression of one’s consciousness, as correspondent of a pre-defined meaning.

The experimental use of telecommunications by artists points to a new cultural problematic and to a new art. How to describe, for example, the encounter between two or more people in the space of the image in a videophone call? If two people can talk at the same time on the phone, if their voices can meet

and overlap, what can be said about the experience of telemeeting in the reciprocal space of the image? What can be said about all the telecommunication models that don't account for the multi-party interwoven fabric of planetary networks?³⁸ And what about the hybridization of media, which compress maximum information-processing capabilities in minimum space? How can we deal with the hypermedia that will unite in one apparatus telephone, television, answering machine, video recording and playback, sound recorder, computer, fax/email, videophone, word processing and much more? How can there be a receiver or a transmitter as positive values if it is only in the connecting act, if it is only in the crisscrossing of telephonic exchanges that such positions temporarily constitute themselves?

In the next two chapters I will provide a theoretical framework to discuss the work of contemporary artists who employ telecommunications media. Through their works they address the pervasive influence of new technologies in every aspect of our lives, particularly interpersonal communications and the creative use of mass media.

End Notes

¹ I have coined the phrase “telecommunications art” in analogy with the title of the following book: Grundmann, Heidi, ed. *Art + Telecommunication* (Vancouver, Western Front, and Vienna, Blix, 1984). The term “telecommunications art” is meant to encompass all kinds of creative work by artists with telecommunications media, one-way, two-way, or multiparty, synchronic or asynchronic, analogue or digital.

² Shannon’s theory seeks to answer the question of how rapidly or reliably information can be transmitted from a source over a channel to a receiver. As a result, the semantic meaning of information plays no role in the theory. See: Shannon, C. E. and Weaver, W. *The Mathematical Theory of Communication*. Urbana: U of Illinois P, 1949 (republished in paperback in 1963).

³ The linguist Roman Jakobson employed Shannon’s addresser-channel-addressee structure in his analysis of the functions of language, but acknowledged the role of the context and of the (cultural or linguistic) codes at play. See: Jakobson, R. “Linguistics and Poetics.” *Style in Language*. Cambridge, Mass.: MIT P, 1960: 353-356.

⁴ I can offer two examples of such an exchange based on personal experience: a) In 1989, Carlos Fadon and I (Chicago), Bruce Breland and Matt Wrbican (Pittsburgh) and Dana Moser (Boston) collaborated in “Three Cities”, a slow-scan exchange operated through three-way calling; b) In 1990, Fadon and I suggested to Bruce Breland the creation of an international telecommunication event to be called “Impromptu,” in which artists would try to engage in conversations with telemedia (fax, telephone, SSTV, videophone) the same improvised way they do when talking face-to-face. “Earth Day” was going to be celebrated soon, and Bruce suggested we expand the idea to encompass the ecological context and make it “Earth Day Impromptu.” Fadon and I agreed, and we started to work with Bruce and the Dax group, and Irene Faiguenboim, in organizing it. Later, Bruce’s experience with large networks proved crucial: working with other Dax members, he made possible a very large SSTV conference call with several artists in different countries, which was, together with the fax and videophone network, part of the “Earth Day Impromptu.”

⁵ Enzensberger proposes that “the manipulation of media cannot be countered . . . by old or new forms of censorship, but only by direct social control, that is to say, by the mass of the people” (104).

⁶ In his (unpublished) MA thesis, "Artists' Use of Interactive Telephone-Based Communication Systems from 1977-1984," Eric Gidney gives an account of pioneer artist Bill Bartlett's telecommunication events and also of his disappointment with other artist's response: "Bartlett was dismayed at the rapacity of many North American artists, who were willing to collaborate only insofar as it furthered their own careers. He found that some artists would simply refuse to correspond after a project was completed. He felt let down, exploited and "burned out". Assaulted by serious doubts, he decided to withdraw from any involvement in telecommunications work" (18). Gidney also summarizes the telecommunication work of pioneer artist Liza Bear: "A hierarchical structure is not conceptually well-suited and does not create the best ambiance for communication by artists. This [medium] is only successful in regions where artists and video people already have a good track record of working together, sharing ideas and preparing material" (21).

⁷ Baudrillard formulates the problem of lack of response (or *irresponsibility*) of the media with clarity: "The totality of the existing architecture of the media founds itself on this latter definition: *they are what always prevents response*, making all processes of exchange impossible (except in the various forms of response *simulation*, themselves integrated in the transmission process, thus leaving the unilateral nature of the communication intact). This is the real abstraction of the media. And the system of social control and power is rooted in it" ("Requiem for the Media" 129). In order to restore the possibility of response (or *responsibility*) in telecommunications media it would be necessary to provoke the destruction of the existing structure of the media. And this seems to be, as Baudrillard rushes to point out, the only possible strategy, at least on a theoretical level, because to take power over media or to replace its content with another content is to preserve the monopoly of speech.

⁸ See: Roy Ascott. "Art and Telematics." *Art Telecommunications*. Ed. Heidi Grundmann. Vancouver, Western Front, and Vienna, Blix, 1984: 25-58, and "Is there love in the telematic embrace?" *Computers and Art: Issues of Content*. Art Journal special issue. Ed. Terry Gips. 49.3 New York: College Art Association (Fall 1990): 241-247.

⁹ See: *Art Com* (an online magazine forum). Eds. Tim Anderson and Wendy Plesniak. 10.40 (August 1990). Issue dedicated to the Dax Group.

¹⁰ See: Karen O'Rourke. "Notes on Fax-Art." Special Issue: *Navigating in the Telematic Sea*. Ed. Bruce Breland. *New Observations*. 76 (May-June 1990): 24-25.

¹¹ See: E. Gidney. "The Artist's use of telecommunications: a review." *Leonardo* 16.4 (1983): 311-315.

¹² In English see: Fred Forest. "For an Aesthetics of Communication." *Plus Moins Zéro*. 43 (October 1985): 17-24 and "Communication Esthetics, Interactive Participation and Artistic Systems of Communication and Expression." Special Issue: Design Issues. *Designing the Immaterial Society*. Ed. Marco Diani. University of Illinois, Chicago. IV.1 & 2 (1988): 97-115. For a discussion of

Forest's early work with video, mass media, and interventions in social space see: Fred Forest. *Art sociologique*. Paris: Union Générale d'Éditions, 1977. For a discussion of Forest's works from 1967 to 1992, including telecommunications events, see also: Fred Forest. *100 Actions*. Nice: Z'Éditions, 1995. Since 1983 Forest has continuously collaborated with the Italian critic Mario Costa in developing theoretical contributions to an aesthetics of communications. For more on this collaboration, see: Mario Costa. *L'Estetica Della Comunicazione*. Salerno: Palladio, 1987.

¹³ Robert Adrian X addressed this issue when he observed, "Nobody in eastern Europe can get access to telefacsimile equipment or computer timesharing equipment . . . and the situation is much grimmer in Africa and most of Asia and Latin America. If these parts of the world are to be considered for inclusion in artists' telecommunications projects it has to be at the level of ACCESSIBLE electronic technology . . . the telephone or short wave radio" (76-80).

¹⁴ On October 28, 1991, Jaron Lanier lectured at The School of The Art Institute of Chicago. At that occasion I asked him what he meant by this often-quoted and seldom-explained phrase ["post-symbolic communication"]. Lanier explained that one direction he envisions for virtual reality is for it to be taken over by telephone companies, so that timesharing in cyberspace becomes possible. In this setting, it would be possible for people in distant locations, wearing data suits, to meet in cyberspace. These people would be able to exercise visual thinking on a regular basis and communicate by other means different than spoken words; they would be able to express an idea by simply making that idea visible in cyberspace, or by manipulating their own avatar or by manipulating their interlocutors' avatar. This kind of communication, achieved by a still symbolic but perhaps more direct use of visual signs, is what Lanier called "post-symbolic communication". His "Reality Built for Two," or "RB2," was a step in that direction.

¹⁵ See also: William Uricchio. "Ruttman's BERLIN and the City Film to 1930." Diss. New York U, 1982.

¹⁶ The untranslated title of Fillipo Marinetti's work is *Il teatro futurista sintetico (dinamico-alogico-autonomo-simultaneo-visionico) a sorpresa aeroradiotelevisivo caffè concerto radiofonico (senza critiche ma con Misurazioni)* (Naples: Clet, 1941). Some words in this title were neologisms coined by Marinetti and allow for multiple interpretations. My choices in the translation of it are but some of the possible solutions.

¹⁷ Telecommunication media efface the distinction between themselves and what used to be perceived as something apart, totally different from and independent of themselves, something we used to call the "real." Baudrillard calls this situation "hyperreal," or "hyperreality." This lack of distinction between sign (or form or medium) and referent (or content or real) as stable entities is by the same token a step further away from McLuhan and a step closer to the new literary criticism as epitomized by Derrida. In what is likely to be his most celebrated essay, "The Precession of Simulacra," he once again acknowledges McLuhan's perception that

in the electronic age the media are no longer identifiable as opposed to its content. But Baudrillard goes further, saying "There is no longer any medium in the literal sense: it is now intangible, diffuse and diffracted in the real, and it can no longer even be said that the latter is distorted by it" (*Simulations* 54).

¹⁸ The Dadaist boutade was part of an article entitled "Dada Art," signed by Alexander Partens, pseudonym for Tristan Tzara, Walter Serner, and Hans Arp. The article stated: "Abstract painters were thus among the first to side directly with Dadaism, being strongly attracted by the movement's individualism. But more important than this was its dislike of handicraft, its disdain for schools and its ridicule of doctrines. In principle no difference was made between painting and ironing handkerchiefs. Painting was treated as a functional task and the good painter was recognised, for instance, by the fact that he ordered his works from a carpenter, giving his specifications on the phone. It was no longer a question of things which are intended to be seen, but rather how they could become of direct functional use to people" (Huelsenbeck 95).

¹⁹ See: Luigi Moretti. "Arte e televisione." *Spazio*. 7 (December 1952-April 1953)" 74 and 108. See also: Matteo Chini. "Fontana e la TV: Prove tecniche di Spazialismo." *Art e Dossier*. 145 (May 1999): 13-16. Note: An English translation of the "Manifesto of the Spatial Movement for Television" (1952) can be found in Crispolti, Enrico and Siligato, Rosella. *Lucio Fontana*. Milan: Electa, 1998: 176.

²⁰ Telecopier was the early name of the fax machine. Telex is an acronym for TELEgraph EXchange (teletypewriters, teletype) linked via the telegraph network.

²¹ The history of Western civilization, the history of our philosophy, is one of what Derrida calls the "metaphysics of presence." It is a history of the privilege of the spoken word that is thought as the immediate, direct expression of consciousness, as the presence or manifestation of consciousness to itself. In a communication event, for example, the *signifier* seems to become transparent as if allowing the concept to make itself present as what it is. Derrida shows that this reasoning is not only present in Plato (only spoken language delivers truth) and Aristotle (spoken words as symbols of mental experience), but in Descartes (to be is to think, or to pronounce this proposition in one self's mind), Rousseau (condemnation of writing as destruction of presence and as disease of speech), Hegel (the ear perceiving the manifestation of the ideal activity of the soul), Husserl (meaning as present to consciousness at the instant of speaking), Heidegger (the ambiguity of the "voice of being," which is not heard), and virtually in any instance of the development of the philosophy of the West. The rationale and implications of this logocentrism/phonocentrism are not obvious and one must research its functioning. Derrida explains that language is impregnated by and with these notions; therefore, in every proposition or system of semiotic investigation metaphysical assumptions coexist with their own criticism, all affirmations of logocentrism also show another side that undermine them. See:

Jacques Derrida, *Of Grammatology*. Baltimore and London: John Hopkins UP, 1976.

²² What Hopper does not account for is the fact that, in his discussion of linguistic intercourse, Saussure only employs examples of face-to-face exchanges, eliminating telephonic intercourse. According to Saussure, "Whereas provincialism makes men sedentary, intercourse obliges them to move about. Intercourse brings passers-by from other localities into a village, displaces a part of the population whenever there is a festival or fair, unites men from different provinces in the army, etc" (206)

²³ In *The Gutenberg Galaxy: The Making of typographic Man*. (Toronto: U of Toronto P, 1962), McLuhan sought to demonstrate how the phonetic alphabet and the technology of printing changed perception from an oral and multisensory experience to a sequential, predominantly visual method. In *Understanding Media: The Extensions of Man* (1964), McLuhan stated that technologies are extensions of human senses and that new technologies alter what he called the "ratio of the senses," profoundly changing how we perceive the world. Global electronic communications technology, he stated, altered the linear sense-ratio developed by typographic printing and reintroduced the multisensory experience that constituted the world of tribal men, thus creating what he called "the global village" (18), a term which had already been introduced in *The Gutenberg Galaxy*.

²⁴ The process of dematerialization of art in the 1960s was first noted by the Argentinean critic Oscar Masotta in his lecture "Despues del Pop: Nosotros Desmaterializamos" ("After Pop: Dematerialization"), presented at the Instituto Di Tella on July 21, 1967. The lecture was first published in Masotta, Oscar, *Conciencia y estructura* (Buenos Aires: Editorial J. Alvarez, 1968), pp. 218-244. Masotta derived the word "dematerialization" from El Lissitzky's essay "The Future of the Book," in which the Constructivist artist stated that, as a consequence of media such as telephone and radio, "dematerialization was the characteristic of the period" and that as matter diminishes, "dematerialization increases ever more" (Masotta 235). Masotta's chief insight in the lecture-article was the recognition that a new (immaterial) art had emerged based on the creative use of communications and mass media. This insight came, in part, in response to the practical and theoretical work of the Argentinean artists Roberto Jacoby and Eduardo Costa. The American critic Lucy Lippard was in Buenos Aires in the fall of 1968 and met Masotta on the occasion. The concept of "dematerialization" was also proposed by Lippard (with John Chandler) in an article published in *Art International* (February 1968) and in her book *Six years : the dematerialization of the art object from 1966 to 1972* (Berkeley and London: UC Press, 1997 and 1973). Lippard's book mentions several events and works from Argentina, but makes no reference to Masotta.

²⁵ See J. Glusberg's *Arte en la Argentina* (Buenos Aires: Gaglianone, 1985), pp. 330-331. *Simultaneidad en simultaneidad* was a collaboration between Marta Minujin, Wolf Vostell and Allan Kaprow realized in New York, Berlin and Buenos Aires.

²⁶ Preceded by a discussion of the context that led to its creation, the manifesto was originally published in *Happenings* (Ed. Oscar Masotta. Buenos Aires: Jorge Alvarez, 1967), pp. 119-122. It is available in English in *Conceptual Art: A Critical Anthology* (Eds. Blake Stimson and Alexander Alberro. Cambridge and London: MIT P, 1999), pp. 2-4. See also: Patricia Rizzo. *Instituto Di Tella. Experiencia '68* (Buenos Aires, Fundación Proa, 1998), pp. 42-46. For more information on the experimental work carried out at the Instituto Di Tella, see John King. *El Di Tella y el desarrollo cultural argentino en la década del sesenta* (Buenos Aires, Argentina: Ediciones de Arte Gaglianone, 1985) and Jorge Romero Brest. *Arte visual en el Di Tella : aventura memorable en los años 60* (Buenos Aires, Argentina: Emecé, 1992).

²⁷ See: Jane Farver, Luis Camnitzer, Rachel Weiss, eds. *Global Conceptualism : Points of Origin 1950s-1980s*. New York: Queens Museum of Art, 2000:192; *Heterotopías. Medio siglo sin-lugar: 1918-1968*. Madrid: Museo Nacional Centro de Arte Reina Sofía, 2000: 410-411.

²⁸ In the spring of 1968 more than 1,300 striking Memphis sanitation workers—nearly all African-Americans—demonstrated against racism and poor working conditions, many with the sign “I Am A Man.” The photo used by Jacoby was appropriated from a publication reporting on the protest.

²⁹ A teletype machine was a terminal that printed text slowly in capital letters on rolls of paper. Teletypes were made by Teletype Corporation.

³⁰ In photocopy format, the book can be consulted in the Flaxman Library at The School of the Art Institute of Chicago as an appendix to Eric Gidney's unpublished master thesis, *Artists' use of interactive telephone-based communication systems from 1977-1984* (submitted to City Art Institute, Sidney College of Advanced Education), 1986. On the WWW, the book can be seen at the following address: www.normill.com/Text/plissure.txt The two versions are different.

³¹ See: Giorgio Celli, Roy Ascott, Dario Del Bufalo, and Valerio Eletti. *Arte e biologia : Tecnologia e informatica*. Venice, Milan: Edizioni La Biennale, 1986: 33-45 and 65-74.

³² For a complete list, see *Art Com*, 10.40 (August 1990).

³³ See: Mario Ramiro. “Between Form and Force: Connecting Architectonic, Telematic, and Thermal Spaces.” *Leonardo*. 31.4 (1998): 247-260.

³⁴ See: Carlos Fadon. “Still Life/Alive.” (Special Issue) *Connectivity: Art and Interactive Telecommunications*. Eds. Roy Ascott and Carl Eugene Loeffler. *Leonardo*. 24.2 (1991): 235. See also: Carlos Fadon. “Evanescent Realities: Works and Ideas on Electronic Art.” *Leonardo*. 30.4 (1997): 195-205.

³⁵ See: Eduardo Kac. "O Videoteatro de Otávio Donaschi." *O Globo*. September 14, 1988: 8.

³⁶ See: Roy Ascott and Carl Eugene Loeffler, eds. *Connectivity: Art and Interactive Telecommunications*. *Leonardo* 24.2 (1991): 233.

³⁷ See also: J. Grimes and G. Lorig, eds. *Siggraph'92 Visual Proceedings*. New York: Association for Computing Machinery, 1992: 40.

³⁸ For a summary of communication models, see Denis McQuail and Sven Windahl. *Communication Models for the Study of Mass Communications*. London and New York: Longman, 1981.

Chapter 2 - DIALOGIC INTERACTION IN TELECOMMUNICATIONS ART

The previous chapter examined how the use of telecommunications media by artists throughout the twentieth century, but before the Web, progressively led to the creation of artworks in which meaning is negotiated between participants, instead of being expressed or communicated from the artist to the public, as is traditionally the case in the visual arts. In order to further examine questions concerning the notion of negotiation of meaning, in this chapter I will consider a particular mode of interaction with telecommunications media which I will call “dialogic interaction”, that is, interaction that takes place between living subjects, and not between a participant and an object (such as a manipulable sculpture, for example), or a participant and a system (such as a computer program simulating human intelligence, for example). To this end I will apply the insights of dialogical philosophy as developed by Martin Buber and Mikhail Bakhtin. I do not claim that Buber and Bakhtin had a direct influence on the practical development of a dialogical approach to art; rather, I wish to demonstrate how their contribution to a philosophy of dialogue evolved in parallel to the artistic creation of collaborative and interactive works. I also wish to investigate the extent to which their collective insights remain an important tool with which to reflect on the the application of dialogic principles to art.

The words “dialogical” or “dialogism” appear often in literary criticism and philosophy, but when applied to visual arts these terms usually become tropes similar to their counterparts in literary theory, that is, metaphors to support the analysis of cultural products that are materially self-contained (books, paintings)

and therefore incapable of creating the living experience of dialogues. It is clear that one can engage in a dialogue *about* a book, but the book itself is not a dialogical medium. The understanding of art as inter-communication moves us away from the issue of “what is it that art or the artist communicates?” to question the very structure of the communication process itself. It is not so much what is being communicated in a particular situation that is at stake, but the very possibility of verbivocovisual interlocution that ultimately characterizes symbolic exchanges. (Kac 20-23)

Works of art created with telematic media are communication events in which information flows in multiple directions. These events aim not to represent a transformation in the structure of communication, but to create the experience of it. I propose that new insights can be gained by examining art works that are themselves real dialogues, that is, active forms of communication between two living entities. These works can often be found among artists that pursue the aesthetics of telecommunications media. To name these works, I propose a literal use of the term “dialogism.” I will present four main ideas. First, it is important to identify and articulate the significance of the field of practice that I refer to as “dialogical art.” Secondly, there is a clear difference between dialogical art and interactive art (all dialogical works are interactive, not all “interactive” works are dialogical). Thirdly, dialogical aesthetics is intersubjective and stands in stark contrast with monological art, which is largely based on the concept of individual expression. Lastly, because it employs media that enable real dialogues, electronic art is uniquely suited to explore and develop a radical (literal) dialogical aesthetics. Seen collectively, these notions will inform the identification and study of what can properly called “dialogical electronic art.”

THE DIALOGIC PRINCIPLE IN THE VISUAL ARTS

One of the most important contributions of electronic art in the second half of the twentieth century is the introduction of what I call the “dialogic principle in the visual arts.” This means that dialogic electronic art undermines emphasis on visuality to give precedence instead to interrelationship and connectivity. These two terms do not designate purely theoretical concepts. Interrelationship and connectivity refer to tangible processes that enable the emergence of dialogic artworks. While dialogism in art is not exclusive to media-based propositions, as Lygia Clark’s relational works¹ and some of Suzanne Lacy’s social projects² so clearly demonstrate, the creation of media-based dialogic art is particularly important. It finds a model in the unpredictable loop of ideas, gestures, words, gazes, sounds, and reactions interlocutors perform in real time according to one’s feedback to the other’s utterances.

Naturally, dialogic electronic art is interactive, but dialogism in electronic art must not be confused with interactivity. Many interactive electronic artworks are monologic, for example, a CD-ROM or a self-contained Web site. Some interactive electronic artworks are dialogic without employing telecommunications media, as exemplified by Piero Gilardi’s *Shared Dolor* (2000), in which two participants recline opposite to one another and together navigate a virtual world as they touch each other’s hand. As much as local dialogical interaction is important and deserves to be further discussed, my focus is on telecommunications-based dialogicality, as it overcomes local boundaries and enables intersubjective experiences through the network on a global scale.

Dialogic electronic art has exhibited the collapse of the sender/receiver bipolarity of Jakobson's schematic communication model, and is inventing the multilogue of networking as a collaborative art form. Positioning itself against monologic ideologies that structure the mediascape, as exemplified by one-way television broadcasting, dialogic electronic art remains open to differentiated levels of contingency and indeterminacy. Media-based dialogic artworks are important not only because they enable new kinds of dialogues to emerge in art, but also because they remind us that it is possible (and desirable) to stimulate dialogue. Works that make open and emancipative use of telecommunications media, in association with the Internet or not, are representative of the dialogic venture in electronic art. Also significant are works that do not exist as independent entities and in a direct way depend on what interactants bring to the experience. My intention here is to propose a literal interpretation of dialogicality in art. I wish to assert the importance of art works in which actual dialogical experiences (dialogues of various kinds) take place. I hope that by acknowledging the differences between monologic and dialogic modalities of art, we can recognize the unique contribution of the latter as a promoter of new aesthetic values such as real-time remote interaction, intersubjectivity, and negotiation of meaning through manipulation of visual elements. To that end, I will discuss some key concepts of dialogism and provide examples that illustrate the emergence of dialogical electronic art since the 1960s.

DIALOGIC PHILOSOPHY AND COLLABORATIVE ART

A major manifestation of the digital revolution is the Web, the most popular of Internet protocols. While the Internet is made up of several different

protocols, many of which enable intersubjective linking among participants, the Web itself has not privileged synchronous two-way social interaction. Likewise, most of what we see on the Web under the rubric of art is as monological as painting or television. It is useful to remember that the initial impulse behind the Web was to produce a publishing instrument, not a dialogic medium. The monological models that prevail online show, I believe, that electronic art has more to learn from Martin Buber's philosophy and from interactional sociolinguistics than from computer science.

Dialogic philosophy was elaborated by Buber in regards to interpersonal relationships³ and developed by Mikhail Bakhtin as an approach to the literary genre of the novel. Bakhtin clearly understood the dynamic and intersubjective nature of language beyond the rigid Saussurian model. For Bakhtin, human consciousness is the semiotic intercourse of one subject with another; that is, consciousness is at once inside and outside the subject. The novel, by its very nature as print, freezes speech rather than promotes its flow. The novel preserves imagined interactions on paper; it does not enable, nor could it, the truly dialogic and unpredictable nature of language as experienced in verbal interlocution. This can only be accomplished via face-to-face interactions or with two-way media works. Acknowledging the conceptual gap between the novel (print) and other genres (media), Bakhtin wrote:

It seems to us that one could speak directly of a special *polyphonic artistic thinking* extending beyond the bounds of the novel as a genre. This mode of thinking makes available those sides of a human being, and above all the *thinking human consciousness and the dialogical sphere of its existence*, which are not subject to artistic assimilation from *monologic positions*." (Bakhtin, *Problems of Dostoevsky's Poetics*, 270)

For Bakhtin, language is not an abstract system, but a material means of production. In a very concrete way the body of the sign is negotiated, altered, and exchanged via a process of contention and dialogue. Meaning arises along the way. Bakhtin is very clear: “*the thinking human consciousness and the dialogic sphere in which this consciousness exists*, in all its depth and specificity, cannot be reached through a monologic artistic approach” (Bakhtin, *Problems of Dostoevsky’s Poetics*, 271). If taken literally, as I believe it should be, Bakhtin’s approach reveals the possibility of articulating artworks that give no prerogative to visuality and that reinstate the dialogic in the aesthetic experience. In this scenario, images (and objects) become one among many elements in the elaboration of dialogic situations. Visual dialogues, for example, imply the exchange and manipulation of images in real time. In this case, we no longer speak of space as form, but instead concentrate on the time of formation and transformation of the image (as in speech). This, of course, demands a revision of the most entrenched convictions of what art is, from its material base and predominant ocular centrism to its unilateral reception, semiological negotiation, distribution logic, and social meaning.

When applying Bakhtin’s ideas to the visual arts, commentators, despite their enthusiasm for his work have been unable to show that dialogism always had the potential to be more than a literary trope.⁴ Because the dialogic principle is deeply rooted in the social reality of consciousness, thought, and communication, it is precisely there that it ought to be explored aesthetically. Allusions to dialogism in reference to wall hangings and other objects miss the opportunity to contribute a theoretical viewpoint to the actual embodiment of dialogical principles in art. The dialogic principle changes our conception of art; it offers a

new way of thinking that requires the use of bi-directional or multidirectional media and the creation of situations that can actually promote intersubjective experiences that engage two or more individuals in real dialogic exchanges. Through creative network topologies, artists can enable the realization of experiences that I call “multilogic interactions.” Multilogic interactions are complex real-time contexts in which the process of dialogue is extended to three or more persons in an ongoing open exchange. What one says or does directly affects and is affected by what the others say or do.⁵

It is clear that modern avant-garde experiments, such as the Surrealist exquisite corpse, for example, already explored notions of collaboration and participation. However, what I wish to point out is that the dialogic telecommunications art I examine here has the potential to open new possibilities for artmaking by introducing elements such as remote agency and the use of electronic media.

The playfulness of the exquisite corpse enraptured writers and artists such as Tristan Tzara, André Breton, Yves Tanguy, and Man Ray. Breton wrote that the collective production of a sentence or drawing “bore the mark of something that could not be created by one brain alone” and that it “provoked a vigorous play of often extreme discordances, but also supported the idea of communication between the participants” (Breton 95). There are significant parallels between the shared authorship of the exquisite corpse and the collaborative procedures typical of telecommunications art. In both cases there is no single author and the physical byproduct of the experience (for example, drawing or faxes) is not the goal, but a record of the collaborative effort. One significant difference is that in the co-presence of the participants communication is partially influenced by the local

behaviour of the participants. Artists working through telematic networks can operate between synchronous and asynchronous time. They can also limit the exchange to specific channels (thus exploring a focused mode of communication), incorporate network noise into the experience; work the visual, audio or verbal material simultaneously; convert one into the other (since through the network they are data), or explore the non-deductive response enabled by geographic distance (response in the absence of the source of sound or image).

DIALOGIC IMAGINATION

Throughout the twentieth century new concerns for dialogicality slowly emerged. In the thirties and forties, while early kinetic art had already moved sculpture beyond fixed form, the few kinetic artworks produced then still called for a contemplative viewer. This started to change with the first works that required direct, physical involvement on the part of the viewer. This non-contemplative strategy, which depended on viewer interaction, was a first step towards future dialogicality.

Moholy-Nagy created kinaesthetically interactive works in 1936, when he lived in London. His *Gyros* was a kinetic sculpture composed of gyrating glass rods filled with mercury. Elegantly suspended over a reflective metallic surface, the two mercury-filled structures had to be spun by hand in order to reveal their performative potentialities. The effect was accentuated by the structure's duplication as a reflected image. His *Light* painting was constituted by two painted and engraved celluloid sheets spiral bound to a painted background. The viewer was asked to manipulate the sheets. Sibyl Moholy-Nagy remembered in 1950 that in creating this work, "the re-creative *action* became his goal, the

establishment of an immediate relationship between spectator and object” (202). Moholy himself described the effect: “The slight warpage and motion of the hinged celluloid sheets produces a combination of reflections and shadows on the background and the pigmented surfaces of the wings achieving an effective combination” (*Vision in Motion* 167). Sibyl Moholy-Nagy pointed out that the experience “depended on the action of the spectator” and that one “could create a variety of light and colour combinations of his own choice” (203). The aesthetic parameters in these two works deliberately replaced static form and contemplation with action, immediate relationship, combinatory operations, participation, and choice.

Pushing these premises further, the Buenos Aires-based Madi movement produced works in the forties and fifties with indeterminate mobile structures that were meant to be manipulated by the viewer and which, therefore, had no finite form. These works reflected formal concerns, but they opened up new and unexpected interactive possibilities. The material configuration of these works demanded active participation, ultimately leaving the experience open-ended. Outstanding examples of these early forms of interactive art are *Roji* (1944), an articulated wooden sculpture by Gyula Kosice⁶ and the articulated wall paintings by Diyi Laañ,⁷ *Arden Quin*,⁸ and *Sandú Darié*.⁹ These artists proposed that art should reach beyond fixed form to engage the viewer in a transformative process.

I find striking conceptual connections between the ideas embedded in these pioneering works and much of the participatory art of the sixties, when the ornamental qualities of the discrete *objet d'art* gave way to propositions that privileged challenging concepts and culturally meaningful ideas. This often meant that actions were more important than products, technological media more

appropriate to the Zeitgeist than precious materials, and that lived experiences were more significant than contemplation of pictorial form. This radical change led to the unpredictability that results from the direct involvement of the participant, echoing Bakhtinian concepts such as outsideness, answerability, and unfinalisability. I suggest that the roots of contemporary dialogical art experiences can be traced back to this arc of experimentation briefly summarized here, from modern avant-garde collaborations and interactive propositions to the dematerialised and participatory events of the sixties and seventies. This makes evident, I believe, that dialogism is an intrinsic and continuous development in art that results from the increased dissatisfaction with concepts of art centered on the individual and on romantic heroic myths, as elaborated by Clement Greenberg and others.¹⁰

Dialogic experimentation in the arts privilege lived experiences based on contextual reciprocity (the context of the experience is reciprocal, it enables one to take the initiative to interfere and alter the experience). In the context of dialogic telecommunications art one no longer finds the notion of the artist as the individual who works in isolation and who provides the audience with a personal vision of an idea or emotion as embodied in a rigid material composition in a system of time deferral. This model, which affirms the primacy of individuality, does not suggest alternatives to unidirectional and conventional modes of thinking and perception. It is based on the belief that an individual has the need (and particular skills) to externalise emotions and inner visions. This assumes that the “individual” is a discrete psychological entity and not a dialogical subject in perpetual negotiation with others. This model is far removed from the reality of a networked world in a global economy. Or, as Suzi Gablik so poignantly put it:

Modernist aesthetics, concerned with itself as the chief source of value, did not inspire creative participation; rather, it encouraged distancing and depreciation of the Other. Its nonrelational, noninteractive, nonparticipatory orientation did not easily accommodate the more feminine values of care and compassion, of seeing and responding to need. The notion of power that is implied by asserting one's individuality and having one's way through being invulnerable leads, finally, to a deadening of empathy. (80)

The dialogic imagination in electronic art enables us to think about notions of alterity in a larger sense, beyond the specific situated conditions of given groups and representation politics. The struggle for acceptance and recognition of outnumbered groups within a given social system is more than a necessity; it is often a matter of physical, intellectual, and emotional survival. However, instead of constituting specific groups as Other, peripheral to a given dominant group, Buber's philosophy of dialogue foregrounds the simple and radical notion that "I and Thou" relate as subjects through reciprocity and mutuality. Likewise, Bakhtin's dialogic literary theory articulates the idea that meaning only emerges in dialogic relations with the other. Despite the original contexts and impetuses that prompted Buber and Bakhtin to develop their work, that is, Buber's manifest theology and Bakhtin's literary emphasis, despite his strong religiosity (developed under a totalitarian regime that suppressed religion),¹¹ we must not lose sight of the political statements they make. Buber makes it clear that I-It connections objectify subjects in disproportionate relationships that involve control of passive objects. (Eisenstadt 2) For Bakhtin, monologic discourse is that which tries to negate the dialogic nature of our very existence—always the case of political discourse. For both men these ideas were not just theoretical exercises. The rise of Nazism forced Buber to leave Germany in 1933. Bakhtin was arrested in

Stalin's Soviet Union in 1929 (for expressing his spiritual connection with the Orthodox church) and exiled because of poor health. (Todorov 4)

The political dimension of dialogism is intrinsically connected to its aesthetic potential. Buber states that the spirit is not in individuals but between them. For Bakhtin the aesthetic event implies the dialogic interaction of two distinct consciousnesses. Taken literally, the notion of a dialogical aesthetics makes it clear that traditional visual arts are monologic because they offer finite forms in unidirectional systems of meaning. Vilém Flusser, who like Buber left Europe to flee from the Nazis, clearly understood the relevance of dialogics not only as aesthetic parameter, but also as social and ethical philosophy. He stated that "what we call 'I' is a knot of relations" (Flusser 32), and in a brilliant summary he gave the following examples to support his position:

Analytic psychology is able to show that what we call an individual psyche is nothing but the tip of an iceberg of what might be called a collective psyche. Ecological studies are able to show that individual organisms must be understood to be functions of a relational context best called an ecosystem. Political studies can show that 'individual man' and 'society' are abstract terms (there is no man outside society, and no society without men), and that the concrete fact is intersubjective relations. This relational (topological) vision of our position coincides with the relational vision the physical and biological sciences propose to us with regard to the physical world. The physical objects are now seen to be knots within relational fields, and the living organisms are now seen to be provisional protuberances out from the flow of genetic information. Husserl's phenomenology is possibly the most adequate articulation of this relational vision, and it is becoming ever more adequate as our knowledge advances. It states (to put it in a nutshell) that what is concrete in the world we live in, are relations, and that what we call 'subjects' and 'objects,' are abstract extrapolations from these concrete relations. (Flusser 33)

Drawing from the collective insights of Buber, Bakhtin, Flusser, and many other authors,¹² a rough sketch of a dialogical aesthetics can be extrapolated, one that is primarily concerned with intersubjectivity. In a dialogic context, the local or remote presence of an individual has a direct bearing on what kinds of experiences

might unfold. The use of telecommunications media in the creation of dialogical artworks reflects the changing paradigm of a global culture, one in which email replaces letters and telegrams, meetings often take the form of telephone calls and videoconferences, and collaborative work often takes place through public or private global networks.

DIALOGIC TELECOMMUNICATIONS ART

The dialogic model in telecommunications art will not be expressed via arrangements that privilege teleological human-computer interfaces (unless, perhaps, if we consider “machine consciousness”). The a priori determination of the behaviour of the computer or the device prevents true responsiveness, surprise, and synergetic interaction. We have a lot to learn from a preverbal child who grabs a book with the left hand, looks at you, and with the right hand stretches your fingers, only to gently place the book against your palm in anticipation that you will read it for her. We can expand our awareness of the untapped possibilities of electronic art by observing the signals given by a plant to a pollinating bee, and by this bee to the other bees through its accelerated wing beat. The lifelong interaction between a human and her dog is also a precious education for anyone who cares to notice its beauty, complexity, emotional charge, unpredictability, and rich behavioural nuances beyond verbal languages. Rather than reiterating what we already know about point, line, and plane, electronic art can be an art of promoting contact between apparently disparate elements, expanding our awareness by revealing that what may seem distant in fact plays a direct role in our local experience. Nam June Paik pointed out Jules Henri Poincaré’s insight that in his time we witnessed, not new things, but new

relationships between what was already there (Paik 67). It is important for art to foster the cognisance that it ought to bring in dialogic contact entities that may not seem connected. In this perspective, one might speculate that electronic art will become progressively less “clean” and will enable the coming together of antithetical ideas, public and private places, artificial and natural forces, and organic and inorganic matter. This implies that electronic art cannot be exclusively digital and that it has to be integrated with the smooth and rough surfaces of the world, which is analogue. It is exactly as a negotiating agent between the two, in the interface between analogue and digital, that the new electronic art is emerging.

Electronic art is particularly well suited to bring about this change (dialogic awareness) because of the very communicative potentiality of electronic media, digital and analogue. Important, albeit sporadic experiences in the sixties, created the precedent. It was in the late sixties and early seventies, however, that the dialogic principle started to be addressed more directly and systematically. One of the first artworks/exhibitions to employ multiple channels of communication and to explore exchange between remote participants was Iain Baxter’s *TransV.S.I.* (1969). This event was a Halifax/Vancouver connection realized via telex, telephone, and fax. It took place between September 15 and October 5, 1969, between Vancouver-based Iain Baxter (a member, with Ingrid Baxter, of the N.E. Thing Company conceptual art group) and the Nova Scotia College of Art and Design in Halifax, where artist Gerald Ferguson coordinated a group of art students. Starting in 1968, instead of using the word “art” to denominate his activity, Baxter used V.S.I., an acronym he coined for Visual Sensitivity Information. *TransV.S.I.* was, therefore, the transmission of art

through remote communication channels. This three-week event unfolded as Baxter transmitted instructions to the art students, who in turn executed them and transmitted back the results. Baxter sent to Halifax instructions such as “live in Vancouver time,” and received in exchange a diary with the record of the experience. He also instructed his remote collaborators to “make molds of the word MELT, freeze water, release the frozen letters, put them in the ocean, and let them melt.” The young artists followed the instructions, took photographs, and sent them back. Baxter asked the art students to “find a tree, paint the trunk green, and paint the bow and branches brown.” Perhaps even more significant, Baxter and the Halifax group engaged in a discussion about the overall experience through the phone and the telecopier—arguably the most dramatic moment in this experimental dialogic work, since the discussion was not based on the execution of conceptual tasks but on an intersubjective engagement.¹³

Another early remote and interactive work was Robert Whitman’s *Children and Communication*, realized in 1971 in the context of Billy Kluver’s and Robert Rauschenberg’s E.A.T.’s *Projects outside Art*, a series designed to show how E.A.T. could contribute to areas of society beyond the fine arts. *Children and Communication* linked children in two primary schools in New York via telephone, fax, telex, and other devices.¹⁴ Douglas Davis, a New York-based artist, working with live broadcast and cable television created works such as his 3 1/2-hour-long *Talk-Out!* from 1972. Callers had a conversation with Davis over the phone and on the air about what they were watching in this live bi-directional telecast. As the program unfolded, and phone calls started to come in, the artist interacted with viewers in real time. Everyone watching the broadcast could see the dialogue. A surprising moment occurred when an irate viewer

yelled “you don’t know what you’re doing!,” following this comment with the suggestion that an open experiment such as this would corrupt young minds.

Davis and his co-host made an impromptu effort to engage in dialogue with an unidentified viewer who had a gripe with the work, thus creating one of the most fascinating moments in this dialogic project. In instances such as this, when a conversation takes unprecedented turns and participants become emotionally invested in the exchange, the dialogic principle in art manifests itself plainly.

(Davis 91)¹⁵

The French artist Fred Forest’s contribution to the XII São Paulo Bienal (1973), entitled *Animation Presse*, realized at the height of the repressive military regime’s dictatorship, was a bank of telephones that enabled citizens to call in, “speak freely” and be heard, at a time when public space and freedom of speech had been obliterated in the country. Forest also enabled the public to mail messages that were posted on the walls of his exhibition area. After a demonstration with blank posters on the street, another of Forest’s “actions” (as “happenings” were known in France), the artist was arrested and interrogated by the political police (DOPS). He was set free after the French embassy and the organizers of the Bienal intervened.¹⁶

Liza Bear, Willoughby Sharp, Keith Sonnier and others collaborated in 1977 to create the first live bi-directional satellite artwork, *Send/Receive* or *Two-Way Demo*, between New York and San Francisco (simulcasted via cable in both cities). (Sharp 18-19) Absolutely new dialogic possibilities were first explored in this piece, such as the idea of the image as a meeting place in which, for example, two dancers could interact and affect one another remotely. In 1978 Bear started to work with slow-scan television (SSTV), a device to send and receive video

stills over the phone. This made communications projects more practical than with expensive live satellite links, and in the following year she realized the first SSTV project in Europe, between Milan, Arnhem, and Amsterdam. (Canongia 40-43)

Works like these brought Brecht's call for participatory use of telecommunications closer to our ears and elicited response. Responsibility implies both the aesthetic bidirectionality of the art experience as well as the ethical awareness of the social implications of the work. The eighties saw the emergence of a truly international telecommunications art movement, with artists worldwide experimenting with two-way systems and network topologies often based on accessible media such as SSTV, telephones, fax, and ham radio. As a result, not only countless dialogic propositions were carried out, but also the conception of network topologies was elevated to a legitimate area of artistic experimentation.¹⁷ This legacy finds its natural expansion on the Internet, with its listservs, MOOs and MUDs, chat sessions, videoconferences, and telepresence (telerobotic) experiences.

Telecommunications based on the exchange of audiovisual information offers the reassurance of the remote presence of the other (via voice, video, white board, and chat). Telepresence, as it merges telecommunications media with telerobotics and remote hardware steering, allows one to have a sense of one's own presence in a remote space.

These two aesthetic principles are complementary. Dialogical telepresence events combine self and other in an ongoing interchange, dissolving the rigidity of these positions as projected remote subjects. Art both shares concerns with other disciplines and offers us cognitive models with which to

reflect on social, political, emotional, and philosophical aspects of life. The more electronic art learns from the fascinating and unpredictable qualities of conversational interaction—with its reciprocal rhythms, body language, speech patterns, eye contact, touch, hesitations, sudden interruptions, changes of course, and continuing flow—the closer it will get to engaging us in a process of negotiation of meaning. This is the ultimate goal of dialogic art.

¹ For a comprehensive survey of Clark's work, see *Lygia Clark*, Catalogue of the homonymous exhibition organized by the Fundació Antoni Tàpies, Barcelona, 1997. For an account of the significance of Clark's dialogism for electronic art, see: Simone Osthoff. "Lygia Clark and Hélio Oiticica: A Legacy of Interactivity and Participation for a Telematic Future." *Leonardo*. 30.4 (1997): 279-289.

² A good example is her "The Crystal Quilt" (1987), in which 430 older women sat down in groups of four to discuss aspects of their personal lives. See: Suzanne Lacy, ed. *Mapping the Terrain : New Genre Public Art*. Seattle, WA: Bay P, 1995.

³ See: Martin Buber. *I and Thou*. New York: MacMillan, 1987. This text was first published in German in 1923 and in English in 1937. In his excellent article on Buber's dialogical philosophy, John Stewart clarifies ambiguous aspects of Buber's work and offers an overview of Buber's main concerns. See: John Stewart. "Martin Buber's Central Insight: Implications For His Philosophy of Dialogue." Eds. Marcelo Dascal and Hubert Cuyckens. *Dialogue: An Interdisciplinary Approach*. Amsterdam; Philadelphia: John Benjamins, 1985: 321-335. See also: Robert E. Wood. *Martin Buber's Ontology; An Analysis of I and Thou*. Evanston: Northwestern UP, 1969; Ronald C. Arnett. *Communication and Community: Implications of Martin Buber's Dialogue*. Southern Illinois UP, 1986; Samuel Hugo Bergman. *Dialogical Philosophy from Kierkegaard to Buber*. New York: State U of New York P, 1991; Nina Perlina. "Bakhtin and Buber: Problems of Dialogic Imagination." *Studies in Twentieth Century Literature* 9 (Fall 1984): 13-28; Martin Buber. *On Intersubjectivity and Cultural Creativity*. Ed. S. N. Eisenstadt. Chicago: U of Chicago P, 1992.

⁴ In her book *Bakhtin and the Visual Arts* (1995), Deborah Haynes provides a clear and important discussion of Bakhtin's aesthetics, represented by concepts such as outsideness, answerability, and unfinalisability. Haynes applies these concepts to the works of such artists as Carl Andre and Sherrie Levine. (Haynes 5) The point I wish to make is that, while Bakhtin's ideas can be employed as metaphors in multiple contexts, they are uniquely suited in the analysis of works that actually embody these concepts in material form. My contention is that such works are to be found, not in the genres of painting and sculpture, which, as conventionally practiced, are irreversibly monologic, but in the field of electronic art, particularly in interactive telecommunications works. As Haynes notes, Bakhtin does not focus on the aesthetic object or on the problem of beauty, but on "the phenomenology of self-other relations, relations that are embodied—in actual bodies—in space and time." Reading Bakhtin in the context of the digital culture, one can see that dialogical aesthetics is literally manifested in interactive telecommunications works that explore the phenomenology of self-other relations in dispersed remote spaces and real time.

⁵ Ordinary examples of such interactions in cyberspace are MOOs, MUDs, chat rooms, and avatar-based virtual communities.

⁶ In a phone conversation between Chicago and Buenos Aires (January 3, 2002), Kosice stated that Roji (pronounced roh-gee) was “the first kinetic and participatory art work in the context of Latin American art.” See: Gyula Kosice. *Arte Madi*. Buenos Aires, Ediciones de Arte Gaglianone, 1982: 26-27.

⁷ See: Dawn Ades. *Art in Latin America*. New Haven; London: Yale UP, 1989: 246.

⁸ *Arden Quin*. Catalogue of the artist’s retrospective. Fundación Telefónica, Madrid, 1997: 38.

⁹ See: Maria Lluïsa Borràs, ed. *Arte Madi*. Madrid: Museo Nacional de Arte Reina Sofía, 1997: 88-89.

¹⁰ Suzi Gablik offers a sharp critique of individualism, heroism, and market-driven art and embraces a dialogical aesthetics that privileges relatedness and interactivity. See: Suzi Gablik. “Connective Aesthetics: Art After Individualism.” *Mapping the Terrain: New Genre Public Art*. Ed. Suzanne Lacy. Seattle, WA: Bay P, 1995): 74-87; Suzanne Gablik. “The Dialogic Perspective: Dismantling Cartesianism.” *The Reenchantment of Art*. London; New York: Thames and Hudson, 1991: 146-166.

¹¹ In “Author and Hero in Aesthetic Activity,” Bakhtin states that his concept of “otherness” is directly connected to the Christian worldview, which stresses “we must relieve the other of any burdens and take them upon ourselves” (*Art and Answerability* 38). Discussing autobiographical writings, Bakhtin says that an accounting of oneself is not possible without the existence of another. For Bakhtin, any writing about the self implies an audience of higher authority: “Outside the bounds of trust in absolute otherness, self-consciousness and self-utterance are impossible . . . because trust in God is an immanent constitutive moment of pure self-consciousness and self-expression” (*Art and Answerability* 144).

¹² See: Deborah Tannen. *Talking Voices: Repetition, Dialogue, and Imagery in Conversational Discourse*. Cambridge UP, 1990; Dale M. Bauer and Susan Jaret McKinstry, eds. *Feminism, Bakhtin, and the Dialogic*. New York: State U of New York P, 1991; S. N. Eisenstadt, S.N., ed. *On Intersubjectivity and Cultural Creativity*. U of Chicago P, 1992; Roy Ascott. *Is There Love in the Telematic Embrace? Collected Writings*. Ed. Eddie Shanken. Berkeley: U of California P, forthcoming.

¹³ Phone conversation between Chicago and Windsor, Ontario, February 5, 2002. “TransV.S.I.” was documented in a book published in 1970 by the Nova Scotia College of Art and Design. For more on “N.E. Thing Company,” see: William Wood. “Capital and Subsidiary: The N.E. Thing Company and Conceptual Art.” *Parachute* 67 (July-August-September 1992): 12-16.

¹⁴ Private email from Sue Wrbitan at (E.A.T.) Experiments in Art and Technology, Berkeley Heights, New Jersey, March 23, 1998.

¹⁵ The video documentation of this work is archived at the Flaxman Library at The School of the Art Institute of Chicago.

¹⁶ See: Catalogue XII Bienal de São Paulo, Fundação Bienal. São Paulo, 1973; Sebastião Gomes Pinto. "Entre na bienal pelo telefone." *Veja* n° 267. 17. Outubro 1973: 130; Fred Forest. *100 Actions*. Nice: Z'Editions, 1995: 94-95.

¹⁷ Many of these propositions are well documented in Eric Gidney's *Artists' use of interactive telephone-based communication systems from 1977-1984* (MA Thesis. City Art Institute, Sidney, Australia, 1986).

Chapter 3: NETWORKING FROM MAIL ART TO THE INTERNET

The first two chapters examined the use of telecommunications media by artists before the Web, focusing on works that explored dialogic principles, including intersubjective collaboration and interaction. This chapter gives continuation to the issues discussed previously, with a focus on the question of networking in art. Three major networks used in art are examined: mail art (which made use of the postal system), videotext (the French Minitel, also adopted in Brazil), and the contemporary Internet. While some artists explored networking as a means of distribution of their ideas, others viewed networking as the creation of a complex, dispersed, interconnected group of participants that researched the aesthetic dimensions of their exchanges as a group (or that of the technological systems that mediated their remote interaction). Due to its impact and direct influence, particular emphasis is given in this chapter to Internet art, as it emerged following the announcement of the pioneering Web browser, Mosaic, released in 1993 by the University of Illinois in Urbana-Champaign. Internet art is examined in the period of 1994-1996, the first three years of its development. This period was selected because it demarcates the time before the commercialisation of the Internet, when selection of standards was an open issue and artists had essentially the same tools and resources available to large corporations. This created favourable conditions for free experimentation and encouraged the production of dialogic works.

Following an introduction on the emergence of the Web as a new environment, I will start by locating sources of contemporary networking art practices within analogue mail art in the 1960s and 1970s. Expanding from mail

art, I will then consider aspects of digital networking in art with the videotext medium in the 1980s. Next, I will examine works that made radical use of some of the Internet's unique features between 1994 and 1996. I will conclude with remarks on dialogic projects produced in the same period through hybridization of media which could not have existed as such if not experienced through the Internet.

THE INTERNET AS A NEW SOCIAL SPACE

Between 1994 and 1996, the first three years of the Internet explosion, new worlds of aesthetic, social, and cultural possibilities were discovered online daily with great excitement. The appearance of a new site was a novel event. For the most part, these discoveries were made at speeds of 14.4 Kbps or 28.8 Kbps, which gave them specific aesthetic qualities. A comparison with the first days of cinema is helpful. Roughly speaking, one can think of the frame rate of early silent cinema (which was variable, but let us consider 16 frames per second (fps) as an example) compared to the 24 fps of the sound era. To give us a sense of what audiences saw before the 1920s, silent films must be projected, on average, between 16 fps and 18 fps. Likewise, the work discussed here must be imagined as accessed between 14.4 and 28.8 Kbps, which were not the fastest speeds available but which were the most widespread. The chapter is structured exclusively with references to material that can be immediately accessed on the Internet.

For artists committed to exploring the uniqueness of the Internet, this network is not simply a means of storing, distributing, and accessing digital information. For these artists the Internet is a social space, a conflation of

medium and exhibition venue. While since 1996 we have witnessed the conversion of the Internet into a global mall, in parallel we have also seen Internet artworks establishing an ever-increasing presence in contemporary art exhibitions. This relatively quick acceptance may be explained in part by the fact that Internet art has made itself attractive in many ways. It usually does not compete for space with material art, since exhibitions are held primarily in cyberspace. As we shall see, the problem with this approach is the perpetuation of the erroneous perception that Internet art is contained in cyberspace. Its implementation calls for minimum cost, since most works shown are digital files hosted remotely or added to servers already in place. With digital literacy among the population at large increasing exponentially, perhaps more significant still is the fact that the Internet has become an effective cultural force, affecting in tangible ways reality outside cyberspace. Examples include, on the one hand, the commercialisation of goods, and on the other, campaigns staged online to mobilize public opinion or special interest groups to act publicly on a given issue.

From the questioning of the white cube to street action, from environmental propositions to radio, video, videophones, television, and satellites, artists throughout the twentieth century consistently sought to work in alternative spaces. Public spaces, in the form of urban settings and natural landscapes,¹ as well as electronic media² have offered artists new challenges and possibilities.

By contrast, at the beginning of the twenty-first century, the Web has quickly emerged as a conservative force, channelling the potentially free and creative online experience to ordinary transactions. While for the public, the emergence of standard interfaces and communication protocols is undoubtedly

productive because they facilitate accomplishing tasks, in art conformation to standards runs the risk of imposing unwanted restrictions.

In 1995 the general public started to think of the Internet as “the Web,” due to the wide dissemination and the ease of use of Web browsers. In the spring of 1995, *Time* published a special issue under the title of “Welcome to Cyberspace”³, and in its December issue, *Art in America*, featured “Art On Line” on its cover.⁴ It is clear that most users and many artists consider the Internet and the Web one and the same thing. They are not. The Web is one among many protocols available online (to be accurate, the name of the protocol that makes the Web so user-friendly is “http.” or Hypertext Transfer Protocol). In other words, the Web is a subset of the Internet. While several protocols are compatible with Web browsers, some standard and experimental protocols are not. Examples include CU-SeeMe and MBone, both used for real-time videoconferencing, and Napster and LimeWire, used for file sharing. If on the one hand the market constantly pushes for media convergence, leading us to believe that in the future more protocols will be integrated into common browsers, on the other, media research continuously develops new protocols that expand the reach of human agency online. Awareness that the Internet is not reducible to the Web is very important because it helps us understand the complexity of this network and its potential beyond the familiar Web browser.

The wide acceptance of the Web as a standard format since 1996 has lead to a proliferation of self-contained hypermedia works which employ the Internet as a dissemination medium. (Exceptions developed until 1996 will be discussed later in the text.) Consensus around a single form of online experience runs the risk of stifling development and suppressing the emergence of alternatives. The

solution is to remain aware of, and seek to support, works that deviate from standard browsers and webcentric approaches. As much as webcentric works are self-contained projects designed exclusively for the Web, they still can go beyond the usual hypermedia structure, as when an experimental browser is itself the work, for example.⁵

The ordinary use of interactive features of the Internet, such as chat and email, might suggest that it is akin to the telephone and the postal systems, which basically enable the exchange of messages synchronically (telephone) and asynchronically (mail) between distant interactors. The Internet does incorporate aspects of television and radio by making possible the broadcast of video, audio, and text messages to small and large groups alike. At times, the Internet is a virtual catalogue or gallery, resembling a database. While some explore the Internet as a bi-directional medium, others integrate interactivity with hybrid contexts that incorporate physical spaces. Perhaps the most exciting feature of the Internet is that it is simultaneously all of the above and more. The Internet continues to grow and transform itself as we read our email today.

The Internet can be thought of as a public space, with millions of people experiencing it simultaneously, as if walking by a square or park (note that one important difference is the lack of awareness one usually has of the online presence of others). Art on the Internet can be considered “public art,” since the majority of available works are easily accessible from public computers located in libraries and civic centres. This challenges the local specificity of “public art” (that is, of public art as geographically circumscribed), since online works can reach audiences anywhere in the world where the Internet is available.

ANALOGUE NETWORKING: MAIL ART

Long before the Internet, artists such as Ray Johnson,⁶ who started the *New York Correspondence School*, explored the question of networking in art. Johnson created radical, experimental media works that helped lay the foundation of network art. Johnson's "school" became the seed of the international mail art movement. This postal network developed by artists explored non-traditional media, promoted aesthetics of surprise and collaboration, challenged the boundaries of (postal) communications regulations, and bypassed the official system of art with its curatorial practices, commodification of the artwork, and judgment value. In 1962, Edward Plunkett (an artist who also used the postal system to send his works) coined the phrase *New York Correspondence School* to name Johnson's relentless postal activity. The phrase mocked both the "New York School" of abstract expressionist artists and commercial art schools that teach art by correspondence.

The actual use of the postal system (or of some of its characteristics, such as stamps and postcards) as a medium, has a few historical antecedents including Dada telegraphy, Futurist correspondence, and Duchamp's *Rendez-vous du dimanche 6 fevrier 1916*, a set of four postcards with a text in French in which the artist deliberately and playfully avoided referential meaning. The philatelic interventions of Flávio de Carvalho and Yves Klein must also be mentioned. In 1932, the Brazilian artist Flávio de Carvalho created three postage stamps for which he tried, unsuccessfully, to obtain official approval by the Brazilian postal system. One of the stamps shows an expressionist nude with a stylised structure (a modernist building?) in the background; another includes the critical sentence "A people without vision will perish" (Daher 33). In 1957, Yves Klein created

postage stamps with his unique “Klein Blue” colour. He then attached them to invitations to his simultaneous Paris exhibitions at Iris Clert and Collette Allendy galleries. The painted stamps were then cancelled and the French Post Office delivered the invitations. Klein continued to use these stamps to mail announcements within France at least through 1959.⁷ Mail art⁸ was also embraced by the international neo-Dada movement Fluxus in the 1960s⁹ and became a truly international postal network, with hundreds of artists feverishly exchanging, transforming, and re-exchanging written and audiovisual messages in multiple media, including faux stamps, invented envelopes, photographs, artist’s books, collages, photocopies, postcards, audiotapes, rubber stamps, and fax machines.

From its inception, mail art was non-commercial, voluntary, open, uncensored, and unrestricted. Still practiced via the postal system, but also in cyberspace, mail art shows never have juries and all entries are always exhibited. Between the late 1960s and early 1980s, in countries with oppressive regimes that silenced dissident voices by torturing and killing their own citizens, and where new technologies were inaccessible to individuals, mail art often became the only form of artistic anti-establishment intervention. Uruguayan mail and performance artist Clemente Padin for example, was incarcerated in 1975 for the crime of “vilification and mocking of the armed forces.” Released from prison in 1977 he was forbidden to leave Montevideo and forbidden correspondence until February 1984.¹⁰ Since 1984, Chilean artist Eugenio Dittborn has been creating what he calls “Airmail Paintings.” Using silkscreen and stitching photocopied images onto cheap fabric, writing and making painterly marks on it, he borrows from the aesthetics of immediacy and precariousness of mail art. Dittborn folds and mails the paintings to international exhibitions from his home in Santiago, Chile. The

envelopes are of his own design. He always exhibits the envelope that transports the painting next to it, revealing its global trajectory and additional information about the work.

Italian artist, Guglielmo Cavellini, developed a different mail art strategy. In 1971, Cavellini, a collector turned postal activist, started a process of “self-historification” through which he relentlessly celebrated his importance to art history. One strategy employed by Cavellini was the promotion of (fictitious) exhibitions of his work at prestigious venues. Cavellini often worked with ephemeral materials in his critique of the idolatry through which museums and the market canonize individuals. I corresponded with Cavellini in the early ‘80s, and from 1989 to 1992 was surprised to see one of his round stickers (celebrating his fictitious “centennial exhibition” at the Palazzo Ducale, Venice, Italy) survive Chicago’s weather while stuck on a public sign on the Art Institute’s block. Echoing Klein’s self-validating gesture through the blues stamps that mimicked government-issued stamps commemorating nationally significant cultural events or works, Cavellini also produced self-glorifying stamps. Cavellini and Johnson never worked with the Web: the first died in 1990, and the second in 1994.¹¹ Their deaths might be taken to symbolize the end of the print era of artists’ networks, coinciding with the first efforts at visual exploration of the Internet.

DIGITAL NETWORKING: VIDEOTEXT

Throughout the 1980s, when the Internet was limited to ASCII, complex digital visual artworks were experienced online through the national videotext networks installed in countries such as France and Brazil. In the early 1980s, artists created stills, animations, literary texts, and interactive works. The

videotext system, a precursor to the Internet, enabled users to exchange messages and to access remote databases via the telephone line using a special terminal. A computer with a special card could also be used. Beyond Benjamin's lost "aura" of the unique object and the dematerialization of the work of art, the rise of the digital network signalled the birth of a truly immaterial art.

In France the system was known as Teletel and the terminal was known as Minitel. The public used the word "Minitel" in reference to both the terminal and the system. In Brazil the system was called "Videotexto" (videotext, a term also used in the United States). The system was still in use both in France and in Brazil in 2002, albeit in a much smaller scale than when introduced in the early 1980s.¹² With the advent of the Internet interest declined substantially, but a free program that gives access to the Minitel through the Net does exist and is used in France.¹³

Fred Forest and Orlan were among the many artists who worked with the Minitel in France. Forest created *La Bourse de L'Imaginaire (Stock Exchange of the Imagination)*, a multimedia installation that included the Minitel and was shown in 1982 at the Centre Georges Pompidou, Paris. Forest invited the French public to create and transmit "fait divers" (news in brief, news items) via the telephone and the postal system. All news was organized in categories and formed an online database accessed through the Minitel system. Working with Frédéric Develay and Frédéric Martin, Orlan presented *Art-Accès* online in March 1985, in the context of the monumental exhibition *Les Immatériaux*, also realized at the Centre Georges Pompidou, in Paris. This virtual gallery included works by Ben, Jean-François Bory, Orlan, Aldo Spinelli, Roy Ascott, and Edouard Nono, among others.¹⁴

Brazil licensed the Minitel in 1981 and implemented it in 1982.

Throughout the 1980s, many artists in the country experimented with it. In 1985, I showed the videotext piece *Reabracadabra* in a São Paulo virtual gallery called *Arte On Line* and hosted by Livraria Nobel. This animated digital poem evolved from a sequence of two-dimensional geometric forms to a three-dimensional letter “A” floating in space. The letter was surrounded by blinking stars, which changed into the letters B, C, D, and R. In 1986 I set up a virtual gallery in Rio with works by several artists, which were accessed with the code RJ*ARTE from public terminals around the country. This virtual gallery included works by Eduardo Kac, Flavio Ferraz, Rose Zangirolami, and Nelson das Neves, among others. I presented several works, including *Tesão* (1985/86), *Recaos* (1986) and *D/eu/s* (1986). The first was a love poem, an elaborate sequence of animated lines and colour fields that oscillated between forms and words, spelling an erotic-lyrical statement. The second was an animated poem that used colour change and movement orientation on the screen (from bottom to top, from right to left) to create meaning and ambiguously evoke both the infinity symbol and the shape of an hourglass. The third piece was an animation that slowly placed a white rectangle in the centre of the screen, filling it with interspersed black vertical lines. At the bottom there were letters and numbers: 19D6E U4S86. The viewer soon perceived that this was a Universal Product Code label. With further scrutiny, it became clear that the code was the word God (DEUS), with an isolated I (EU) in the centre. The numbers represented the date of the composition: April 6, 1986. Ferraz presented *Vira e Mexe* (*Turn Around and Swing*), a gender-bending two-frame animation created in 1985. The first frame showed a person’s frontal torso. The second frame changed only a few pixels to reveal the back

torso. Ferraz's design intentionally made it impossible to discern if the figure was male or female. Ferraz also presented *Babel* (1986), an interactive visual narrative that evolved as online participants navigated through an ever-changing sequence of forms. Rose Zangirolami presented works from the *Mulheres (Women)* series, which she had initiated in 1982. The series was composed of animated portraits of women. Created in different styles, the portraits often presented women in active scenes. Nelson das Neves presented a lyrical animated geometric work. In his piece, horizontal and diagonal lines suggested a static, three-dimensional form. Then, a vertical band of colour delicately moved from top to bottom on the right side of the screen and disappeared.

Clearly, early artistic networking evolved from the use of postal and electronic telecommunications systems, including but not limited to the videotext network (see chapter "The Aesthetics of Telecommunications" in this text). These early works made inroads into issues that have contemporary relevance, such as the need to work collaboratively and asynchronously to exchange and manipulate audiovisual materials at-a-distance, the development of communicative models for the remote integration of text, image and sound into a coherent form, and the understanding that the conception of network topologies is a creative practice.

THE EMERGENCE OF NET ART

The Internet produces a dense information landscape that shapes a particular sensibility. On the Net, one becomes capable of inhabiting multiple contexts at once and of absorbing large amounts of sensorial stimuli simultaneously. On the Net, one evolves strategies to manipulate large amounts of data and to move through fields of information. The Internet configures a new

cultural situation, enabling artists to help define a social process and prompting reflection on its impact and potential.

The alternative cultures and communities on the Internet are evidence that this global network is a new kind of public space. On the Internet, artists can show their works to a large public with the same seductive screen glow with which they were created. Without the Internet, artists who make immaterial works (digital images, or multimedia and interactive works, for example) would have to present their work on a CD-ROM, with limited circulation, or in a gallery context, to a relatively small number of viewers. For gallery viewing, images would have to be printed or projected and multimedia and interactive works would take the form of an installation. It is clear that artworks that require specific network topologies could not adapt to these Netless environments without severe compromise to their meaning.

In the period covered here, from 1994 to 1996, the work that epitomized the use of the Web itself as a medium, *stricto sensu*, is jodi.org, a site created by Joan Heemskerk and Dirk Paesmans.¹⁵ It first went online on August of 1995, and it is regularly changed by the duo. First time visitors are often startled with, and fearful of, the apparent visual and verbal randomness of the site because it attempts to give them the impression that something is wrong with their computer. If the operating system freezes at the moment that the viewer accesses the site, as it happened to me once, one's suspicions might become reality. It is a truism that computer programs are constituted of lines of code, which resemble gibberish to the uninitiated. Programming syntax and computer jargon are firmly beyond the reach of most computer users. The sheer amount of lines of code adds another layer of complexity; in some cases, a single program can have seven million lines

of code. In the context of jodi.org, gibberish becomes art for the initiated. This “gibberish” is, in fact, the result of free association, appropriation of, and witty commentary on, the very elements that constitute the environment in which the site resides, the Web itself. When the home page presents a sequence of characters in no apparent order, blinking in a green hue reminiscent of old computer terminals, the Page Source reveals a long and elaborate ASCII art piece. In jodi.org, programming is not hidden as invisible layers of information buried within an application, as is usually the case. Instead of serving a clear purpose, HTML tags, ASCII characters, jpeg or gif images, javascripts, and other elements, are removed from the standard syntax of the programming environment they belong to, and recontextualised as the objects of interest, as the very subject of the work. Their work points to the overwhelming saturation of information we ordinarily live with. In daily life, as in their work, this information surplus can lead to great frustration. They make it a point to capture the irrational side of the clean, productive, and functional network that the Internet is evolving into. In a world in which digital technology is virtually omnipresent, who does not enjoy being reminded of the absurdness of it all?

In 1996, searching for a visual language unique to the Internet, Alexei Shulgin, Vuk Cosic, and Andreas Broeckmann created *Refresh*.¹⁶ This collective, multi-nodal artwork asked participants to build a web page; all pages were then incorporated into a “refresh loop,” That is, from the first page, after a few seconds the site automatically substituted the next page, creating a digital cascading effect. The original sites often resided in remote servers. *Refresh* offers a dynamic metaphor of an emergent digital culture, one in which information is unstable and every element is connected to another in an endless loop of references.

Another vector contributing to change the Internet is the development of shared three-dimensional environments, like volumetric spaces visualized on the screen in which several individuals can be active participants through their avatars (stylised representations of the participant). Many of these worlds have used a standard called VRML (pronounced “ver-mal”), which stands for Virtual Reality Modelling Language, a specification for displaying three-dimensional objects on the Web. VRML was first proposed in the spring of 1994, with the initial 1.0 version available a year later. The more complex version 2.0 version became available in 1996, but lack of commercial interest stalled further development while other 3D formats appeared. As the concept of shared virtual worlds evolved with new tools that made them possible, artists progressively experimented with their many features.

Marcos Novak,¹⁷ for example, started creating three-dimensional virtual worlds in 1991, and in 1995 presented some VRML pieces at the Tidsvåg Noll v2.0 (*Timewave Zero*) art and technology exhibition in Göteborg, Sweden. Entitled *TransTerraFirma*, these worlds “took on the names of cities of disaster—Sarajevo, Kobe, Kikwit, Carthage—the idea being to move into virtual space without escapism from this one” (Novak). In Novak’s *Alien Space*, a virtual world presented online in 1996, the viewer navigates a seemingly infinite environment composed of lines, numbers, geometric objects, and words. As the navigation takes place, the lines and the geometric objects spin, and the words and numbers change, giving rise to new meanings.

Chimerium was an online VRML artwork created by Perry Hoberman and Scott Fisher in 1995. *Chimerium* enabled participants to assemble their virtual bodies themselves (by connecting headless bodies on the ground with floating

heads in the sky) and to navigate in an interactive, three-dimensional virtual world with their new bodies. The creatures included cow, dog, ant, chimpanzee, duck, and turtle. Each body/head combination provided the viewer with a different perspective of the same space.¹⁸

In 1990 I created *IO* ("I" in Italian), a three-dimensional navigational digital poem, which in 1995 I first translated to VRML (other VRML translations followed). In this piece the letters/numbers I and O form an imaginary landscape suggesting the dispersion of the self. The reader is invited to explore the space created by the stylised letters and experience it both as an abstract environment and as a visual text.¹⁹ My VRML poem *Secret*,²⁰ created in 1996, is comprised of small bright points dispersed in a dark space. As the viewer navigates the environment, she approaches these points and realizes that they are words made of three-dimensional lines (cylinders) and circles (spheres), representing ones and zeros. As the viewer gets close to a particular word, the other words slide away, producing fleeting meanings that resist simultaneous visual apprehension.

VRML is a standard that will disappear but new formats will emerge in the future. The prospect of teleimmersion suggests that three-dimensional navigation of information landscapes and real-time interaction in 3D spaces will be an important component of the Internet in the future.

As artists explored the Web, some institutions were quick to respond. In the beginning of 1995, the Dia Center for the Arts, in New York, started to promote works created for their Web site.²¹ Also in 1995, the international festival, Ars Electronica, realized annually in Linz, Austria, introduced Web Sites as an artistic category in its competition.²² The proliferation of art on the Net has been followed by a proliferation of critical discourse on network art and related

issues, often found on the Net itself. The Nettime discussion list, for example, was founded in 1995 and has brought together writers, artists, and critics from all over the world around many interconnected cyberculture topics.²³ Online publications that emerged between 1994 and 1996, and that contributed early on to document and discuss art on the Internet, include *C-Theory*,²⁴ *Rhizome*,²⁵ and *Leonardo Electronic Almanac*.²⁶ Published in the Web edition of The New York Times from 1995 to 2000, Matt Mirapaul's *Arts@Large* column was widely read and offered informed insights on digital culture.

Web works such as described above make evident that the Internet is not just a publishing medium nor an extension of broadcast television. Existing paradigms of broadcast and publishing are to the Internet what theatre and literature were to cinema and radio in the beginning of the twentieth century. Television, as we know it, simply cannot create communitary experiences, which is the most prominent civic aspect of the Net. Large broadcast and publishing companies continue to muscle their traditional and regulatory views onto the Net, sure that the use of increased technological sophistication and an "army of programmers," will force users away from self-generated content.

In the meantime, most Internet users thrive in the exchange of chat and email messages, in their participation in the online communities they belong to, in the newly accessible body of knowledge they discover daily, and in the wealth of multimedia and interactive experiences they have on the World Wide Web with sites generated by other individuals. Further expanding the interest and the reach of the Internet are systems that provide high speed access from home and work, IP telephony (the use of the Net as a phone network), mobile wireless connectivity via palmtops and cell phones, microchip implants, and satellite delivery of Net

traffic to remote geographic locations. These and other developments open up new opportunities for artists as well.

INTERNET HYBRID EVENTS

Emerging new technologies are constantly reshaping the information landscape. Artists experimenting with interactive concepts online are expanding and hybridising the Internet with other spaces, media, systems, and processes, forging new mediascapes, questioning standards, exploring relationships between protocols and communications infrastructures, and developing new directions for interactive art.

Internet hybrid events expose at once the limitations of unidirectional and highly centralized forms of distribution, such as painting or television, and contribute to expand communicative possibilities in art. Hybrids also allow artists to go beyond the creation of online pieces that conform to the design and conceptual standards of the Internet, such as the Web (http). Often working in collaboration, a new international generation of media artists promotes change by creating immaterial, telematic works, on and for the Net, stimulating radical innovation and prompting media criticism.

Two examples are the groups Ponton European Media Art Lab²⁷ and Van Gogh TV.²⁸ Ponton was founded in 1986, and in 1995 Karel Dudesek, one of Ponton's founding members, left the group and continued with Van Gogh TV as a separate and independent project. Ponton's interactive television event, *Piazza Virtuale (Virtual Square)*, was presented for 100 days as part of *Documenta IX* in Kassel during 1993. Van Gogh TV, formerly Ponton's television production unit, produced this event. (Seyfarth and Dudesek 85)

Piazza Virtuale created an unprecedented communication hybrid of live television (based on two satellite feeds) and four lines for each of the following: ISDN (system that enabled connectivity at a speed of 128Kbps), telephone voice, modem, touch-tone phone, videophone, and fax. There was no unidirectional transmission of programs as in ordinary television. With no pre-set rules or moderators, up to twenty viewers called, logged on, or dialed-up simultaneously, and started to interact with one another in the public space of television, occasionally controlling remote video cameras which moved linearly on a track in the studio's ceiling. All of the incoming activity from several countries was re-broadcast live from Ponton's Van Gogh TV site in Kassel to all of Europe and occasionally to Japan, and North America.²⁹ In an article entitled "Ponton Media Lab plans to drive a stake through the sclerotic heart of that 50 year old bloodsucker, television",³⁰ Jules Marshall, an editor of *Mediamatic*,³¹ an Amsterdam-based techno-culture magazine, quoted Dudesek: "We had no intention of dealing with information, post-production, or reality TV. Our major goal was live interaction; to break through the barrier of the screen; to downgrade TV from a master medium into just one window onto a space" (Marshall 2). Another Dudesek quote from the same article further illustrates the goal of the project:

TV is too linked to power and systems of control. We have more and more free time, but what are we using it for? Do we want to keep everyone at home simply watching and consuming? Piazza was about saying 'Here, if you use this, things can be different, your life can be enriched and enriching to others.' (Marshall 2)

Thought models and games can lead to new social architectures. This kind of work is deeply rooted in the idea that art has a social responsibility. The artists act directly in the domain of mediascape and reality. Among other implications,

this project takes away the monologic voice of television and converts it into another form of public space for interaction, analogous to the Internet. Corporate-hyped ideas of entertainment and shopping via Web TV fall short of the global interactivity enabled by the Internet. In a statement posted on August 30, 1993, in the newsgroup *comp.multimedia*, Ponton's interface designer Ole Lütjens stated: "The *Piazza Virtuale* is a step forward for the media art of the future, in which interactive television and international networks can be an important collective form of expression" (Lütjens).

The emphasis here is in the word "collective." Artists explore the mediascape by creating new arenas for democratic interaction, opposing regulatory models and homogenizing standards. New technologies that aim at Net/TV convergence try to absorb the public space of the Internet and convert it into something akin to the privately controlled broadcast world. They have failed in the past and will continue to fail in the future because they refuse to recognize that the public does not want the Internet to become another broadcast medium, or an extension of it. Artists working in electronic media cannot ignore the constantly changing conditions of the mediascape. They are in a unique position to propose alternative communications models from within.

One such alternative was opened up by telepresence (telecommunications coupled with telerobotics). In 1994 two telepresence works were presented on the Internet: *Ornitorrinco in Eden*, by Eduardo Kac and Ed Bennett,³² and *The Mercury Project*,³³ a collaboration between co-directors Ken Goldberg and Michael Mascha, and a team formed by Steven Gentner, Nick Rothenberg, Carl Sutter, and Jeff Wiegley.

Ornitorrinco in Eden hybridised the Internet with wireless telerobotics, remote-controlled mobility in physical (architectural) spaces, the traditional and the cellular telephone systems, videoconferencing (CU-SeeMe) and a literal, digital “tele-vision.” This enabled participants to decide for themselves where they went and what they saw in a remote environment via the Internet. The interface was any regular telephone. Anonymous participants shared the body of the telerobot, controlling it and looking through its eye simultaneously. (For more information, see Chapter 5, topics “Ornitorrinco in Eden,” and “Rara Avis: Telepresence Art on the Internet”).

The Mercury Project combined the Web with a remote-controlled robotic arm connected to a video camera. With a built-in compressed-air jet, remote viewers could activate the air jet to reveal buried artifacts. The system used the Mosaic browser to provide access to the Web. The interface consisted of a window that explained the project, showed a schematic map of the area the robot arm traversed, and gave basic operating information about the system. Operators could also see still video images of the scene. *The Mercury Project* was based on a fictional story created by the collaborators. Thus, it explored the narrative potential of telepresence and enabled anyone on the Internet to blow air in a remote sandbox to reveal buried artifacts, such as matchbooks, a watch, and dollhouse miniatures. Goldberg said, “The installation encourages a collaborative exploration, with each user posting his discoveries in the log, so that the common threads emerge gradually. The artifacts have been chosen so that they tell a story as multiple users uncover them” (Goldberg and Mascha).

Another fascinating area of investigation is the connection between the human body, the environment, and the Internet. In a pioneering performance,

entitled *Thundervolt* (1994), Gene Cooper, an American installation and performance artist, linked the electrical system of his body to that of the earth. Real-time data sensing lightning strikes around the United States were relayed to his computer in Telluride, Colorado, via the National Lightning Detection Network. The strikes registered onscreen were translated into electrical signals, involuntarily stimulating muscles to twitch in Cooper's body through a series of neuromuscular stimulators called TENS (Transcutaneous Electro Neuro Stimulators).³⁴

Exploring the hybridisation of radio and the Internet, Austrian artist Gerfried Stocker³⁵ created *Horizontal Radio* in collaboration with Heidi Grundmann and many other artists, producers, and technicians in several countries. The project ran live for 24 hours (June 22 to June 23, 1995) during the *Ars Electronica Festival*, in Linz, Austria, on the frequencies of many radio stations in Australia, Canada, Europe, Scandinavia, Russia and Israel, on the Internet, and at the network intersections in Athens, Belgrade, Berlin, Bologna, Bolzano, Budapest, Edmonton, Helsinki, Hobart, Innsbruck, Jerusalem, Linz, London, Madrid, Montreal, Moscow, Munich, Naples, Quebec, Rome, San Marino, Sarajevo, Sydney, Stockholm, and Vancouver.³⁶ The project was loosely based on the theme of migration, and intentionally challenged the standardized forms of communications promoted by large broadcasting institutions and entertainment corporations.

Horizontal Radio created a new form of media experience, in which self-regulated groups dispersed worldwide collaborated on a single piece, integrating diverse communications systems such as real-time transmissions typical of broadcast radio and the asynchronous nature of Internet audio. Participants

merged several old and new technologies to transform radio into a space for the exchange of audio messages. This new audio environment combined multiple forms of sound art such as tape compositions, live-concerts, telematic simultaneous events between some of the participating stations, sound sculptures, and texts and sound collages triggered by the Internet. *Horizontal Radio* emphasized dialogic distribution and created a sense of equidistance that transcended the limited spatial range of radio transmitters. A double-CD published by Ars Electronica in 1996 documents samples from more than one hundred hours of this global interactive radio event.³⁷

Artists such as Fred Forest, Stelarc, Richard Kriesche, Shu Lea Cheang, and Masaki Fujihata contributed other hybrid topologies to this oscillating field between public and private spaces. Merging television, radio, telephones and the Internet, French artist Fred Forest³⁸ created *From Casablanca to Locarno: Love reviewed by the Internet and other electronic media*, realized on September 2, 1995, in Locarno, Switzerland. In this piece, the artist broadcasted the film *Casablanca*, with Humphrey Bogart and Ingrid Bergman, without sound and with text onscreen informing the public about the possibility of interactive participation. The public used the Internet and called participating radio stations to fill in with creative and improvised dialogues. Fred Forest also controlled the images viewed on the screen from a theatre in Locarno, open to the local public and transformed into a radio and television studio especially for this piece.³⁹

Unlike virtual galleries, multimedia projects, and hyperlink-based pieces, hybrid art works that bridge the Internet with physical environments and other telecommunications media are not seen frequently online. Stelarc, Kriesche, Cheang, and Fujihata proposed such contact between tangible objects and virtual

spaces in events and installations. Stelarc's performance during 1995, *Fractal Flesh*, enabled remote collaborators, with point-to-point direct links via PictureTel teleconferencing system and ISDN connections from three European cities, to manipulate his arms and one leg through muscle-stimulation circuitry while receiving visual feedback on a video monitor. Electrodes attached to his limbs relayed the remote-triggered voltage to cause arms and leg to jerk involuntarily. Images of the performance were uploaded to the web site dedicated to the event.⁴⁰ Kriesche's installation, entitled *Telematic Sculpture 4*, also in 1995, was comprised of a conveyor belt with a railway track on it that moved in the Austrian pavilion at the Venice Biennale according to Internet data flow, eventually hitting and breaking through a wall. What caused the sculpture to move was an equation comparing data flow in computer newsgroups to art newsgroups. A newsgroup is an online discussion board that one may read or post to. Internet participants could slow down the movement of the sculpture by sending email to the project's address, accessing its Web site, or discussing the work in the aforementioned newsgroups.⁴¹ Shu Lea Cheang's *Bowling Alley* (1995) installation spanned not only the Web, but two "real world" sites. A gallery in the Walker Art Center, Minneapolis, and a bowling alley several miles away were linked via ISDN lines and sensors. The actions of participating bowlers at the alley controlled an enormous video display in the museum on which were projected pictures of the bowlers (friends of the artist) and text from their earlier e-mail correspondence with her. The images changed according to the velocity of the ball and its course down the lane.⁴² In Masaki Fujihata's *Light on the Net* (1996), the Web viewer sees a grid depicting forty-nine tiny light bulbs. They can click on the bulbs to turn their real counterparts on and off in the lobby

of a Japanese office building.⁴³ This whimsical work conflates object (bulbs) and information (light data) and gives the viewer credit for her work. Switch on a light and your computer's ID appears under "Recent 10 Accesses."

Works like these render tangibly the connection between body, physical space, and the network, a much needed antidote to the metaphysical suggestion—pervasive since the Internet boom in 1994—that the "consensual hallucination" (51) of cyberspace, as Gibson wrote in *Neuromancer*, suppresses the physical body.

MULTICASTING

Undoubtedly, the Internet presents a new challenge for art. The digital revolution foregrounded immaterial works and underscored interactive propositions. The Net offers a practical model of decentralized knowledge and power structures, beyond the unidirectionality that shapes the mediascape. The broadband Internet of the future will enable mobile multimedia computing. Fibre-optic infrastructure, wireless access, and small portable devices will connect individuals through the integration of voice, text, graphics, videoconferencing, telepresence, and multi-user three-dimensional worlds.

With increase in broadband capabilities, conservative forces will also attempt to impose restrictive standards, trying to stifle individual freedom and creativity. The issue of bandwidth is not simply a technical matter; it is important because it will dramatically change the nature of the Internet as a public space and the very experience of being online. As I pointed out in the beginning of the chapter, speed and bandwidth are determining factors in network art as canvas size and colour palette are in painting. Hints of Internet 2 were offered by events

realized on the “Multicast Backbone,” or MBone, a virtual network first established in 1992 and layered on top of the physical Internet to support real-time two-way transmission of audio and video data between multiple sites.⁴⁴

Although the MBone is mainly used by scientists worldwide to interactively attend videoconferences, some cultural manifestations occasionally employ the system. Mexican artist Guillermo Gómez-Peña created the satellite/MBone telecast *El Naftazteca: Cyber TV for 2000 AD*, broadcast on November 22, 1994. The character El Naftazteca was “a renegade high-tech Aztec who commandeers a commercial television signal and broadcasts a demonstration of his Chicano Virtual Reality machine from the techno-altar setting of his underground bunker. The Chicano Virtual Reality machine enables El Naftazteca to retrieve instantly any moment from his or his people’s history, and then display the moment in video images” explained Gómez-Peña in the Web site that documents the event.⁴⁵ Also a participant in the international mail art movement in the ‘70s, Gómez-Peña addresses issues of multiculturalism in his work with media that include film, video, radio, performance, and installation art. “What will television, and performance art, look like in ten years? It will have to be multilingual and it will marginalize everyone,” states Gómez-Peña. An interactive component to the production encouraged viewers to phone the iEAR Studios of Rensselaer Polytechnic Institute and examine the basic cultural assumptions they maintain about US-Latino relations. Via the MBone, computer users could communicate directly with El Naftazteca for the 90 minutes of the performance.

I worked with the MBone in 1996 in my networked telepresence installation entitled *Rara Avis*.⁴⁶ It was presented simultaneously in the physical

space of the Nexus Contemporary Arts Center in Atlanta, and on the Internet (via interactive conferencing both in colour and black and white), the Web (with gif uploads captured from the live video feed), and the MBone (with colour video). Gallery visitors “transported” themselves to the body of a telerobotic macaw inside an aviary with thirty small birds. Visitors could wear a virtual reality headset and take control of the vision system of the robotic bird in real time. They shared the body of the telerobot with Internet participants, who activated the robot’s vocal system. What the local viewer saw was seen live on the Internet, the Web, and the MBone. What was heard in the gallery was a combination of the voices of anonymous participants who happened to be on the body at the moment. This piece was first experienced in Atlanta and on the network from June 27 to August 24, 1996.

Growing exponentially since its initial phase (1994-1996) discussed here, Internet art has become a formidable cultural force. It is clear that the future of art and the future of the Internet will be intertwined. As electronic devices with embedded Web browsers and servers become pervasive, we will have access to the network in many new ways. For example, it will be common to browse and serve from cars and airplanes. Telephones, as well as photo and video cameras, will have IP addresses, numbers that enable them to be directly connected to the Internet without a desktop computer. This newly gained mobility, coupled with broadband access and future protocols, will open new possibilities for network art. As more people gain access to the Internet, with faster land and wireless connections, art created on and for the Internet can potentially gain greater momentum and reach new audiences. Online the computer screen is much more

than a trading outpost; it is a portal into myriad minds, a vehicle for interaction, a bridge to other worlds waiting to be discovered or invented.

End Notes

¹ See: John Beardsley. *Earthworks and Beyond*. New York: Abbeville, 1989.

² See: Frank Popper. *Art of the Electronic Age*. New York: Abrams, 1993.

³ See: *Time Magazine*. Special Issue: "Welcome to Cyberspace." 145.12 (1995).

⁴ See: Robert Atkins. "The Art World and I go Online." *Art in America*. 83.12 (December 1995): 58-65, 109.

⁵ The first examples were developed after 1996, and include "WebStalker" (1997) by Mathew Fuller <<http://www.backspace.org/iod/>>, "Shredder" (1998) by Mark Napier <<http://www.potatoland.org/shredder/>>, and "Netomat" (1999) by Maciej Wisniewski <<http://www.netomat.net/>>. While "Shredder" works within contemporary browsers, "Netomat" and "WebStalker" require you to download the browser itself. These are browsers that offer a very unusual view of the Internet. Instead of presenting information in a clear and linear manner, following the original design of accessed web sites, they reconfigure text and pictures from these sites, in a kaleidoscopic self-assembling display of visual information.

⁶ See: *The Correspondence Art of Ray Johnson: Online Publications* <http://www.artpool.hu/Ray/RJ_onlinetext.html>.

⁷ See: John Held, Jr. "The Formidable Blue Stamp of Yves Klein." December 1995. <<http://www.geocities.com/johnheldjr/YvesKlein.html>>.

⁸ See: *Electronic Museum of Mail Art*. Ed. Chuck Welch. 2 July 1998. <<http://www.actlab.utexas.edu/emma/>>.

⁹ See: *Fluxus Portal for the Internet*. 19 September 1999. <<http://www.fluxus.org/>>. Also see: *The Fluxus Homepage*. 22 December 2000 <<http://www.nutscape.com/fluxus/homepage/>>.

¹⁰ See: *Art and People: Latin American Art in Our Time*. Ed. Clemente Padin. English Trans. Harry Polkinhorn. 1997. <<http://www.thing.net/~grist/l&d/padin/lcptitle.htm>>

¹¹ See: *The Cavellini Archive Foundation*. <<http://www.cavellini.org/auto/index.html>>

¹² See: *Minitel*. <http://www.pic.fr/site/f_minitel.html>.

¹³ See: *Le Pages Minitel sur Internet*.

<<http://www.minitel.tm.fr/multione.cgi/V230/>>; and *Teletel / Minitel*.

<http://iml.jou.ufl.edu/carlson/professional/new_media/History/TELETEL.HTM>

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¹⁴ See: *Les Immatériaux*. (Unnumbered Loose-leaf) Catalogue. Paris: Centre Georges Pompidou, 1985. This catalogue is from an exhibition held at the Grande Galerie, Centre National d'Art et de Culture Georges Pompidou, March 28-July 15, 1985, under the management of the Centre de Creation Industrielle and the curatorship of Jean- François Lyotard and Thierry Chaput.

¹⁵ See: *Jodi.org*. Joan Heemskerk and Dirk Paesmans. <<http://www.jodi.org>>.

¹⁶ See: *Refresh*. Alexei Shulgin and J. Luc Faubert. 14 March 1997. <<http://www.ljudmila.org/fresh.htm>>; and *Refresh and REad* . . . 28 July 2000. <<http://www.absurd.org/de-A/fresh.html>>.

¹⁷ See: *Marcus Novak*. Marcus Novak. <<http://www.centrifuge.org/marcos/>>.

¹⁸ See: *.InfoArt: The Digital Frontier from Video to Virtual Reality*. Cynthia Goodman. 1996. <<http://www.rvi.com/fisherhob.html>>.

¹⁹ See: *Selected Bibliography on Kac's Digital Poetry*. Eduardo Kac. 1998. <<http://www.ekac.org/multimedia.html>>.

²⁰ See: *Secret*. Eduardo Kac. 1996. <<http://www.ekac.org/multimedia.html>>.

²¹ See: *Dia Center for the Arts*. 2002. <<http://www.diacenter.org/rooftop/webproj/index.html>>.

²² See: *Ars Electronica*. <<http://www.aec.at/>>.

²³ See: *nettime mailing lists: mailing lists for networked cultures, politics, and tactics*. <<http://www.nettime.org>>.

²⁴ See: *cttheory.net*. Eds. Arthur and Marilouise Kroker. <<http://www.cttheory.com>>.

²⁵ See: *Rhizome.org: The New Media Art Resource*. <<http://www.rhizome.org/fresh/>>.

²⁶ See: *Leonardo Electronic Almanac*. Ed. Nisar Keshvani. 2002. <<http://mitpress.mit.edu/e-journals/LEA/>>.

²⁷ See: *Ponton*. <http://www.ponton.de/index_en.html>.

²⁸ See: *VGTV Network*. <<http://www.vgtv.com>>.

²⁹ This information comes from a printed 4-page brochure distributed by Van Gogh TV on the occasion of the event (June 13 to September 20, 1993), Documenta 9, Kassel.

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- ³⁰ See: Jules Marshall. "The Medium is the Mission: Ponton media lab plans to drive a stake through the scleric heart of that 50 year old bloodsucker, television." *Wired Archive*.
<<http://www.wired.com/wired/archive/1.05/medium.mission.html>>.
- ³¹ See: *Mediamatic*. <http://www.mediamatic.nl/index_e.html>.
- ³² See: *Telepresence Art: The Ornitorrinco Project*. Eduardo Kac and Ed Bennett.
<<http://www.ekac.org/ornitorrincoM.html>>.
- ³³ See: *Mercury Project: Robotic Tele-Excavation*. Dirs. Ken Goldberg and Michael Mascha. 1994-1995. <<http://www.usc.edu/dept/raiders/>>.
- ³⁴ See: <http://www.fourchambers.org/artown_gc_thundervolt.asp>
- ³⁵ See: *Gerfried Stocker*. <<http://gewi.kfunigraz.ac.at/x-space/bio/stocker2.html>>.
- ³⁶ See: *Horizontal Radio*. <<http://gewi.kfunigraz.ac.at/~gerfried/horrad/>>.
- ³⁷ See: *Horizontal Radio*. 2 CD Kunstradio. Linz, Austria. ORF/Transit, 1996.
- ³⁸ See: *J'arrete le temps: Le jour du printemps*. Fred Forest.
<<http://www.fredforest.com>>.
- ³⁹ See: *Video Art*. <<http://www.tinet.ch/videoart/va16/multimedia.html>>.
- ⁴⁰ See: *Stelarc's Site*. <<http://www.stelarc.va.com.au/>>.
- ⁴¹ See: Biennale Venice 1995. *Telematic Sculpture 4*.
<<http://iis.joanneum.ac.at/kriesche/biennale95.html>>.
- ⁴² See: <<http://bowlingalley.walkerart.org>>.
- ⁴³ See: <<http://light.softopia.pref.gifu.jp>>
- ⁴⁴ As of March 1997, there were more than 3,000 MBone servers on the Internet <<http://webopedia.internet.com/TERM/M/Mbone.html>>. The MBone will become obsolete when Internet 2 <<http://www.internet2.edu/home.html>> becomes fully operational in the public realm, installing what was dubbed quality of service (QoS) technology. The QBone (Quality Backbone) <http://www.internet2.edu/html/I_december_1998.html> was first launched in October 1998 by the Internet 2 project as an academic testbed, (a high-speed fibre optic cable network promoting media integration, interactivity, and real-time collaboration. Temporarily restricted to participating educational and research institutions, this broadband technology will one day be made available to the general public. The QBone is a model for the Internet of the future, which will have bandwidth wide enough to fully enable real-time voice, video, and teleimmersion online.

⁴⁵ The quotations attributed to Gómez-Peña in this paragraph were found at the following site on November 16, 1994: <<http://www.rpi.edu/~djwap/ggp.html>>.

⁴⁶ See: *Rara Avis*. Eduardo Kac. <<http://www.ekac.org/raraavis.html>>.

SECTION II:
TELEPRESENCE ART

Chapter 4 - TELEPRESENCE ART: THEORETICAL BACKGROUND

After the survey of the practical and theoretical implications of the use of telecommunications media by artists presented in the previous chapters, I now wish to focus on a question that is central to my own research: the use of telecommunications media in art to produce action at a distance. By “action at a distance” I mean precisely a situation in which the participant has the means to provoke a tangible (and not virtual) manifestation in a remote physical space. The remote agent is the cause of the action, and its consequence can be visualized in real time as a spatial (and not exclusively graphic) phenomenon. I have called this “telepresence art.”¹ I will start by examining some historical and theoretical implications of the notion of telepresence. In the next chapter I will proceed to discuss the two artworks that embody my practical telepresence research.

CYBERSPACE, VIRTUAL REALITY AND TELEPRESENCE

The word “cyberspace” was coined by William Gibson in his sci-fi novel *Neuromancer*, where it meant “a graphic representation of data abstracted from the banks of every computer in the human system” (51). The prefix “cyber” as used here comes from the science of “cybernetics” (from the Greek “kubernetes,” or steersman), first proposed by Norbert Wiener in 1948 to address control and communication in animal and machine.² In Cybernetics, the notion of communication of information joins biological and physical sciences, encompassing under a general science automatic mechanisms and the workings of the brain and the central nervous system. Topics usually understood separately, such as mechanics, biology and electricity, are brought together in the discussion of self-stabilizing control action and communication, and man and machine are

seen in *analogous* fashion. Regardless of its pertinence, the ordinary use of the word *memory* to describe the storage unit of a computer is an example of the pervasive influence of cybernetic theory. It is also an example of its subtle attempt to undermine the implications of traditional philosophic concepts, such as soul, life, choice and memory which, writes Jacques Derrida, “until recently served to separate the machine from man” (*Of Grammatology* 9). Cyberspace is, therefore, a synthetic space where a human equipped with the proper hardware can perform based on visual, acoustic, and sometimes haptic feedback obtained from software.

The phrase “virtual reality,” coined by Jaron Lanier,³ is more generic than the term *cyberspace*. “Virtual reality” depicts the field of activity devoted to promoting human performance in synthetic environments. These environments are images representing computer data. The word “virtual,” as used in computer jargon (for example, “virtual memory”), can be traced back to its earlier use in Optics, where a *virtual image* is, for example, the one seen inside a (flat) mirror. They are called *virtual* because they are not optically formed where one sees them (behind the mirror). *Virtual images* stand in opposition to the so-called *real images*, which are in fact formed outside a (concave) mirror. A *real image* is formed at a point through which the rays of light entering the observer’s eyes actually pass. In Optics, “virtual” stands for what is inside the mirror and beyond reach, while “real” stands for that which is outside and shares our three-dimensional bodily space. If we look at the surface of the mirror as we look at the surface of the screen, as that boundary that separates two spaces, the corporeal and the representational, we notice that as opposed to the specular image the digital image is formed on the screen through cathode rays actually projected from

within. (Hecht 131) The digital image on the screen does not require external illumination as does the mirror to form its image. The digital image on the screen projects light on us. It invades our corporeal reality. Virtual reality blends the ideas of tangible corporeality (real) and intangible representation (virtual). To experience virtual reality one must, in a sense, enter the virtual image (one must be immersed in cyberspace). The two concepts are intertwined. As Pierre Lévy put it, “So-called virtual reality systems enable us to experiment with the dynamic integration of different perceptual modalities” (38).

As for telepresence, the coupling of robotics and telematics, we must look at both literature and popular culture to locate the origin of the concept. In 1910 the French avant-garde poet Guillaume Apollinaire published in Paris a collection of short stories in which he described a system capable of reproducing touch at a distance. (Apollinaire 238-254) More concretely, the idea of a remote-controlled robotic system appeared in the comic strip Buck Rogers in the 25th Century A.D. (1929) by writer Philip Francis Nowlan and artist Richard Calkins. (Nowlan and Calkins 46) Robert Heinlein’s 1942 short novel, *Waldo*, tells the tale of Waldo F. Jones, a genius who suffered from a disabling disease and who built for himself a zero-gravity home in orbit around Earth. Using his impotent muscles without the constraints of gravity he developed hardware (“waldoes”) that allowed him to perform teleoperations on Earth. He built waldoes with robotic hands of different sizes, from half an inch to several feet across their palms, which responded to the command of his arms and fingers. In his 1990 book, *Waldo & Magic, Inc.*, Heinlein commented that “The same change in circuits which brought another size of waldoes under control automatically accomplished the change in sweep of scanning to increase or decrease the magnification so that Waldo always saw

before him in his stereo receiver a ‘life-size’ image of his other hands” (Heinlein 133).

When Marvin Minsky wrote the pioneering article “Telepresence,” he acknowledged Heinlein’s vision and proposed the development of a whole economy of mining, nuclear, space and underwater exploration based on this technology. Minsky commented: “Think how much more we could have learned with a permanent vehicle on the moon. The Earth-Moon speed-of-light delay is short enough for slow but productive remote control” (48). In the same article Minsky also clarified the origin of the word “telepresence,” which, he writes, “was suggested by my futurist friend Pat Gunkel” (47).⁴ Telepresence, which seemed as improbable thirteen years ago as when Heinlein wrote *Waldo*, has evolved into a new field.

In principle, telepresence and virtual reality coincide only when a person immersed in the digital environment can remotely control an actual telerobot in our tangible space and receive feedback from his or her teleactions. The input may originate in the physical world and affect the virtual space as well. One can also conceive of immersive virtual reality online. This means that several people from different countries could meet online and interact through their graphic projections using telecommunication systems, which could be coupled to telerobots.

Scientists pursue telepresence as a pragmatic and operational medium that aims at equating robotic and human experience. The goal is for the anthropomorphic features of the robot to match the nuances of human gestures. In this search for an “operational double,” to use Baudrillard’s term, humans wearing flexible armatures will, scientists believe, have a quantifiable feeling of “being

there.” While it is clear that actions will be performed by telepresence routinely in the future, the ability to execute specific practical tasks that captivate scientists may or may not be of interest to artists working with telepresence. The idea of telepresence as an art medium is not primarily about the technological feat, the amazing sensation of “being there.” As I will show, telepresence art is a means for questioning the unidirectional communication structures that mark both traditional fine arts (painting, sculpture) and mass media (television, radio). In what follows I will investigate telepresence art as a way to express on an aesthetic level the cultural changes brought about by remote control, remote vision, telekinesis, and real-time exchange of audiovisual information. Telepresence art creates a unique context in which participants are invited to experience invented remote worlds from perspectives and scales other than human. Unlike the industry, whose goal is to channel this technology for practical applications, telepresence art focuses on the symbolic and philosophical implications of remote agency.

TELEPRESENCE: A NEW COMMUNICATIVE EXPERIENCE

As has been demonstrated in the previous chapters, the sender/receiver model of semio-linguistic communication is not sufficient to account for the multimodal nature of networked, collaborative, interactive telecommunication events that characterize symbolic exchange in art or in the ordinary intercourse of our daily affairs. As a hybrid of robotics and telematics, telepresence adds to the complexity of this scene. In telepresence links, images and sounds are transmitted but there are no “senders” attempting to convey particular meanings to “receivers.” Telepresence can be both an individualized or intersubjective bidirectional experience.

We speak of the mass media as being a means of *communication*, but if we look carefully at the logistics of the mass media we realize that what they produce is, in fact, non-communication. Baudrillard states that mass media are anti-mediatory because communication is “an exchange, [...] a reciprocal space of a speech and a response” (“Requiem for the Media” 128). How is this reciprocal space different from that of the transmission-reception model made reversible through feedback? In other words, when any television spectator phones in and participates in a poll giving his/her opinion, is he or she in a reciprocal space?

Baudrillard does not think so:

The totality of the existing architecture of the media founds itself on this latter definition: *they are what always prevents response*, making all processes of exchange impossible (except in the various forms of response *simulation*, themselves integrated in the transmission process, thus leaving the unilateral nature of the communication intact). This is the real abstraction of the media. And the system of social control and power is rooted in it. (“Requiem for the Media” 129)

Whether involving an exchange between two interlocutors or not, telepresence seems to create this *space of reciprocity* absent from mass media. The space created by telepresence is reciprocal because the decisions (motion, vision, sound, operation) made by the “user” or “participant” affect and are affected by the remote environment and/or remote participant.

Baudrillard formulates the problem of lack of response (or *irresponsibility*) with clarity, but to solve the problem, to restore the possibility of response (or *responsibility*) in telecommunication media would be to provoke the destruction of the existing structure of the media. And this seems to be, as he rushes to point out, the only possible strategy, at least on a theoretical level, because to take power over media or to replace its content with another content is to preserve the monopoly of verbal, visual, and aural discourse. The idea of probing the structure

of the mass media and creating parallel structures which defy the persuasive nature of unidirectional transmissions is, I believe, of relevance to artists exploring interactivity.

In a growing tendency observable since the sixties, when videotape and communication satellites became the major vectors in forming the grammar of television, many important social events (both of a progressive and conservative nature) have been experienced as media events. Examples include the historic democracy movement in China and the Gulf War. Not that these events became the *content* of special programs; the new phenomenon is in that for most of the world these events took place *in* the media. Thus, it comes as no surprise that Chinese crowds were cheering American reporters as heroes and asking “Get our story out!” and that Gulf War missiles transmitted from their own perspective images of their targets as they approached them, until the very moment of the explosion, when all one saw was a noisy screen. What is observed here is that the meaning of actions no longer results purely and simply from the actions themselves, from negotiations between co-present inter-actors; meaning is now generated *directly* in the domain of reproducibility, in the realm of the ubiquitous and unidirectional image. Telecommunications media seem to abstract everything, from their own pseudo-mediation process to the massacre of a population. It all becomes abstract, spectacular, and in a perverse twist, entertaining, served in minute temporal doses between commercials.

Telecommunications media efface the distinction between themselves and what used to be perceived as something apart, totally different from and independent of themselves, something we used to call reality. Baudrillard calls this lack of absolute distinction between sign (or form or medium) and referent (or

content or real) as stable entities “hyperreal,” or “hyperreality.” In what is likely to be his most celebrated essay, “The Precession of Simulacra,” Baudrillard once again acknowledges McLuhan’s perception that in the electronic age the media are no longer identifiable as different from their content. McLuhan knew that it is the new pattern introduced by a new medium or technology that provokes the social consequences of the medium or technology—and not a particular program content. But Baudrillard goes further saying that “there is no longer any medium in the literal sense: it is now intangible, diffuse and diffracted in the real, and it can no longer even be said that the latter is distorted by it” (*Simulations* 54). One could say that the fusion of the medium and the real is especially true in telepresence, since one can actually perform and change things in the real world from far away. Thus, telepresence art dramatizes and draws attention to this important aspect of contemporary culture.

Television is of particular importance here because it is the mass medium par excellence, the most influential medium worldwide. It is easy to see that television’s influence will grow even stronger with HDTV, Digital TV, the popularisation and miniaturisation of both static and mobile satellite receivers once fibre-optic networks become as ordinary as the introspective Walkman. I mention the Walkman because in its private sensorial experience it can be seen as the epiphenomenon of a society that chooses to remove itself from public space. Away from the public space, we experience socialization as phone conversations, the shared experience of TV viewership, or interactions through networks such as the Internet. More and more the phenomenon that used to be thought of as “direct” experience becomes mediated experience without us really noticing it. To “get in touch” (touch!) is to make a phone call. People get married after

having developed personal relationships over the Internet. (LaQuey and Ryer 8)

From a technological standpoint we are not so far from routinely touching someone remotely through a phone call by means of force-feedback devices. Like in Heinlein's *Waldo*, the dream is of being there without ever leaving here. At different levels we subordinate local space to remote action promoting what Baudrillard so succinctly described as "the satellitization of the real" ("The Ecstasy of Communication" 128). What we understand by *communication* is changing because physical distances from the public space no longer impose absolute restrictions on certain kinds of bodily experiences (audition, mobility, vision, touch, and proprioception [sense of limb position]) as they once did.

In his essay "Signature Event Context," Derrida pointed out the multivocal nature of the word *communication*.

We also speak of different or remote places communicating with each other by means of a passage or opening. What takes place, in this sense, what is transmitted, communicated, does not involve phenomena of meaning or signification. In such cases we are dealing neither with a semantic or conceptual content, nor with a semiotic operation, and even less with a linguistic exchange. (*Limited Inc.* 1)

It is this opening, this passage between two spaces, which defines the nature of the particular communication experience created by telepresence art. This opening is not a context for "self-expression" (of the author or of the participant); it is not a channel for communicating semiologically defined messages; it is not a pictorial space where aesthetic formal issues are structurally relevant; it is not an event of which one can clearly extract specific meanings. Baudrillard suggested that to restore the responsibility of the media would imply a reconfiguration of the architecture of the media. The conclusion that can be derived from this statement for art is that a viable strategy is the creation of communication events that aim

not to represent a transformation in the structure of communication, but to create the experience of it.

REAL TIME AND THE DISAPPEARANCE OF DISTANCE

At a near subliminal level we are experiencing a significant change in the way we carry out even our most ordinary affairs. What seems to be at the core of this change is the fact that *real space* and the very notion of *distance* are becoming increasingly irrelevant, giving up their once privileged status to *real time* and the *commuting of sound and images* (including text).

Paul Virilio addresses such questions as they concern the new social role of the image and the field of telepresence. Suggesting that live transmission of video images over great distances becomes in itself a new kind of place, a “tele-topographic locale,” he states that a *tele-bridge* of sorts, made of sound and image feedback loops, gives origin to telepresence or telereality, of which the notion of real time is the essential expression. This telereality, Virilio continues, supersedes in real time the real space of objects and sites. In other words, we see the continuity of real time overcoming the contiguity of real space. We experience this new condition daily, when we are in the office or studio and activate by remote control our answering machine at home to retrieve recorded messages, or when we withdraw money from an automatic teller machine that communicates with a remote computer. The impact of fibre optics, monitors and video cameras on our vision and on our surroundings will go beyond that of electricity in the nineteenth century: “In order to see,” Virilio observes, “we will no longer be satisfied in dissipating the night, the exterior darkness. We will also dissipate time lapses and distances, the *exterior itself*” (*L’Inertie Polaire* 72).

In consonance with Baudrillard's perception of the new informational landscape, Virilio advances the notion that we don't inhabit or share a *public space* anymore, as we used to do before the electrification of towns. Our domain of existence or socialization is now the *public image*, with its volatile, functional, and spectacular ubiquity that commands identity, surveillance, relationship, memory, and ultimately, life and death. To the notion of a phenomenology of perception as epitomized by Merleau-Ponty he will oppose a *logistics of perception*, the meaning of which becomes more obvious in the piercing gaze of scientific imagery and in satellite surveillance, which will instantaneously map the body of the patient or of the enemy territory. The strategy of vision will anticipate the strategy of the assault (against a virus or an army), and will be a powerful weapon in itself. With the use of real-time video in surveillance systems, the introduction of video technology in apartment buildings and the popularisation of the camcorder and the videophone, social behaviour is changing. One can expect strategies of vision to develop on a more personal level.

For Virilio, one of the most important aspects of the new technologies of digital imaging and of synthetic vision made possible by optoelectronics is the "fusion/confusion of the factual (or operational) and the virtual," the predominance of the "effect of the real" (*La Machine de Vision* 128) over a reality principle. In other words, everything now involves images in one way or another, though not necessarily images in the traditional sense of representation. Instead, they are images of light that are part of the contemporary landscape, just as electricity invaded towns in the late nineteenth century, an "electronic lighting." Images now are invasive and diverse social groups use them. The role of the image, Virilio says, is "to be everywhere, to be reality" (Interview 7).

Virilio distinguishes three kinds of logic of images, according to a clear historical development. For Virilio, the *formal logic* of the image is the one achieved in the eighteenth century with painting, engraving, and architecture. In traditional pictorial representation it is the composition of the figure that has primary importance and the flow of time is relatively irrelevant. Time is absolute. The age of the *dialectical logic* is that of the photograph and of cinematography in the nineteenth century, when the image corresponds to an event in the past, to a differentiated time. At last, the end of the twentieth century with video, computer and satellites marks the age of the *paradoxical logic*, when images are created in real time. This new kind of image gives priority to speed over space, to the virtual over the real, and therefore transforms our notion of reality from something given to a construct. Virilio says that to some extent the lesson of the new technologies is that reality has never been given, it has always been acquired or generated. (*La Machine de Vision* 133) Our images never really duplicated reality, they always gave it shape. The difference is that before a functional distinction could still be made on more solid grounds.

A great deal of our social experience takes place through sound and images transmitted throughout the globe via telecommunications: regular and cellular phones, satellite and cable television, teleconference systems, fax, modems, wrist watch telecommunications devices, and so on. In all cases the actual space that disconnects the interlocutors is not an impediment to interaction because what really separates them is the different time zones.

In a seminal text entitled “Art and Telematics,” Roy Ascott stated that telematics “breaks the boundaries not only of the insular individual but of institutions, territories and time zones. To engage in telematic communication is

to be at once everywhere and nowhere. In this it is subservive. It subverts the idea of authorship bound up within the solitary individual. It subverts the idea of individual ownership of the works of imagination” (57).

The shortest distance between two points is no longer a straight line, as it was in the age of the locomotive and the telegraph. In the age of satellites and fibre-optics, the shortest distance between two points is *real time*. The ability to commute information instantaneously, to send and receive sound and images immediately (“i-mmediately, or with no apparent medium or means?”), accounts for the decreasing social relevance of the extensity of space in regard to the intensity of time. As a consequence, speed is no longer expressed only in miles or kilometres per hour, but also in bauds or bytes per second. More than ever, when in need to actually dislocate our bodies through the environment, we express the contiguity of space by means of a temporal deferral or delay.

Discussing the cultural and aesthetic conditions of a society that increasingly manipulates more information than objects, Abraham A. Moles states that the human spirit has to adjust to this new situation in which images and reality become more and more identified with one another. I find this to be nowhere more patent, in terms of applied technology, than in virtual reality systems under development by NASA⁵ that allow a person immersed in cyberspace to mediate force at a distance. In this case, the operator or user acts or performs at the level of reality and virtuality simultaneously. Moles writes that

As we enter the age of telepresence we seek to establish an equivalence between ‘actual presence’ and ‘vicarial presence.’ This vicarial presence is destroying the organizing principle upon which our society has, until now, been constructed. We have called this principle the law of proximity: what is close is more important, true, or concrete than what is far away, smaller, and more difficult to access (all other factors being equal). We are aspiring, henceforth, to a way of life in which the distance between us

and objects is becoming irrelevant to our realm of consciousness. In this respect, telepresence also signifies a feeling of equidistance of everyone from everyone else, and from each of us to any world event. (27-28)

This blending of reality and images and the “feeling of equidistance” are, like most consumer technologies, the consequence of research originally carried out for strategic and military purposes. Telepresence will leave the laboratories and become more accessible, as it happened before with the telephone, radio, television, and computers. We shall not lose sight of this, even if our sight is blurred with images of a new kind, images that themselves illuminate the environment. The equidistance we share is felt as a media phenomenon, if such distinction can still be made, because of the process of intermediation of real space promoted by real-time telecommunication apparatuses. This equidistance means approximation as much as it means distancing. The subordination of three-dimensional bodily space to real time is a process of abstraction that continuously blurs the distinction between images and reality. It brings to the same sphere of entertainment sitcoms, the most tragic news from Bosnia or Somalia, and talk shows.

Telecommunication systems are used for overt or disguised entertainment and surveillance, for democratic and anti-democratic propaganda and for new forms of imprisonment. Remote surveillance is found in public areas, such as the subway, or in private environments, such as office and apartment buildings. Remote surveillance systems have also been employed by the police to monitor home prisoners. During the Tian an Men Square bloodshed in Beijing, Chinese military warned journalists that they would be shot if they photographed army units on the streets of the city. CBS news anchorman Dan Rather was forced by Chinese officials to shut down his satellite hook-up. CBS in turn used

videophones (“transceivers”) to transmit still-video pictures over regular phone lines from Beijing to New York, and from there to the rest of the world. Reporters like Richard Roth in Beijing used a cellular phone to speak live on TV from Tianan Men Square over the pictures which galvanized world opinion. During the Gulf War the American government released pre-recorded video sequences transmitted in real time by a missile, from its own perspective, until the moment of the explosion. The images were broadcast to show the missile’s precision (which one obviously reads as military supremacy). Videophones are also being used to control multiple offenders incarcerated in their own homes. In some states in the United States convicted drunk drivers are prisoners in their own houses under a strict regime of electronic surveillance. A computer at a local police headquarters phones the offender at random up to 15 times every 24 hours and orders him to transmit his picture after performing a simple task (“turn your head to the right,” for example) to confirm real-time action. The computer also asks the offender to blow into an alcohol tester and to send a picture of the resulting numbers.

Virilio reminds us that through telepresence, “the inhabitant of telematic places is in the position of a demiurge: to the *omnivision* of the trans-appearance of things, it is added another divine attribute, i.e., *omnipresence* from afar, a sort of electro-magnetic telekinesis” (*L’Inertie Polaire* 129).⁶ The use of remote surveillance for social control is already rooted in our public space, and it invades the privacy of the home. This is an important phenomenon and contemporary art must address it, employing the same tools to criticize its scrutinizing gaze from within.

TELEPRESENCE AND THE PHENOMENOLOGY OF PERCEPTION

If we look at the domain of virtuality not only as personal security or punishment, but also as business as usual, going from the police headquarters to the corporate world we notice that the dream of omnivision resurfaces, this time turning the invisible visible as simulation and visualization. The debate on direct or mediated perception of reality re-emerges with renewed interest in light of digital networking and simulation technologies. In *Téléprésence, naissance d'un nouveau milieu d'expérience* (*Telepresence, birth of a new milieu of experience*), Jean-Louis Weissberg indicates what he sees as the phenomenological predicaments of virtual reality. Weissberg's essay rightly points out connections between Merleau-Ponty's discussions of vision and what Weissberg refers to as the "applied phenomenology of NASA's laboratories." (Weissberg 169-172). In Merleau-Ponty's essay, "Eye and Mind," he had already criticized the operational models of science as a construct; he had also mentioned Panofsky's reading of Renaissance perspective in order to reveal perspective as another form of construction of the world. In both cases, the constructs are abstracted from that body caught in the fabric of the world that generates them. Science uses instruments that "sense" phenomena that the human body does not respond to. The technique of perspective promotes cyclopean vision, which does not represent stereopsis and other aspects of human vision. If scientific thinking deals with "the most 'worked-out' phenomena, more likely produced by the apparatus than recorded by it" ("Eye and Mind" 160). Renaissance perspective tried to found an "exact construction" but was only "a particular case, a date, a moment in a poetic information of the world which continues after it" ("Eye and Mind" 174-175). Rejecting Cartesian rationalism, Merleau-Ponty states that one cannot "imagine

how a *mind* could paint” and that in fact it is in his or her actual body, not the body as bundle of functions but as an “intertwining of vision and movement” (“Eye and Mind” 162) that the artist changes the world into artworks. Observing the indissociability of vision and motion, he underlines that the body is immersed in the visible, that it sees and is seen, that it sees itself seeing. Changes of place, Merleau-Ponty writes, form a “map of the visible,” meaning that what is within the reach of sight, the visible world, is also within the map of motility, “the world of my motor projects.” “My movement,” he writes, “is not a decision made by the mind, an absolute doing which would decree, from the depths of a subjective retreat, some change of place miraculously executed in extended space. It is the natural consequence and the maturation of my vision” (“Eye and Mind” 162).

The very idea of telepresence in art plays on the notion of this “change of place miraculously executed in extended space.” This *miracle*, of course, is not achieved by a mental command but by the use of specific instruments (for example, telerobot, modem, telephone, video monitors, computers, network routers). This equipment, which in science would be used for data collecting, in art is used as a means to address the complexity of our perception in the age of media. If we once thought of images only in terms of mirror reflections, pictorial representations, or mental recollections, in the contemporary context electronic images command the map of the visual and of the motor projects of humankind. That is why Virilio spoke, as I mentioned before, of a logistics of perception replacing a *phenomenology of perception*. Electronic cameras invade all spaces (including the limits of the galaxy and the human body during surgery) and electronic images on screens become indissociable from other elements in our landscape.

In my telepresence works, the screen is both the bridge to another place and that which makes vision possible. But this vision does not separate what it sees from what sees it, nor does it separate space from objects (since all are brought to the same layer). This layer is a black and white, pixellated image, which breaks action into instants, which invites participants to generate “maps of the visible.” The low-resolution image, which forms the bridge to the low-resolution environment, draws attention to itself and makes no effort to disguise itself as that clear window that commercial television strives to be. The screen, then, is as much a part of the process of seeing as the movements made by the participant in consonance with a telerobot. The point here is that human vision is not just a function of the fact that light shines on objects around us, exciting our retinas, but that it is also a function of a code or a network of meanings in place prior to our seeing which allows us to recognize these illuminated objects as meaningful forms. As Norman Bryson writes,

Between the subject and the world, is inserted the entire sum of discourses which make up visuality, that cultural construct, and make visuality different from vision, the notion of unmediated visual experience. Between retina and world is inserted a *screen* of signs, a screen consisting of all the multiple discourses on vision built into the social arena. (91-92)

This linguistic interpretation of visuality agrees with Merleau-Ponty when he says that our eyes are “more than receptors for light rays” and that the gift of the visible “is earned by exercise” (“Eye and Mind” 165). This interpretation uses the metaphor of the screen as that which mediates our experience, a screen that catches our vision in a network of meanings socially agreed on. In this sense, perhaps, all “presence” is somewhat removed, remote, caught in an oscillation between presence and absence. As Merleau-Pont said, “voir c’est avoir à distance” or “to see is to have at a distance” (“Eye and Mind” 166). In my

previous telepresence research, which included a series of works with the telerobot *Ornitorrinco*⁷, the use of the video monitor was meant both as a door or passage between two spaces and a metaphor for the mediated experience of an intelligible world. Both my previous and my current investigation of telepresence in art are not concerned with scientific *simulation* but with promoting aesthetic *stimulation* of the presence-absence experience.

End Notes

¹ See the following three essays by Eduardo Kac: "Ornitorrinco: Exploring Telepresence and Remote Sensing." Special Issue: "Connectivity: Art and Interactive Telecommunications." Eds. R. Ascott and C.E. Loeffler. *Leonardo*. 24.2 (1991): 233 ; "On the Notion of Art as a Visual Dialogue." *Art-Reseaux*. Ed. Karen O'Rourke. Paris: Université de Paris I, 1992. 20-23. ; "Telepresence Art." *Teleskulptur*. Ed. Richard Kriesche. Graz, Austria: Kulturdata, 1993. 48-72.

² See: N. Wiener. *Cybernetics: Or Control and Communication in the Animal and the Machine*. Cambridge: MIT Press, 1948.

³ Jaron Lanier: "I made up the term 'virtual reality.' Originally the term referred to systems that used head-mounted displays and gloves that were networked together so that people could experience a shared meeting place in the virtual world and have the ability to design the world with simulated tools while they were inside it. I made up the term to contrast this technology with 'virtual environment' systems, where you focus on the external world but not on the human body or the social reality created between people" (Lanier 114).

⁴ For more on Pat Gunkel, see: David Stipp. "Patrick Gunkel Is An Idea Man Who Thinks in Lists." *The Wall Street Journal*. June 1, 1987.

⁵ Scott S. Fischer writes, "The VIEW system is currently used to interact with a simulated telerobotic task environment. The system operator can call up multiple images of the remote task environment that represent viewpoints from free-flying or telerobot-mounted camera platforms. Three-dimensional sound cues give distance and direction information for proximate objects and events. Switching to telepresence control mode, the operator's wide-angle, stereoscopic display is directly linked to the telerobot 3-D camera system for precise viewpoint control. Using the tactile input glove technology and speech commands, the operator directly controls the robot arm and dexterous end effector which appear to be spatially correspondent with his own arm" (107).

⁶ Virilio coined the term "trans-appearance" to indicate that in this age of real-time transmission of sensible appearances it is no longer light alone that lets us see, but its speed. According to Virilio, "Transparency is not only that of the appearance of objects seen at the instant of the gaze. It suddenly becomes that of appearances transmitted instantaneously over distance; therefore I propose the term TRANS-APPEARANCE of 'real time,' and not only the TRANSPARENCY of the 'real space'" (*L'Inertie Polaire* 108).

⁷ The telerobot named Ornitorrinco ("platypus" in Portuguese) came to life in 1989 in Chicago as a result of my collaboration with hardware designer Ed Bennett. *Ornitorrinco* is the name of both a series of telepresence art works realized between 1989 and 1996 and the telerobot used to realize them. See: Eduardo Kac. "Dialogical Telepresence Art and Net Ecology." *The Robot in the Garden: Telerobotics and Telepistemology in the Age of the Internet*. Ed. Ken Goldberg. Cambridge: MIT P, 2000: 180-196.

Chapter 5: TELEPRESENCE ART: PRACTICAL RESEARCH

The previous chapter discussed the theoretical implications of the notion of telepresence in art. In what follows I will document and discuss the practical aspects of my research, which is comprised of two problems. The first problem is: what are the issues involved in the creation of an artwork that enables a remote participant to be in control of an airborne telerobot (that is, a remote controlled robot), at the same time that the participant's actions affect and are affected by additional participation in a virtual world? I researched this question through the creation and production of an artwork entitled "Uirapuru", which was presented in 1999 at InterCommunication Center, Tokyo. The second problem that is the object of my investigation is: what are the issues involved in the creation of an artwork that enables a remote participant to use telepresence to affect a living organism? My specific goal is to create an artwork that uses the Internet to allow remote participants to send light to a plant in total darkness, thus enabling it to grow as a result of the remote action of the participant. I seek to accomplish this using the Web, with an interface that can operate with standard Web browsers. This issue was researched through the creation and production of an artwork entitled "Teleporting an Unknown State - Web version", originally presented in 1998 at Kibla Art Gallery, Maribor, Slovenia. What are the aesthetic parameters of these two propositions? What are their theoretical underpinnings? On a practical level, what are the issues that inform the accomplishment of the goals stated above? These are the guiding questions I seek to investigate in this chapter.

BRIDGING THE PHYSICAL AND THE VIRTUAL

Telepresence and virtual reality have opened up new areas of artistic experimentation. Scientific telepresence research focuses on telerobotics and teleoperation. The development of commercial virtual reality technologies has enabled individuals to experience a completely synthetic environment from immersive or second-person perspectives. When used in radical ways to critique aspects of the mediascape and contemporary life, hybrids of these and other technologies have helped electronic artists chart new directions for contemporary art.¹

In the future telepresence and virtual reality will become more integrated.² This integration will enable actions that will take place inside an immersive virtual environment to affect a physical reality and vice-versa. The same can be said about the use of these technologies in art. However, it is also possible to make an objective distinction between the two.³ In this sense, I will use the word *telepresence* in relation to telerobotics (the remote control of a non-autonomous robot in a distant physical space) or to a telematic work in which an online participant can trigger physical events in a remote location. The phrase *virtual reality* will be employed in relation to the creation and experience of purely digital worlds.

The distinction between telepresence and virtual reality can be further clarified by comparing the processes of these two technologies. Virtual reality relies on the power of illusion to give the observer a sense of actually being in a synthetic world. VR makes perceptually “real” what in fact only has virtual (digital) existence. By contrast, telepresence transports an individual from one physical space to another, often via a telecommunications link.

Telecommunications and robotics can bring together the transmission and reception of motion control signals with audiovisual, haptic, and force feedback. Telepresence virtualises what in actuality has physical, tangible existence.

In fact, from this point of view, it would almost seem that virtual reality and telepresence technologies are opposite in nature. However, I propose that the rise of these two technologies indicates that the new domain of human agency encompasses with the same intensity both electronic space and physical space. Under specific circumstances, digital or synthetic worlds may become “equivalent” to tangible realities, since both telepresence and virtual reality technologies can project human performance beyond its ordinary, immediate reach.

TELEPRESENCE: INTERACTION FROM AFAR

The introduction of televirtual technologies in society is remapping our domain of action and interaction in all public spheres. The social introduction of new technologies has always affected cultural sensibility, from the mechanical press to photography, from telegraphy to the telephone, from the phonograph to cinema, radio, television, the personal computer, and the Internet. New information technologies generate new contexts for the production, distribution, and reception of cultural works as well as new ways of understanding familiar scenarios. They have the power to modify the social arena through the introduction of new forms of intercourse and negotiation of meaning. Our systems of symbolic exchange are increasingly incorporating new multimedia elements introduced by the merger of telecommunications, real-time computing, and worldwide networking. It is clear that phone calls and email messages will

never be the same when full-motion video (30 fps) takes over pervasive broadband digital lines. Conversations will become multimedia and telepresential experiences. Incorporating tactile feedback, for example, will become ordinary. Technology will continue to migrate towards the body, reconfiguring, expanding, and transporting it to remote sites.⁴

The art of telepresence redefines our understanding of human potential by expanding the reach of human presence in real time beyond spatiotemporal barriers. Through events, systems, and ephemeral installations telepresence art interface the human body to computers and other electronic devices. The dominant presence of the local object in the visual arts⁵ makes room for the immaterial experience of telepresence.⁶ While throughout the twentieth century one observed the process of dematerialization of the art object,⁷ it could be also suggested that an immaterial art has emerged as consequence of the use of telecommunications media and networks by artists. Immaterial art does not mean art without any physical substrates; rather, it signifies the exploration of televirtual domains and networks and a primary emphasis on the participant's experience instead of the objects that enable the experience.

I have investigated these presuppositions through the creation of two artworks that explore elements such as co-existence in virtual and real spaces, telerobotic navigation, synchronicity of actions, real-time remote control, and remote interaction through networks.

UIRAPURU

The telepresence work *Uirapuru* [Figure 1] was shown from October 15 through November 28, 1999, in the context of the ICC Biennale '99, at the

InterCommunication Center, Tokyo, and on the Web. The word “Uirapuru” (Musician Wren) is the name of both an actual Amazonian bird (Cyphorhirus arada) and a legendary creature.⁸ In the rain forest, the bird Uirapuru sings for about ten days, only in the morning, and only once a year, when it mates and builds its nest. According to the legend, of Tupi origin, Uirapuru’s song is so beautiful that all other birds stop singing to listen to it. Yet, in another account of the legend, a human being is transformed after his death into the enchanted Uirapuru, breathing new life into the silent forest. Another interpretation of the Uirapuru legend states that it can bring love or happiness to those who own it as a talisman or those who drink cauim (an ancient native brew) mixed with Uirapuru’s ashes. (Casculo 756-757) The Uirapuru story has many more versions, and composers such as Heitor Villa-Lobos (*Uirapuru*, *symphonic poem*, 1917), Olivier Messiaen (*Et exspecto resurrectionem mortuorum*, 1964), and Tom Eastwood (*Uirapuru*, 1983) reworked Uirapuru’s folklore and melodic line in their own work. Both in legend and reality Uirapuru is a symbol of rarefied beauty.



Figure 1 - *Uirapuru*, telepresence work on the Internet, 1999.

I have always been fascinated by the Uirapuru story and by its dual status as real and legendary. With the interactive telepresence work, *Uirapuru*, I create my own version of the legend. In my personal mythology, Uirapuru is a flying fish that hovers above the forest, singing and giving good fortune to forest inhabitants. My Uirapuru sings when it hosts the spirits of those who are far away. “Pingbirds,” fantastic creatures whose melody oscillates according to the rhythm of global network traffic, populate Uirapuru’s forest. Uirapuru’s own spirit is hosted by a virtual fish, who flies and interacts online in virtual space with other virtual fish. Thus, Uirapuru’s behaviour contributes to increase network traffic [Figure 2] and causes the pingbirds to sing more often.

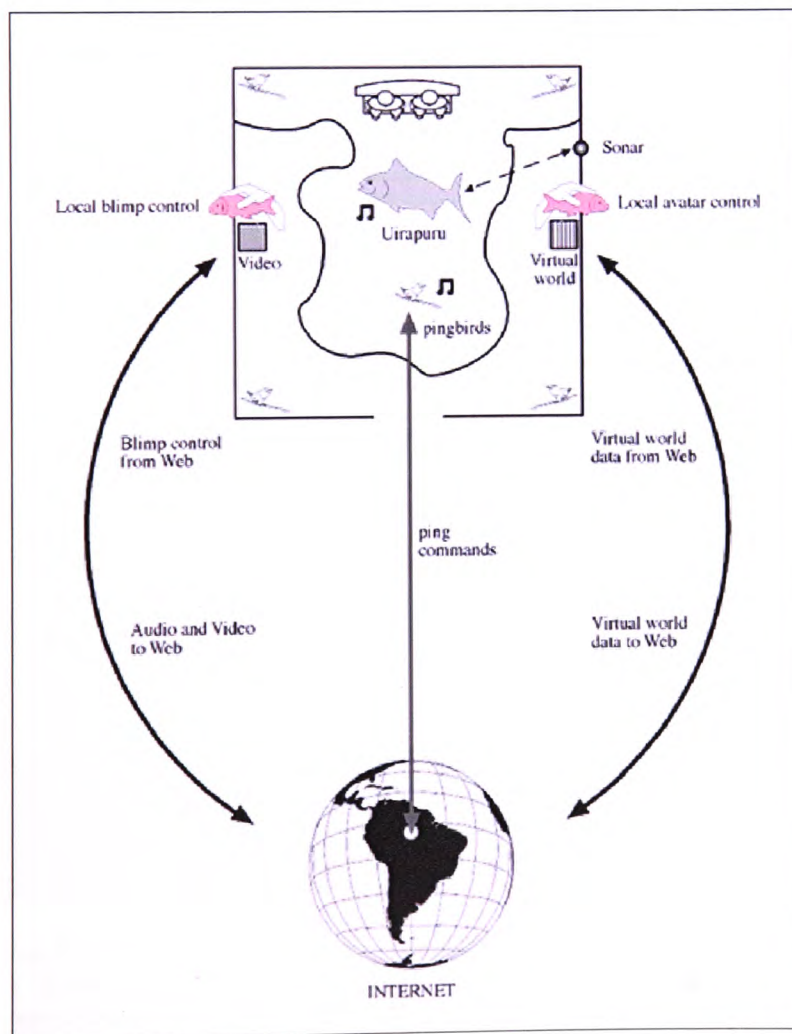


Figure 2: Diagram of *Uirapuru*, telepresence work on the Internet, 1999.

My version of the legend reinvents Uirapuru's dual status as a real animal and a mythical creature through an experience that is at once local and remote, virtual and physical. The flying telerobotic fish is a blimp that can be controlled both through a local interface [Figure 3] and through the Web. The local interface is a fish-shaped object that can be handled and moved freely in three-dimensional space. When participants control it, Uirapuru moves accordingly in the gallery.⁹ Sensors in the gallery track the movement of the telerobotic fish in three-dimensions and send data to the VRML server. As a result, Uirapuru's avatar moves in the virtual space according to the movement of the telerobotic fish in the gallery. Video from the point of view of the telerobotic fish is seen in the gallery and is streamed live on the web.



Figure 3: Interface of *Uirapuru*. Two identical interfaces were used, one for the telepresence station and the other for the virtual reality station. At the telepresence station, a three-dimensional tracker inside the colored fish gave movement instructions to the flying robotic fish. At the virtual reality station, a three-dimensional tracker inside the colored fish gave movement instructions to the local participant's online avatar.

There is a direct correspondence between the physical organization of the gallery space [Figure 4] and the Web interface in *Uirapuru*. In the gallery, once the participant approached the *Uirapuru* forest, she had to choose between walking to the left or right. Because of the dense concentration of trees, it was not possible to walk straight into the space. Likewise, once the participant accessed the *Uirapuru* interface on the Web, she had to choose between clicking on the left or right. There were no clickable options in the middle. If the participant chose to walk to the left in the gallery, she discovered a reddish, earthly-toned pedestal. The top of this pedestal was a flat video display, over which rested the fish-shaped interface. The video on the flat panel (full frame, 30 fps) revealed the top of the canopy from the ever-changing perspective of the flying telerobot, *Uirapuru*. This was the telepresence portal. An identical set-up was found when the participant walked to the right side of the gallery. On the right, however, this set up worked as the virtual portal. The image on the flat panel revealed the virtual world from the perspective of an avatar that was logged on by default to enable gallery participants to fly in the virtual world and to see the other online participants navigating in the same world. On the Web, in correspondence with the gallery spatial organization, clicking on the left opened the telepresence portal; clicking on the right opened the virtual portal.

Uirapuru's online telepresence interface [Figure 5] was composed of a rectangular window in the middle of the screen, which showed the live video stream coming from the point of view of the telerobot, *Uirapuru*. Slightly to the right of this window there was a vertical bar for dynamic volume control, with which online participants could change the volume of the incoming, video-synchronized, streaming audio of Amazonian bird songs heard in the remote

gallery. Surrounding this window there were six java buttons. Online participants clicked on them to control the flight pattern of the telerobot, Uirapuru, in up/down, left/right, and forward/backward trajectories.

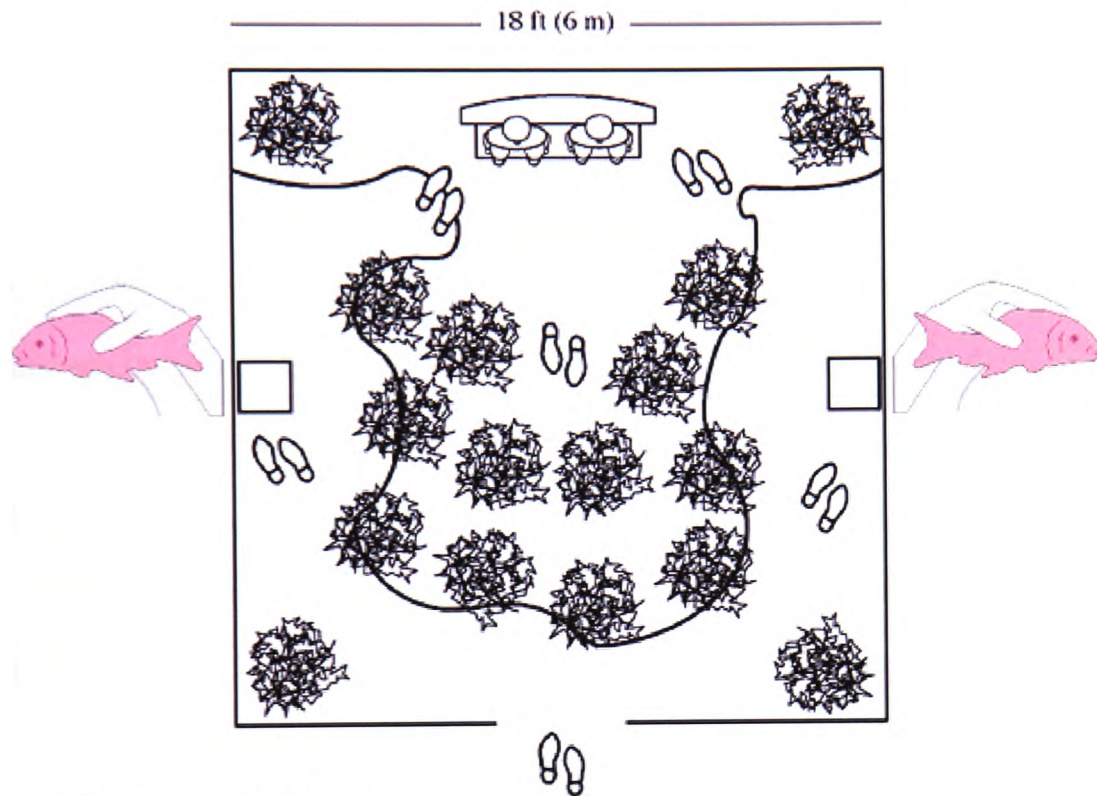


Figure 4: Floor plan of *Uirapuru*.

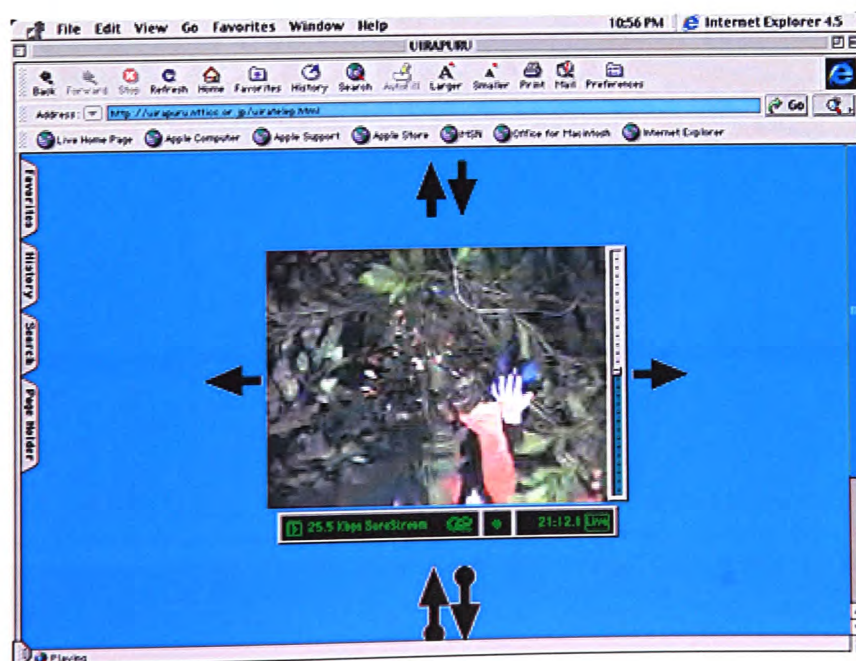


Figure 5 – Online telepresence interface of *Uirapuru*.

Uirapuru's online, multi-user, virtual reality interface was composed of a window with a digital forest [Figure 6]. The trees were concentrated on a brown floating square, which corresponded to the 6X6m gallery space. On the lower right corner, the participant was asked to choose an avatar from a list of fish (blue, red, green, yellow) or to type a URL with a link to his or her own avatar of choice. Once logged in the virtual world with the selected avatar, the participant saw below the world a chat window (bottom left) and a list of participants (bottom right). Participants were able to move freely in the world, going in any direction and traversing any objects.

In the gallery, participants could only experience one portal at a time, having to walk to the other side of the space to experience the other portal. On the Web, participants were able to keep both portals open at once, leaving one in the foreground and the other in the background, and toggling between them.

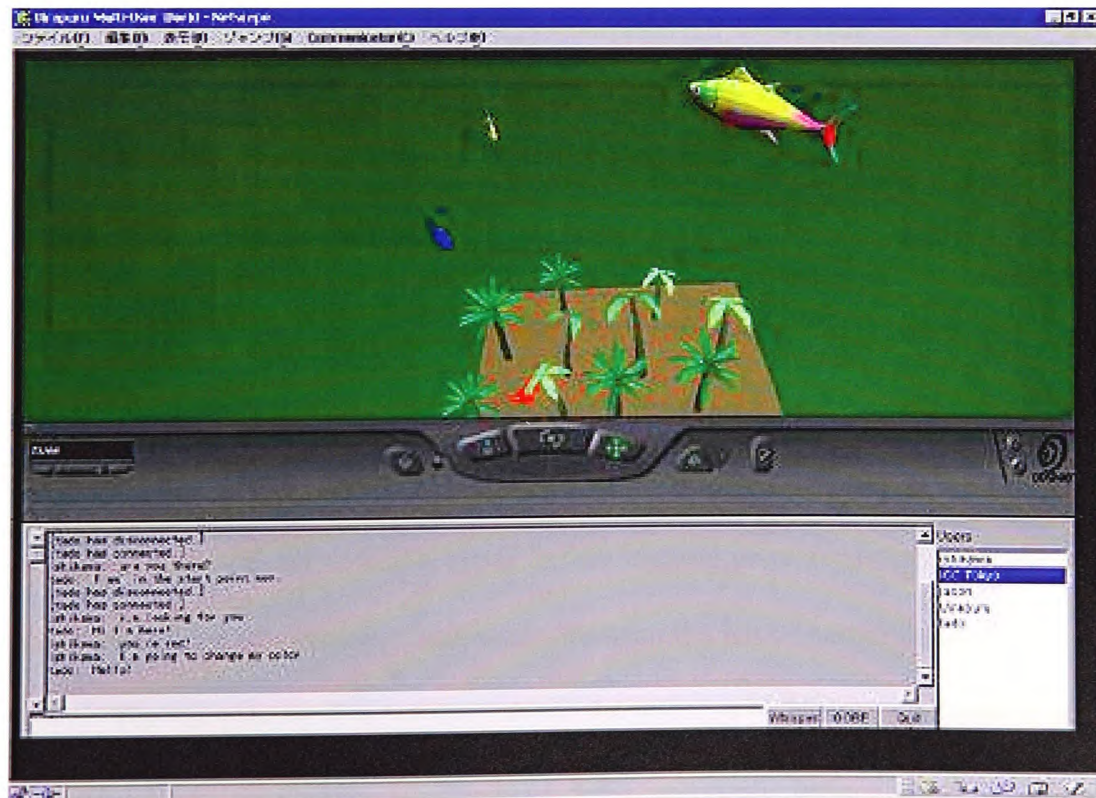


Figure 6: *Uirapuru's* online multi-user virtual reality interface.

Both the telepresence and the virtual interfaces in the gallery were composed of a pedestal with a flat video display for its top, over which rested the fish-shaped interface. Measuring approximately eight inches, the fish had a three-dimensional tracking device inside, which gave a local computer information about its position, orientation, and movement. When participants handled the fish interface freely over the telepresence station, the telerobot, Uirapuru, flew accordingly in real time in the gallery (up/down, left/right, forward/backward). When participants grabbed and moved the fish interface at the multi-user VRML station, they moved their avatar accordingly in the virtual world (also in all directions).

Both local and remote participants were always aware of each other's actions. Since the video from the perspective of the telerobot was constantly streaming, independent of who was controlling the flying telerobot at the moment, Web participants could see local gallery visitors from above (the telerobot's point of view). When the telerobot seemed to move by itself, without local control, gallery visitors became aware that somebody online was on Uirapuru's body. Likewise, when a fish with the "ICC Tokyo" tag above it was moving in the virtual world, online participants became aware that a local participant was present and active in it. If local participants saw any fish other than Uirapuru in the virtual world, they knew that someone online was participating at that moment. A tag of one's choice, typed before logging on, was always seen above one's avatar, clearly showing who was who from the list of participants.

The telerobotic fish hovered above the forest, which was populated by six colourful pingbirds [Figure 7]. Pingbirds were telerobotic birds that sang their songs according to ping commands sent to a server geographically located in the

Amazon region (where the rainforest is located).¹⁰ The ping command is a regular part of the Unix system, which is at the core of the Internet. It operates by sending a packet to a designated address and waiting for a response. It is used to monitor round-trip travel time and as such is a direct measurement of Internet activity. In *Uirapuru*, greater Internet traffic resulted in the telerobotic birds singing more often.



Figure 7: The six pingbirds (robotic birds) in the forest. Pingbirds are telerobotic birds that send ping commands to servers geographically located in the Amazon region (where the rainforest is located). The pingbirds sing the songs of real Amazonian birds according to the rhythm of global network traffic. The ping command operates by sending a packet to a designated address and waiting for a response. It is used to monitor round-trip travel time and as such is a direct measurement of current Internet traffic. In the interactive telepresence installation, *Uirapuru*, greater Internet traffic results in the telerobotic birds singing more often.

The pingbirds were placed strategically in the gallery space to create an immersive sound experience. One pingbird was placed in each of the four corners, while the remaining two were placed around the middle of the space. The flying telerobot, which had a speaker onboard, was also part of the pingbird system, providing an additional sound source from above. To reflect the rarity of Uirapuru's song in the rain forest, its song was only available forty percent of the time when compared with the six pingbirds. This meant that, depending on how much time a visitor would spend in the space, she would hear all other pingbirds but might hear Uirapuru's song only once or not at all.

Uirapuru merged virtual reality with telepresence on the Internet. Virtual reality offers participants a purely digital space that can be experienced visually and in which one can be active, in this case the VRML forest populated by flying fish. Telepresence provides access and a point of entry to a remote physical environment, in this case the "Amazon forest." This forest consisted of over twenty artificial trees, on top of which vividly painted pingbirds were perched. The Internet's information flow was expressed in the gallery through the melodic pattern of the pingbirds. In a direct way, anybody who participated in this work, locally or online, increased Internet traffic and as result contributed to increase the frequency of the pingbird chorus. At the back of the space, along a pathway, hidden within the forest, a bench [Figure 8] awaited local visitors who were invited to rest and enjoy the songs of Uirapuru and the Amazonian pingbirds.



Figure 8: Detail of *Uirapuru*. At the back of the space, along a pathway, hidden within the forest, a bench awaited local visitors who were invited to rest and enjoy the songs of Uirapuru and the Amazonian pingbirds.

TELEPORTING AN UNKNOWN STATE — WEB VERSION

Teleporting an Unknown State— Web Version is the title of my telepresence installation shown at KIBLA Art Gallery, in Maribor, Slovenia from October 24 to November 7, 1998.¹¹ *Teleporting an Unknown State— Web Version* combined biological growth with Internet (remote) activity¹². In a very dark room, a structure with earth served as a nursery for a single seed. Through a video projector suspended above and facing the earth bed [Figure 9], remote individuals sent light via the Internet to enable this seed to photosynthesise and grow in total darkness¹³. The installation created the experience of the Internet as a life-supporting system.

As local viewers walked in they saw the installation: a video projector placed above the ceiling and faced downward, where a single seed lay on a bed of earth. Viewers didn't see the projector itself, only its cone of light projected through a circular hole in the ceiling. The circularity of the hole and the projector's lens flushed with it are evocative of the sun breaking through darkness. At remote sites around the world, anonymous individuals used the Web to activate digital cameras (known as "webcams") trained at the sky of different cities and transmitted sun light to the gallery. The photons captured by cameras at the remote sites were re-emitted through the projector in the gallery¹⁴. The video images transmitted live from remote countries were stripped of their representational value, and used as conveyors of actual waves of light. The slow process of growth of the plant was transmitted live to the world via the Internet as long as the exhibition was up. All participants were able to see the process of growth via the Internet. A portion of the Web interface showing the selected city was projected directly onto the bed of earth in a dark room, enabling direct physical contact between the seed and the photonic stream.

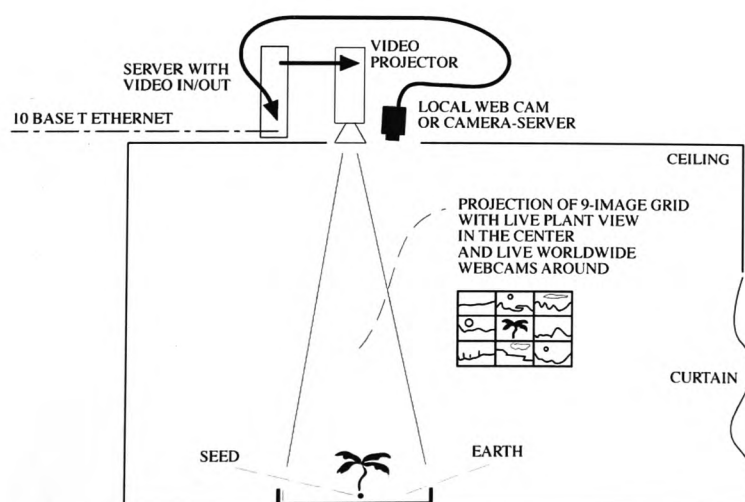


Figure 9: Diagram of *Teleporting an Unknown State— Web Version* (first implementation, 1998).

What the participant saw on the Web [Figure 10] was a nine-image grid, comprised of a central image (the plant) and eight surrounding images (live views of the skylines of different cities). The central image showed the plant and the earth in the dark physical space at the gallery, in Maribor, and was updated automatically (to provide feedback to web participants). The eight surrounding images were activated by web participants at will and immediately projected onto the earth, where the seed was planted in the gallery. The position of the images on the grid reflected the real position of their respective places on the globe, as represented by standard maps. I positioned Maribor at the centre, and the other locations around it: Vancouver (top left), Chicago (left), Cabo Lucia, Mexico (bottom left), Paris (top centre), Antarctica (bottom centre), Moscow (top right), Tokyo (right), and Sydney (bottom right).



Figure 10: Web interface of *Teleporting an Unknown State— Web Version* (first implementation, 1998).

The central image was captured and uploaded automatically with a self-contained camera server (a video camera with embedded web server), to which I added a time stamp showing day and time in Maribor. When projected over the plant, this central image concentrated the light sent by web participants. The eight surrounding images [Figure 11] were uploaded interactively upon the web participant's request. The default state of this work was a central image surrounded by black rectangles (which were filled with live images when requested by the participant). If one saw a black image when he or she logged on, either it was dark at the moment at the selected geographic location or the previous web participant had not selected the corresponding image. Once selected by the web participant, an image remained active (online and in the gallery) for five minutes. After this period it was replaced by a black rectangle, to enable incoming participants to make their own choices. This work enabled Web participants to seamlessly harness the light of the sky from eight different locations to grow a plant in a dark room in Slovenia, and to monitor its progress.



Figure 11: Detail of the Web interface of *Teleporting an Unknown State— Web Version* (first implementation, 1998).

Network topology is an area of artistic creativity. Just as the facture in painting or the rhythm of the line in drawing create the specific quality of a picture, network topology contributes to produce the specific quality of an online piece. The poetics of this piece's network topology operated a dramatic reversal of the regulated, unidirectional model imposed by broadcasting standards and the communications industry. Rather than transmitting a specific message from one point to many passive receivers, *Teleporting an Unknown State— Web Version* created a new situation in which several individuals in remote countries transmitted light to a single point in the remote gallery. The ethics of Internet ecology¹⁵ was made evident in a distributed and collaborative effort.

By merging remote participation through the Internet, geographically dispersed spaces, real-time control (of the projector), and webcams dispersed worldwide, this online telepresence installation produced a form of interactive art that does not conform to unidirectional structures that form the mainstream mediascape. As the analogue mediascape of radio and television becomes digital, mass media's monological discourse (one-to-many) will try to renew its system and its reach through pseudo-interactive gadgets, attempting to absorb and domesticate the multilogue discourse (many-to-many) genuinely practiced on the Internet.

Teleporting an Unknown State— Web Version points to a poetic alternative in which the Web is experienced not as a medium for dissemination of information or for the acquisition of goods, but instead as a medium for the redistribution of natural resources. The piece also suggests that the expansion of communications and telepresence technologies will prompt new forms of interface between computers, networks, and life forms (human and otherwise).¹⁶ A current sign of

this change in science are the chips inhabited by bacteria genetically engineered to glow when detecting pollutants.¹⁷

Further illustrating this connection between biology and technology, during the exhibition of *Teleporting an Unknown State— Web Version*, photosynthesis depended on remote collective action from anonymous participants. Birth, growth, and death on the Internet formed a horizon of possibilities that unfolded as participants dynamically contributed to the work. Collaborative action and responsibility through the network were essential for the survival of the organism.

A newer Web version travelled in 2001 and 2002 as part of the exhibition *Telematic Connections: The Virtual Embrace*, organized by Independent Curators International (ICI), New York, and curated by Steve Dietz, Director of New Media Initiatives, Walker Art Center, Minneapolis. For this version I built a portable and modular structure that contained the plant, server, camera, and video projector [Figure 12]. I also redesigned the Web interface to make the overall experience more intuitive. In this new version, the participant saw the same nine-image grid, but the central image showed only the projection of one city over the plant [Figure 13]. This improved the experience in that it allowed participants to have a more clear understanding of the consequence of their actions, since they could clearly see online the selected city image projected individually over the plant.

Teleporting an Unknown State— Web Version seeks to reflect on the increasing tighter connection between information technologies and the physical world, particularly its biological and ecological aspects. Increasingly people, ideas, objects, influence, and money move fluidly between two or more places.

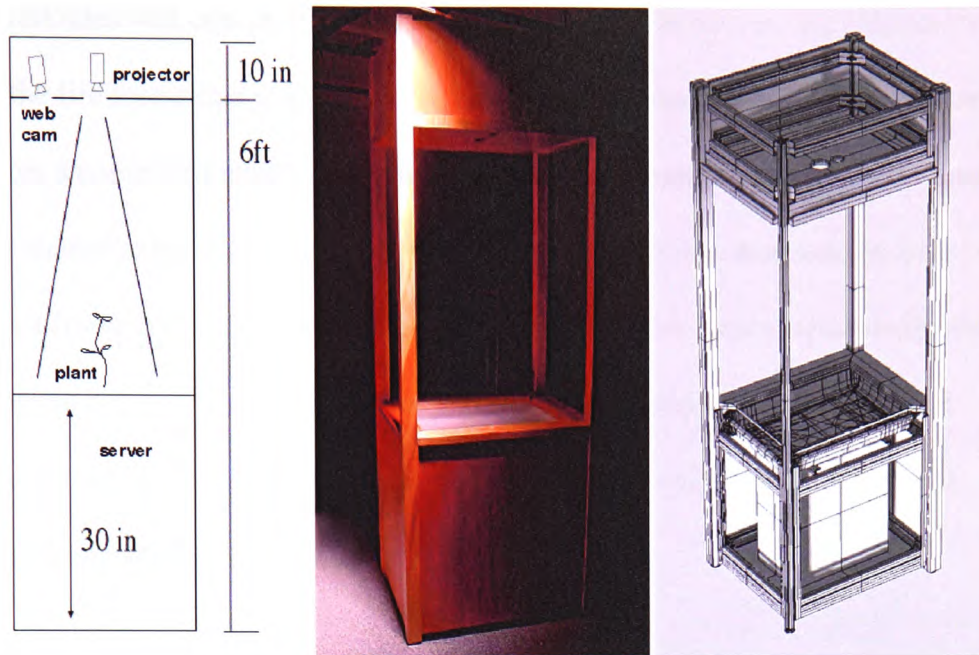


Figure 12: Modular structure of *Teleporting an Unknown State— Web Version* (second implementation, 2001).

Acquaintances, colleagues, friends, and family members dispersed around the world routinely employ email, chat and videoconferencing software to work together, express affection, or simply stay in touch, thus reaffirming social and familial bonds. As a result, we have the notion that a community can exist and thrive as a dispersed but interconnected group in multiple places at once.¹⁸ We have also become acutely aware of the interconnectedness of the world economies and ecologies. Glaring examples are the financial crashes that resonated across Asia, Russia, and Latin America in the 1990s, and the dramatic consequences of the geographic displacement of viruses and insects around the world as a result of increased travel and commercial shipments.

With low earth orbit satellites, portable satellite dishes, virtual retinal displays, wrist phones, holographic video, cloning, transgenics, and a plethora of new inventions currently being researched in laboratories around the world, new

technologies will continue to be developed, exerting impact on the physical world and the life forms that populate it. *Teleporting an Unknown State— Web Version* creates a context in which anonymous participants perceive that it is only through their shared experience and non-hierarchical collaboration that little by little, or almost frame by frame, a new plant grows. In this new reality, spatiotemporal distances become irrelevant, virtual and real spaces become equivalent, and linguistic barriers may be temporarily dissolved in favour of a common, life-supporting experience.



Figure 12: Detail of the Web interface of *Teleporting an Unknown State— Web Version* (second implementation, 2001). A live view from Isummerit, Greenland (top, center) is projected over the plant (center).

End Notes

¹ See: R. Harley, ed. *Cultural Diversity in the Global Village*. Proceeding of the Third International Symposium on Electronic Art. Sydney: ANAT, 1992; K. O'Rourke, ed. *Art-Reseaux*. Paris: CERAP, 1992; R. Verostko, ed. *The Art Factor*. Proceeding of the Fourth International Symposium on Electronic Art. Minneapolis: MCAD, 1993; R. Kriesche, ed. *Teleskulptur*³. Graz, Austria: Kulturdata, 1993; L. Poissant, ed. *Esthétiques des Arts Médiaiques*. Quebec: Presses de l'Université du Québec, 1995; C. Gigliotti. *Aesthetics of a Virtual World: Ethical Issues in Interactive Technological Design*. Diss. 1995; S. Penny, ed. *Critical Issues in Electronic Media*. Albany: SUNY, 1995; M. Lovejoy. *Postmodern Currents; Art and Artists in the Age of Electronic Media*. New Jersey: Prentice-Hall, 1996.

² See: S. Fisher. "Virtual Environments, Personal Simulation & Telepresence." Eds. S. Helsel and J. Roth. *Virtual Reality: Theory, Practice and Promise*. Westport, CT: Meckler, 1991. 101-110; M. Finch et al. "Surface Modification Tools in a Virtual Environment Interface to a Scanning Probe Microscope." *Proceedings of the ACM Symposium on Interactive 3D Graphics*. New York: ACM, 1995. 13-18.

³ See: T. Sheridan. "Defining our terms." *Presence* 1.2 (1992): 272-274.

⁴ See: Stelarc. "Prosthetics, Robotics and Remote Existence: Postrevolutionary Strategies." *Leonardo* 24.5 (1991): 591-595.

⁵ See: M. Fried. "Art and Objecthood." *Artforum*. 5.10 (1967d): 21; F. Colpitt. *Minimal Art; The Critical Perspective*. Seattle: University of Washington, 1990: 67-73.

⁶ See: E. Kac. "Towards Telepresence Art." *Interface* 4.2 (1992): 2-4; E. Kac. "Telepresence Art." *Teleskulptur*³. Ed. R. Kriesche. Graz, Austria: Kulturdata, 1993. 48-72. See also E. Kac. "The Internet and the Future of Art: Immateriality, Telematics, Videoconferencing, Hypermedia, Networking, VRML, Interactivity, Visual Telephony, Artist's Software, Telerobotics, Mbone, and Beyond." (in German) Eds. S. Muenker and A. Roesler. *Mythos Internet*. Frankfurt: Suhrkamp Verlag, 1996.

⁷ See: L. Lippard, ed. *Six Years: The Dematerialization of the Art Object from 1966 to 1972*. New York, Praeger: 1973. See also: Oscar Masotta's lecture "Despues del Pop: Nosotros Desmaterializamos." ("After Pop: Dematerialization"), presented at the Instituto Di Tella on July 21, 1967. The lecture was first published in Masotta's *Conciencia y estructura* (Buenos Aires: Editorial J. Alvarez, 1968): 218-244.

⁸ For information on the actual bird, see: Helmut Sick. *Ornitologia Brasileira, uma Introdução*. Vol. 1 (Rio de Janeiro: Editora Nova Fronteira, 1997); Johan

Dalgas Frisch. *Aves Brasileiras*. Vol. 1. (São Paulo: Dalgas-Ecoltec, 1980); and Rodolpho von Ihering. *Dicionário dos Animais do Brasil*. Brasília: Ed. Universidade, 1968. On the Uirapuru legend, see: Luís da Câmara Cascudo. *Dicionário do folclore brasileiro*. Second Ed. Rio de Janeiro: Ministério da Educação e Cultura / Instituto Nacional do Livro, 1962. 756-757.

⁹ The telerobot Uirapuru has three propellers: one on each side and one at the bottom. During the exhibition, a forward command activated both side propellers in the same direction (clockwise). A backward command made them both turn counter clockwise. Left and right commands made one propeller turn clockwise and the other counter clockwise, and vice-versa. Up and down commands activated the bottom propeller clockwise and counter clockwise, respectively. A sonar in the gallery tracked Uirapuru's movement and instructed the VRML server to move Uirapuru's avatar accordingly. If no instructions were given, because no one was controlling it, Uirapuru's avatar flew in a pattern that took it from above the canopy to the bottom of the forest, and then out in space and back again above the canopy.

¹⁰ The server's IP address, which belonged to the Amazon-based company Netium, was 200.241.125.15. The pingbirds sang the songs of real Amazonian birds according to the rhythm of global network traffic. The birds selected to give voice to the pingbirds were: Uirá-Trovão (Peruvian Wren), Rouxinol (Gray-Breasted Wren), Sabiá-Verdadeiro (Saban Trush), Fri-Frió (Gray Screaming Piha), Galo-do-Mato (Rufous-Vented Anttrush), and Japacanim (Black-Capped Mocking-Trush). Each bird call lasted approximately twenty seconds.

¹¹ See: Peter Tomaz Dobrila and Aleksandra Kostic, eds. *Eduardo Kac: Teleporting An Unkown State*. Maribor, Slovenia: KIBLA, 1998; Matjaz Cernec. "Maribor: Sredisce Sveta." *Vecer*. Maribor. (Oct. 26 1998): 10; David Pescovitz. "Be There Now: Telepresence Art Online." *Flash Art*. (March 1999): 51-52.

¹² This piece was a development from a previous project in which I used a videoconferencing software called "CU-SeeMe", now virtually obsolete. The first version of this project was presented at the Contemporary Art Center, in New Orleans (August 4-August 9, 1996). The piece was part of "The Bridge", the Siggraph '96 Art Show, curated by Jean Ippolito and Carol Gigliotti. See: Eduardo Kac. "Teleporting an Unknown State." *Visual Proceedings: The Art and Disciplinary Programs of SIGGRAPH 96*. New York: ACM, 1996. 28; Parvathi Narayan. "Electronic Art: Pushing the Limits." *Business Times*. Singapore. (August 22, 1998): 14; Avi Rosen. "Virtual Reality and Shaman Worlds." *STUDIO Art Magazine*. Tel Aviv. 98 (Decemeber 1998): 11; Louise Poissant. "L'Art des Possibles." *Etc Montréal*. 46 (June/July/August 1999): 8-13.

¹³ The technical functionality of *Teleporting an Unknown State— Web Version* is achieved with a single computer that provides the web interface for the piece and also controls the projected image at the installation site. The software that controls the piece is a custom Java application that runs on the SuSE Linux operating system. This Java application acts as a web server, so that when a

person connects to the server with a web browser, they are connecting directly to the Java application. The application sends the appropriate web page back to the browser, and also changes the image being projected in the installation to the image that was selected by the user.

¹⁴ Clearly, these are not the very same photons, since no scientific teleportation is taking place. To say that “the photons captured by cameras at the remote sites were re-emitted through the projector in the gallery” is to say in a poetic way that the remote actions of participants had a physical consequence in the gallery (that is, to help the plant stay alive and grow).

¹⁵ By the phrase “Internet ecology” I mean to clarify that the Internet is a shared resource, and that its global behaviour changes dramatically depending on many unpredictable, uncontrollable factors, including the density of nodes in a particular geographic region, bandwidth availability and allocation, nature of the connection, modem and direct-connection speeds, processing power of individual personal computers and servers, choice of connectivity software, and user traffic at a particular time. In this sense, it is important to stress that networking is not broadcasting. To be on the Internet is not similar to transmitting a program over the air (despite emerging technological tours de force, such as satellite-enabled downloading of Web pages and broadcasting television on the Net). Networking is a complex system in which one’s technical choices (or limits) and behaviours directly affects everybody else (whether one is aware of it or not); under certain circumstances, for example, one participant’s slow modem could cause a whole videoconference to bog down. By the phrase “Internet ecology” I also mean to suggest that a new mode of artistic creation emerges when digital networking (telematics) is coupled with biological processes. I have called this “Biotelematics”. See: Eduardo Kac. “Biotelematics.” *Leonardo*. 32.3 (1999): 218-219.

¹⁶ See: R. Weiss. “New Dancer in the Hive.” *Science News*. 136.18 (1989): 282-283; P. Fromherz and A. Stett. “A Silicon-Neuron Junction: Capacitive Stimulation of an Individual Neuron on a Silicon Chip.” *Physical Review Letter*. 75.8 (1995): 1670-1673.

¹⁷ See: Michael L. Simpson, Gary S. Sayler, Bruce M. Applegate, Steven Ripp, David E. Nivens, Michael J. Paulus, and Gerard E. Jellison Jr. “Bioluminescent-Bioreporter Integrated Circuits Form Novel Whole-Cell Biosensors.” *Trends in biotechnology*. 16.8 (1998): 332.

¹⁸ See: Howard Rheingold. *The Virtual Community: Homesteading on the Electronic Frontier*. New York: Harper Perennial, 1993; Sherry Turkle. *Life on the Screen: Identity in the Age of the Internet*. New York: Simon & Schuster, 1995.

SECTION III:
TRANSGENIC ART

Chapter 6 – ART AND BIOTECHNOLOGY

The merger of biology and technology in the creation of an artwork, as I have demonstrated with *Teleporting an Unknown State—Web Version*, opens new aesthetic possibilities. This is precisely the second focus of my research: the investigation of biotechnology as a new medium, in general terms, but specifically the manipulation of genes and proteins as artistic materials in the creation of transgenic organisms. The questions I seek to address are: the encoding, transformation, and recovery of verbal information in invented genes; the use of protein visualization techniques to produce nanostructures (sculptural forms) derived from these invented genes that can be rendered at a human scale; the expression of engineered genes in mammals and the engagement of humans with such animals in a dialogic relationship; the creation of biological robots, that is, robots partially controlled by living organisms integrated in its body; the creation of a transgenic ecology with several organisms enabling these life forms and the public to interact in complex ways, both locally and through the Internet. I will research these issues through the creation and production of a series of artworks, which will be discussed in the following chapters. I will start by introducing in the present chapter the theoretical issues that inform my research and will proceed in the subsequent chapters to outline the conceptual and practical facets of the research.

CULTURAL IMPLICATIONS OF BIOTECHNOLOGY

Molecular genetics has had a profound impact on the contemporary understanding of life. Genetics is often thought of as a “language” (even though

this view has been the object of criticism ¹⁾ and computers are increasingly used not only to create virtual models of biological systems but also to synthesize and analyse genes, and to generate and store information about living organisms. The gradual passage of biology from a life science to an information science provokes debates on the cultural implications of biotechnology,² affecting by extension the visual arts. As controversial as it is stimulating, biotechnology is by no means new. The use of microorganisms to produce chemical compounds goes back to the beginning of recorded history, including the use of fermented juices to produce vinegar and alcoholic beverages. What is different about contemporary biotechnology is the development of genetic engineering and related procedures to exert precise and complete control over living organisms at microscopic levels. Uniquely distinct about molecular biology is the range of goals, ever more ambitious, and the wide assortment of results, at times shocking to the general public.³ At the level of microorganisms we find, for example, bacteria that convert agricultural garbage into fuel alcohol.⁴ At the other extreme, the mammalian level, one of the most striking developments of the 1990s was Dolly,⁵ the cloned sheep, soon followed by the cloning of mice⁶ and cows.⁷ These are just but a few examples that clearly illustrate the complexity of the biotech culture.

Another aspect of the transformation of biology into an information science is the understanding of genetic events in light of semiotics and communications theory, particularly the field known as biosemiotics,⁸ which studies communication and signification in living systems. Biosemiotics regards communication as the essential characteristic of life. With its emphasis on context and meaning, it serves as a healthy antidote to genetic determinism (the belief that every single aspect of life is determined by genes). Because of its conventionalist

nature, traditional semiotics cannot be directly applied to biological systems, however. Peirce⁹ stressed the representation of an object in the human mind invoked by the sign vehicle. Sebeok¹⁰ went beyond the human mind and speech ability in defining zoosemiotics, or the study of visual, acoustic, and chemical signs used by animals. When considering plants, which are believed not to have a mind or not be conscious,¹¹ but which seem to interpret signs,¹² one has to expand definitions of interpretation (make them less humanlike) and widen the scope of communications research to include interspecies interaction.

The human form is also affected by biotechnology research. New technologies culturally mutate our perception of the human body from a naturally self-regulated system to an artificially controlled and electronically transformed object. The digital manipulation of the appearance of the body (and not of the body itself) clearly expresses the plasticity of the new identity of the physical body. We observe this phenomenon regularly through media representations of idealized or imaginary bodies, virtual-reality incarnations, and network projections of actual bodies (also known as “avatars”¹³). Parallel developments in medical technologies, such as plastic surgery and neuroprosthesis, have ultimately allowed the expansion of this immaterial plasticity to actual bodies. The skin becomes a site of continuous transmutation. As a result, a new problem emerges: the impact of biotechnologies that operate beneath the skin (or inside skinless bodies, such as bacteria) and therefore out of sight. More than make visible the invisible, telepresence and biotechnological art can raise the awareness of what firmly remains beyond our immediate visual reach but which, nonetheless, affects us in a direct way. Two of the most prominent technologies operating under the skin are genetic engineering and digital implants¹⁴. Judging from the pace of their

current development, both will have profound consequences in art as well as in our social, medical, political, and economic life in the future.

ART AS THE LITERAL CREATION OF LIFE

My research has lead me to propose that a new art form, which I shall call transgenic art, can be seen to emerge from the use of genetic engineering techniques to create unique living beings. This can be accomplished by transferring synthetic genes to an organism, by mutating an organism's own genes, or by transferring natural genetic material from one species into another. Molecular genetics allows the artist to engineer the plant and animal genomes and create new life forms.¹⁵ The nature of this new art is defined not only by the birth and growth of a new plant or animal, but above all by the nature of the relationship between artist, public, and transgenic organism. Organisms created in the context of transgenic art can be taken home by the public to be grown in the backyard or raised as human companions, unless a particular law forbids or a regulatory institution refuses permission. I would want to insist that there should be nothing calling itself transgenic art which does not exhibit a firm commitment to and responsibility for the new life form thus created. From the perspective of interspecies communication, transgenic art calls for a dialogical relationship between artist, creature, and those who come in contact with it.

SELECTIVE BREEDING OF VEGETABLE, FRUITS AND ORNAMENTAL PLANTS

If the creation of new life forms may seem unprecedented, it is important to recognize that human-generated hybrid living organisms (and their by-products) are routinely integrated into our daily experience. A case in point is the

well-known work of botanist and scientist Luther Burbank (1849-1926) who invented many new fruits, plants, and flowers.¹⁶ In 1871, for example, he developed the Burbank potato (also known as the Idaho potato). Because of its low moisture and high starch content, it has excellent baking qualities and is perfect for french fries. Since Burbank, artificial selective breeding of plants and animals has been a standard procedure widely used by farmers, scientists, and amateurs alike. Selective breeding is a long-term technique based on the indirect manipulation of the genetic material of two or more organisms and is responsible for many of the crops we eat and the livestock we raise. Domestic ornamental plants and pets thus invented are already so common that one rarely realizes that a loved animal or a flower offered as a sign of affection are the practical results of concerted scientific effort by humans. Hybrid Teas, for example, are the typical roses found at a florist shop—the classic image of the rose. The first Hybrid Tea was “La France,” raised by Jean-Baptiste Guillot in 1867. A cherished companion such as the Catalina Macaw, with its fiery orange breast and green-and-blue wings, does not exist in nature. Aviculturists mate blue-and-gold macaws with scarlet macaws to create this beautiful hybrid animal.¹⁷

CHIMERAS IN MYTHOLOGY, ART AND SCIENCE

The creation of these new animals is not at all surprising, considering that cross-species hybrid creatures have been part of our imaginary for millennia. In Greek mythology, for example, the chimera was a fire-breathing creature represented as a composite of a lion, goat, and serpent. Sculptures and paintings of chimeras, from ancient Greece to the Middle Ages and on to modern avant-garde movements, inhabit museums worldwide. Chimeras, however, are no

longer imaginary; they are being routinely created in laboratories and are slowly becoming part of the larger genescape. Here I employ the word “chimera” in its cultural, not scientific sense. Examples include pigs that produce human proteins,¹⁸ plants that produce plastic,¹⁹ and goats with spider genes designed to produce a strong and biodegradable fabric.²⁰ While in ordinary discourse the word “chimera” refers to any imaginary life form made of disparate parts, in biology “chimera” is a technical term that means actual organisms with cells from two or more distinct genomes. A prime example of scientific chimera is the “geep,” an animal with cells from goat and sheep created by Steen Willadsen and his team. (Willadsen, Fehilly, and Tucker 634-36) A profound cultural transformation takes place when chimeras leap from legend to life, from representation to reality.

DIFFERENCE BETWEEN BREEDING AND GENETIC ENGINEERING

Likewise, there is a clear distinction in process between breeding and genetic engineering. Breeders manipulate indirectly the natural processes of gene selection and mutation that occur in the wild. Breeders are unable, therefore, to turn genes on or off with precision or to create hybrids with genomic material so distinct as that of a dog and a jellyfish. In this sense, a distinctive trait of transgenic art is that the genetic material is manipulated directly: the foreign DNA is precisely integrated into the host genome. In addition to genetic transfer of existing genes from one species to another, we can also speak of “artist’s genes,” chimeric genes or new genetic information completely created by the artist through the complementary bases A (adenine) and T (thymine), or C (cytosine) and G (guanine). This means that artists can not only combine genes from

different species, but can also write a DNA sequence on their word processors, email it to a commercial synthesis facility, and in less than a week receive a test tube with millions of molecules of DNA with the expected sequence.

Every living organism has genes that can be manipulated, and the recombinant DNA can be passed on to the next generations. The artist literally becomes a genetic programmer who can create life forms by writing or altering a given sequence. With the creation and procreation of bioluminescent mammals and other creatures in the future,²¹ dialogical interspecies communication will change profoundly what we understand as interactive art. My research has led me to believe that there is no reason to discriminate these animals and that, once in the custody of humans, they should be loved and nurtured just like any other animal.

TRANSGENICS AND ETHICS

The result of transgenic art processes must be healthy creatures capable of as regular a development as any other creatures from related species.²² As genetic engineering continues to be developed in the safe harbour of scientific rationalism, nourished by global capital, it unfortunately remains partially sheltered from larger social issues, debates on ethics, and local historical contexts. The patenting of new animals created in the lab²³ and of genes of indigenous and tribal peoples²⁴ is unacceptable—a situation often aggravated, in the human case, by the lack of consent, equal benefit, or even understanding of the processes of appropriation, patent, and profit on the part of the donor. Since 1980, the U.S. Patent and Trademark Office (PTO) granted several transgenic animal patents, including patents for transgenic mice and rabbits. The debate over animal patents has

broadened to encompass patents on genetically engineered human cell lines and synthetic constructs (“plasmids”) incorporating human genes. As I shall show, the use of genetics in art offers a reflection on these developments from a social and ethical point of view. It could foreground related relevant issues such as the domestic and social integration of transgenic animals and the arbitrary delineation of the concept of “normalcy” through genetic testing, enhancement, and therapy. It also creates a critical context in which to examine and undermine reductionism (a view that asserts that entities of a given kind —animals, for example— are collections or combinations of entities of a simpler or more basic kind —that is, genes) and eugenics (the science of using controlled breeding to increase the occurrence of desirable heritable characteristics in a population).

As we try to negotiate social disputes, it is clear that genetic engineering will be an integral part of our existence in the future. It will be possible, for example, to harness the glow of the jellyfish protein for optical data storage devices.²⁵ Transgenic crops will be a predominant part of the landscape, transgenic organisms will populate the farm, and transgenic animals will become part of our expanded family. For better or worse, vegetables and animals we eat will never be the same. Genetically altered soybeans, potatoes, corn, squash, and cotton have been widely planted and consumed since 1995.²⁶ Although ecological risks are yet to be fully assessed, the development of “plantibodies” (human genes transplanted into corn, soy, tobacco, and other plants to produce acres of pharmaceutical-quality antibodies), promises cheap and abundant much needed proteins.²⁷ While in many cases research and marketing strategies place profit above health concerns (the risks of commercialisation of unlabeled and potentially sickening transgenic food cannot be ignored),²⁸ in others biotechnology seems to

offer real promises of healing in areas difficult to treat effectively with traditional methods. In the future, foreign genetic material will be present in the human body as commonly as mechanical and electronic implants.²⁹ As the concept of species based on breeding barriers is undone through genetic engineering,³⁰ the very notion of what it means to be human is at stake. In the following chapters I will investigate the aesthetic implications of this process of economic and social transformation through a series of artworks, respectively titled “Genesis” (1999), “GFP Bunny” (2000), and “The Eighth Day” (2001).

End Notes

¹ Richard Doyle. *On Beyond Living: Rhetorical Transformations of the Life Sciences*. Stanford, CA: Stanford University Press, 1997; Lily Kay. *Who Wrote the Book of Life?* (Stanford, CA: Stanford University Press, 1999).

² See: Michael W. Fox. *Superpigs and Wondercorn*. New York: Lyons and Burford, 1992; Ruth Hubbard and Elijah Wald. *Exploding the Gene Myth: How Genetic Information Is Produced and Manipulated by Scientists, Physicians, Employers, Insurance Companies, Educators, and Law Enforcers*. Boston: Beacon Press, 1993; Dorothy Nelkin. *The DNA Mystique: The Gene As a Cultural Icon*. New York: Freeman, 1996; Philip Kitcher. *The Lives to Come: The Genetic Revolution and Human Possibilities*. London: Allen Lane, 1996; Mark A. Rothstein, ed. *Genetic Secrets: Protecting Privacy and Confidentiality in the Genetic Era*. New Haven: Yale UP, 1997; Vandana Shiva. *Biopiracy: The Plunder of Nature and Knowledge*. Boston: South End, 1997; Donna J. Haraway. *Modest-Witness, Second-Millennium: Femaleman Meets Oncomouse: Feminism and Technoscience*. New York: Routledge, 1997.

³ In the 1990s scientists announced developments such as the growth of eyes in multiple parts of the body of fruit flies (Halder et al 1988), the creation of headless frogs (Bea and Slack 1995), the successful birth of chicks embodying the behaviour of quails (Balaban 2001), and the growth of a prosthetic human ear on the back of a mouse (Vacanti et al 1990). These are just but a few of the chimerical examples that have serious scientific value and which, at least initially, stir up controversial responses on the part of the general public. The multi-eyed fruit flies and the headless frogs represent isolation and control of specific genes that play a role in organ formation. The quail-like chicks are meant to demonstrate the ability to isolate and transplant behavioural traits. The mouse shows the technical

feasibility of growing organs for surgical cosmetic repair (the ear does not work for hearing).

⁴ See: Y. Murooka and T. Imanaka, eds. *Recombinant Microbes for Industrial and Agricultural Applications*. New York: Marcel Dekker, 1994.

⁵ See: K. H. S. Campbell et al. "Sheep Cloned by Nuclear Transfer from a Cultured Cell Line." *Nature*. 380 (1996): 64-66.

⁶ See: T. Wakayama et al. "Full-Term Development of Mice from Enucleated Oocytes Injected with Cumulus Cell Nuclei." *Nature*. 394 (1998): 369-374.

⁷ Yoko Kato, Tetsuya Tani, Yusuke Sotomaru, Kazuo Kurokawa, Jun-ya Kato, Hiroshi Doguchi, Hiroshi Yasue, and Yukio Tsunoda. "Eight Calves Cloned from Somatic Cells of a Single Adult." *Science*. (Dec 11 1998): 2095-2098.

⁸ See: T. A. Sebeok and J. Umiker-Sebeok, eds. *Biosemiotics: The Semiotic Web*. Berlin: Mouton de Gruyter, 1991.

⁹ See: Charles Sanders Peirce. *Peirce on Signs: Writings on Semiotics*. Ed. James Hoopes. Chapel Hill: U of North Carolina P, 1991.

¹⁰ See: Thomas A. Sebeok. "Communication in Animals and Men." *Language*. 39 (1963): 448-466; Thomas A. Sebeok. *Perspectives in zoosemiotics*. The Hague: Mouton, 1972.

¹¹ See: Alexandra H. M. Nagel. "Are Plants Conscious?" *Journal of Consciousness Studies*. 4.3 (1997): 215-230.

¹² Martin Krampen suggests that plants are capable of interpreting signs although they have no nervous system. See: M. Krampen. "Phytosemiotics." *Semiotica* 36.3/4 (1981): 187-209.

¹³ Bruce Damer. *Avatars! Exploring and Building Virtual Worlds on the Internet*. Berkeley, CA: Peachpit Press, 1998.

¹⁴ Straightening the connection between digital technology and mental activity, memory in particular, Theodore Berger and his colleagues at University of Southern California (a team of neurobiologists, computer scientists, physicists, and electronics engineers) developed a microchip that reproduces the neural activity of a part of the brain involved in memory and learning: the hippocampus. The research is far from concluded, but the goal is to allow the chip to take information already within short-term memory and transfer it to long-term memory. Berger and his colleagues hope that computer chips implanted in the brain will replace the part of the hippocampus that is no longer functioning and thus, one day, benefit Alzheimer's patients, stroke victims, and people with brain damage. For more information, see: Richard H Tsai, Bing J. Sheu, Theodore W. Berger, and Rey Huang. "One Step Closer to a Bionic Brain?" *IEEE Circuits & Devices*. 13.5 (1997): 34.

Brain implants are a form of neuroprosthesis that enable direct communication between the patient and a computer. In 1998 Emory University doctors implanted a device into a man's brain that amplified his brain signals and allowed him to move a cursor across a screen and convey simple messages such as hello and good-bye. The man was a paralysed, mute stroke victim who used his brainpower to communicate with others through the computer. The signals were transmitted from his brain to a laptop computer through an antenna-like coil placed on his head. (Starr et al 1989).

In 1997 the U.S. Food and Drug Administration (FDA) approved the first implantable neuroprosthesis, the Freehand system. This device uses an implant to give individuals with quadriplegia the ability to grip and hold. Another application, a prototype bladder control system, allows individuals with paralysis to control their bodies' waste schedule. Both implants were developed by NeuroControl, and employ a wireless controller activated externally. (Cameron et al 1981).

Implants are also being developed to enable the blind to see: EJ. Wyatt et al. "Silicon Retinal Implant to Aid Patients Suffering from Certain Forms of Blindness." *Interim Progress Report*. Massachusetts Institute of Technology, 1993; R. Eckmiller. "Towards Retina Implants for Improvement of Vision in Humans with Retinitis Pigmentosa: Challenges and first Results." *Proc. WCNN '95*. Washington, D.C., INNS. 1 (1995): 228-233; R. Eckmiller. "Learning Retina Implants with Epiretinal Contacts." *Ophthalmic Research*. 29 (1997): 281-289.

The monitoring of the health of fetuses is also the object of microchip implant research. The technology is known as Implantable Biotelemetry System for Preterm Labor and Fetal Monitoring. See: "Keeping an Eye on the Baby." *Nasa Tech Briefs*. 23.2 (February 1999):16. See also: "Biotelemetry Using Implanted Unit to Monitor Preterm Labor." *Nasa Tech Briefs*. 23.5 (May 1999): 45-46 and "Improved Sensor Pills for Physiological Monitoring." *NASA Tech Briefs*. 24.2 (February 2000): 54 and 56. Implantable biotelemetry has also been developed for the poultry industry. Takoi Hamrita, a researcher in the Department of Biological & Agricultural Engineering, in the College of Agricultural & Environmental Sciences, The University of Georgia, has developed a small transmitter which is implanted in the breasts of chicken to monitor and download the bird's body temperature to computers, which control the temperature in the environment to prevent heat stress and thus maximize productivity. See: T. K. Hamrita, G.V. Wicklen, M. Czarick, and M. Lacy. "Monitoring Poultry Deep Body Temperature Using Biotelemetry." *Journal of Applied Engineering in Agriculture*. 14.3 (1998): 11-15.

¹⁵ George Gessert, an artist who works with plant hybridisation, identified Edward Steichen, well known for his photographic work, as the first artist to propose and produce genetic art. See: George Gessert. "Notes on Genetic Art." *Leonardo*. 26.3 (1993): 205. Indeed, in 1949 Steichen wrote, "The science of heredity when applied to plant breeding, which has as its ultimate purpose the aesthetic appeal of beauty, is a creative act" (Gedrim 356). Also contributing to the development of genetic art is Joe Davis, a contemporary artist who works with DNA synthesis technologies. See: Joe Davis. "Microvenus." *Special Issue of Art Journal*. 55.1

(Spring 1996): 70-74. The Portuguese artist Marta de Menezes has also explored the relationship between art and science and has created butterflies with wing patterns modified by her for artistic purposes. See: de Menezes, Marta. "Nature ?", in Gerfried Stocker and Christine Schopf, eds. *Ars Electronica 2000 - NEXT SEX* (Vienna, New York: Springer, 1999), pp. 258-260.

¹⁶ See: Luther Burbank. *The Harvest Of The Years*. Boston; New York: Houghton Mifflin, 1927; Peter Dreyer. *A Gardener Touched with Genius: The Life of Luther Burbank*. Santa Rosa, CA: L. Burbank Home & Gardens, 1993.

¹⁷ The common roses of the twentieth century, such as Hybrid Teas, Floribundas and Grandifloras, were created by crossing the European Roses and the Chinas, Teas, and Mediterranean types, among many others during the 1700s and 1800s. See: Brent C. Dickerson. *The Old Rose Advisor*. Portland: Timber Press, 1992; J. H. Bennett. *Experiments in Plant Hybridisation*. London: Oliver and Boyd, 1965; Peter Beales. *Roses*. Collins-Harvill (HarperCollins), 1991. On a trip to the Sentosa Island, in Singapore, in 1998, I had the opportunity to interact playfully with a Catalina macaw, perched first on my shoulder and then on my forearm. I was able to appreciate its distinct coloration and to observe and appreciate its interaction with other macaws and humans. A description of the Catalina macaw and other hybrids can be found in Werner Lantermann's *Encyclopedia of Macaws* (Neptune City, NJ: T.F.H., 1995: 173). See also: A. E. Decoteau. *Handbook of Macaws*. Neptune City, NJ: T.F.H., 1982. Other examples of beautiful birds invented by humans that do not exist anywhere in the wild are the Harlequin Macaw (hybrid derived from breeding a Blue and Gold and a Green Winged) and the Parisian Frilled Canary, which has oddly frilled feathers. Examples of new mammals created by humans through cross-breeding include the zorse (zebra and horse), the liger (lion and tiger), zonkey (zebra and donkey), and cama (camel and llama). Cross-breeding also occurs without direct human intervention: In 1985 Hawaii's Sea Life Park reported the birth in their premises of the first "wholfin," a fertile baby from the spontaneous mating of a male false killer whale (*Pseudorca crassidens*) and a female bottlenose dolphin (*Tursiops truncatus*).

¹⁸ See: E. Cozzi and D.J.G. White. "The Generation of Transgenic Pigs as Potential Organ Donors for Humans." *Nature. Med* 1 (1995): 964-966.

¹⁹ See: Samuel K. Moore. "Natural Synthetics: Genetically Engineered Plants Produce Cotton/Polyester Blends and Nonallergenic Rubber." *Scientific American*. (February 1997): 36-37.

²⁰ See: Phil Cohen. "Spinning Steel: Goats and Spiders Are Working Together to Create a Novel Material." *New Scientist*. 160.2155 (10 October 1998): 11. Another combination of insect and mammal is a mouse with fly genes. In this case, the research has the goal of demonstrating that the biochemical activity utilized in mouse to mediate brain development has been retained by certain kinds of proteins across the phyla. See: Mark C. Hanks, Cynthia A. Loomis, Esther Harris, Chung-Xiang Tong, Lynn Anson-Cartwright, Anna Auerbach and Alexandra Joyner. "Drosophila Engrailed Can Substitute for Mouse Engrailed1

Function in Mid-Hindbrain, But Not Limb Development." *Development*. 125.22 (1998): 4521-4530.

²¹ See: G. Brem and M. Müller. "Large Transgenic Mammals." *Animals With Novel Genes*. Ed. N. Maclean. New York: U of Cambridge, 1994. 179-244; M. Ikawa, K. Kominami, Y. Yoshimura, K. Tanaka, Y. Nishimune, and M. Okabe. "Green Fluorescent Protein as a Marker in Transgenic Mice." *Devel. Growth Differ.* 37 (1995) :455-459; Elizabeth Pennisi. "Transgenic Lambs From Cloning Lab." *Science*. 277.1 (August 1997): 631.

²² See: Anthony Dyson and John Harris, eds. *Ethics and Biotechnology*. New York: Routledge, 1994; L. F. M. van Zutphen and M. van Der Meer, eds. *Welfare Aspects of Transgenic Animals*. Berlin; New York: Springer Verlag, 1995.

²³ See: Keith Schneider. "New Animal Forms Will Be Patented." *New York Times* (April 17, 1987); Reid G Adler. "Controlling the Applications of Biotechnology: A Critical Analysis of the Proposed Moratorium on Animal Patenting." *Harvard Journal of Law and Technology*. 1 (1988): 1-63.

; Edmund L. Andrews. "U.S. Seeks Patent on Genetic Codes, Setting Off Furor." *New York Times* (October 21, 1991): A1, A12; Eliot Marshall. "Companies Rush to Patent DNA." *Science*. 275 (7 February 1997): 780-781. Eliot Marshall. "The Mouse That Prompted a Roar." *Science*. 277 (4 July 1997): 24-25.

²⁴ See: Adam L. Penenber. "Gene Piracy." *21C-Scanning the Future*. 2 (1996): 44-50.

²⁵ See: Robert M. Dickson et al. "On/Off Blinking and Switching Behaviour of Single Molecules of Green Fluorescent Protein." *Nature*. 388 (1997): 355-358.

²⁶ See: Kathryn S. Brown. "With New Technology, Researchers Engineer A Plant For Every Purpose." *The Scientist*. 9.19 (October 2, 1995): 14-15; Jane Rissler and Margaret Mellon. *The Ecological Risks of Engineered Crops*. Cambridge: MIT P, 1996.

²⁷ See: W. Wayt Gibbs. "Plantibodies: Human Antibodies Produced by Field Crops Enter Clinical Trials." *Scientific American*. Vol. 277 (November 1997): 44.

²⁸ See: Brian Tokar. "Monsanto: A Checkered History." Special Issue of *The Ecologist*: "The Monsanto Files." 28.5 (September/October 1998): 254-261; Andrew Kimbrell. "Why Biotechnology and High-Tech Agriculture Cannot Feed the World." Special Issue of *The Ecologist*: "The Monsanto Files." 28.5 (September/October 1998): 294-298.

²⁹ Therapies used by reproductive medicine already result in healthy babies with new genetic material not derived from the parents. One such technique, developed at St. Barnabas Medical Center in Livingston, New Jersey, takes

cytoplasm from a donor egg—complete with mitochondria--and injects it into an egg slated for fertilization. A child born from this process may inherit mitochondrial DNA from both eggs. This genetic modification, which has enabled several infertile women to give birth, is inheritable. See: Jacques Cohen et al. "Birth of Infant After Transfer of an Ucleate Donor Oocyte Cytoplasm into Recipient Eggs." *Lancet*. 350.9072 (Jul 19, 1997): 186-187. See also: Carol A. Brenner, Jason A. Barritt et al. "Mitochondrial DNA Heteroplasmy After Human Ooplasmic Transplantation." *Fertility and Sterility*. 74.3 (2000): 573. In an article for the *New Scientist* (October 23, 1999), entitled "We Have the Power," Andy Coghlan reported that a Canadian company, Chromos Molecular Systems of Burnaby, British Columbia, presented preliminary results of experiments with mice given an artificial chromosome. He wrote, "By taking cell samples and exposing them to fluorescent dyes that bind to different parts of the chromosome, Chromos's scientists were able to discover which animals had accepted the chromosome. When the mice carrying the extra chromosome were crossed with normal mice, it was inherited in exactly the same way as the animals' natural chromosomes" (32). This is an indication that human germline gene therapy is becoming a practical possibility. It shows that one day it might be possible, for medical reasons, to add synthetic genes to human embryos which otherwise would develop serious or fatal congenital defects.

³⁰ Some exemplary cases are the production of rat sperm in the testes of a mouse (which clearly suggests that human sperm could also be produced in the testicles of a rodent), the initial division of a human cell in the egg of a cow, and the alleged creation of an embryonic clone of an adult woman in South Korea. See: David E. Clouthier et al. "Rat Spermatogenesis in Mouse Testis." *Nature*. 381 (1996): 418-421; J. M. Robl, D. J. Jerry; S. Stice; J. Cibelli. "Response: Quiescence in Nuclear Transfer." *Science*. 281.5383 (1998): 1611; BBC Online. "S. Korean Scientists Claim Human Cloning Success." (December 16, 1998): <<http://www.news.bbc.co.uk>>. The claim of the Korean scientists cannot be verified, since it was not followed by a peer-reviewed publication.

Chapter 7 - GENESIS

As part of my research into genetics and art, I sought to explore the intricate relationship between biology, belief systems, information technology, dialogical interaction, ethics, and the Internet. The *Genesis* project started with the creation of a synthetic gene and an interactive installation. It continued with the visualization of the protein produced by this gene¹ and with new works that examine the cultural implications of proteins as fetish objects. A critical stance is manifested throughout the *Genesis* project by following scientifically accurate methods in the real production and visualization of a gene and a protein that I have invented and which have absolutely no function or value in biology. Rather than explicating or illustrating scientific principles, the *Genesis* project complicates and obfuscates the extreme simplification and reduction of standard molecular biology descriptions of life processes, reinstating social and historical contextualisation at the core of the debate. In its genomic and proteomic manifestations, the *Genesis* project continues to reveal new readings and possibilities.

EXPLORING GENOMICS AS AN ART MEDIUM

Genesis (1998/99) is a transgenic artwork. Its key element is an “artist’s gene,” a synthetic gene that I invented and that does not exist in nature. This gene was created by translating a sentence from the (biblical) book of *Genesis* into Morse Code and then converting the Morse Code into DNA base pairs according to a conversion principle specially developed for this work [Figure 13]. The sentence reads, “Let man have dominion over the fish of the sea, and over the

fowl of the air, and over every living thing that moves upon the earth” (*Holy Bible*, King James Version, 1:26).

This sentence was chosen for its implications regarding the dubious notion of (divinely sanctioned) humanity’s supremacy over nature.² Morse Code was chosen because, as first employed in radiotelegraphy, it represents the dawn of the information age—the genesis of global communications.³

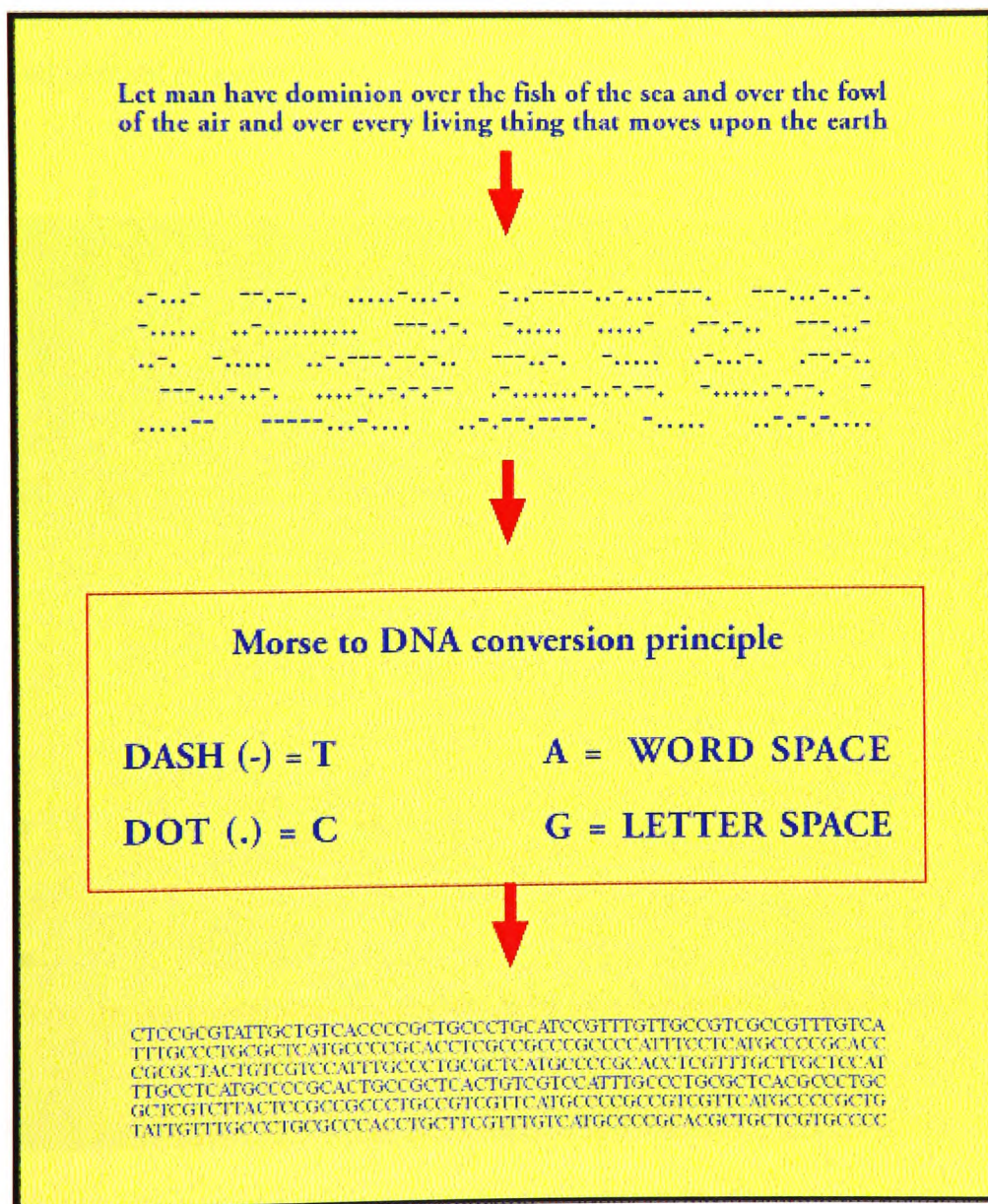


Figure 13 – *Genesis*, transgenic work on the Internet. The “Genesis” gene was created by translating a sentence from the (biblical) book of Genesis into Morse Code and converting the Morse Code into DNA base pairs according to a conversion principle specially developed for this work.

The initial process in this work is the cloning of the synthetic gene into plasmids and their subsequent transformation into bacteria [Figure 14]. Two kinds of bacteria are employed in the work: bacteria that have incorporated a plasmid containing ECFP (Enhanced Cyan Fluorescent Protein) and bacteria that have incorporated a plasmid containing EYFP (Enhanced Yellow Fluorescent Protein). ECFP and EYFP are GFP (Green Fluorescent Protein) mutants with altered spectral properties.⁴

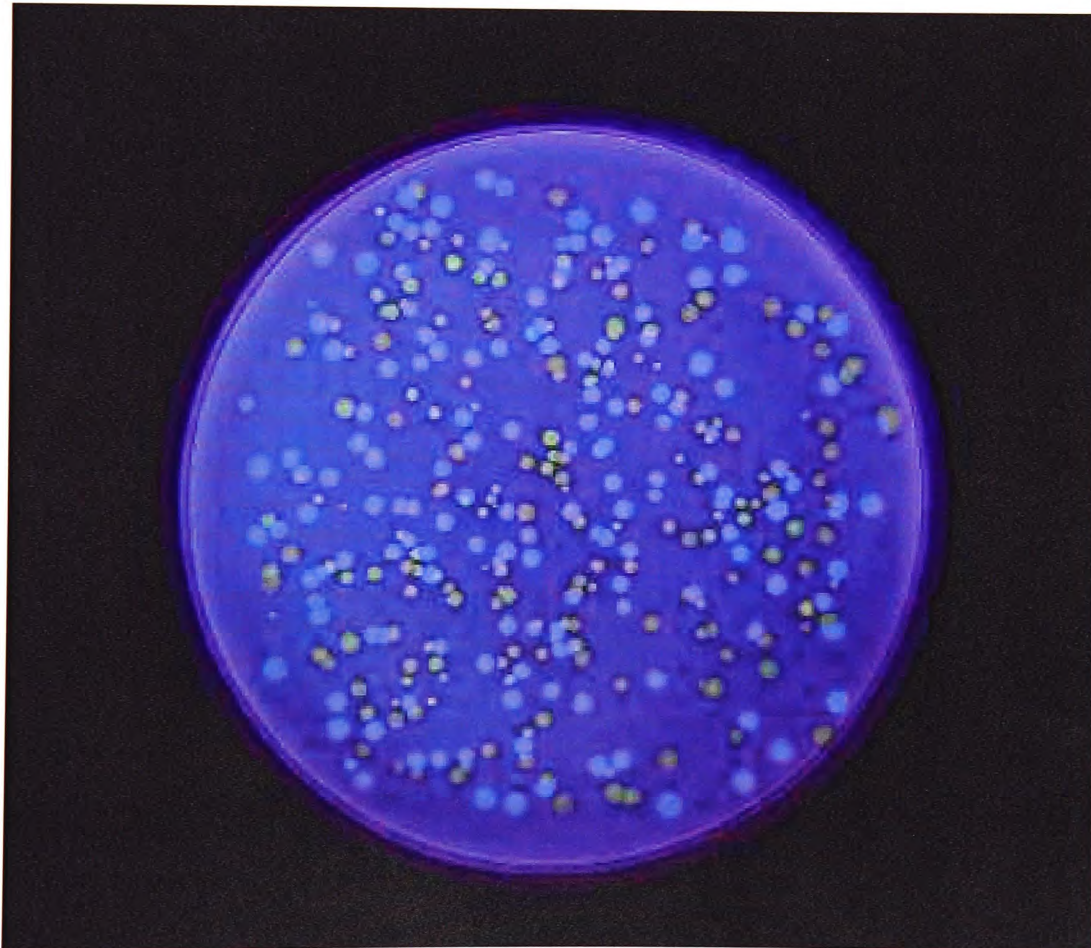


Figure 14 – *Genesis*, transgenic work on the Internet (detail). *Genesis* employed two separate kinds of bacteria genetically engineered to glow emitting either blue or yellow light. The blue bacteria contained the synthetic gene, while the yellow bacteria did not. The mutation rate of the bacteria, as well as their interaction in the Petri dish, also contributed to the changes in the biblical sentence.

The ECFP bacteria contain the synthetic gene, while the EYFP bacteria do not. These fluorescent bacteria emit cyan and yellow light when exposed to UV radiation (302 nm). As they grow in number, mutations naturally occur in the plasmids. As they make contact with each other, plasmid conjugal transfer takes place and we start to see colour combinations, possibly giving rise to green bacteria. Transgenic bacterial communication evolves as a combination of three visible scenarios: (1) ECFP bacteria donate their plasmid to EYFP bacteria (and vice-versa), generating green bacteria; (2) No donation takes place (individual colours are preserved); (3) Bacteria lose their plasmid altogether (become pale, ochre collared).

The strain of bacteria employed in *Genesis* is JM101. Normal mutation in this strain occurs 1 in 10^6 base pairs. Along the mutation process, the precise information originally encoded in the ECFP bacteria is altered. The mutation of the synthetic gene will occur as a result of three factors: (1) the natural bacterial multiplication process (2) bacterial dialogical interaction (3) human-activated UV radiation. The selected bacteria are safe to use in public and are displayed in the gallery with the UV source in a protective transparent enclosure [Figure 15].

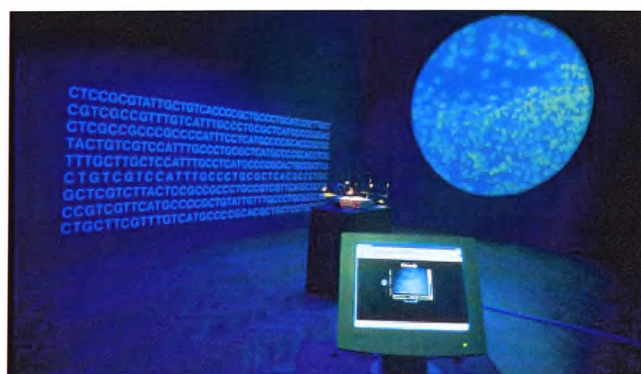


Figure 15 – *Genesis*, transgenic work on the Internet. The *Genesis* gene was incorporated into bacteria, which were shown in the gallery. Participants on the Web could turn on an ultraviolet light in the gallery, causing real, biological mutations in the bacteria. This changed the biblical sentence in the gallery, causing real, biological mutations in the bacteria. The ability to change the sentence is a symbolic gesture: it means that we do not accept its meaning in the form we inherited it, and that new meanings emerge as we seek to change it.

The gallery display enables local as well as remote (Web) participants to monitor the evolution of the work. This display consists of a Petri dish with the bacteria, a flexible microvideo camera, a UV light box, and a microscope illuminator. This set is connected to a video projector and two networked computers. One computer works as a Web server (streaming live video and audio) and handles remote requests for UV activation. The other computer is responsible for DNA music synthesis. Peter Gena composed the original music, which employs the “Genesis” gene.⁵ The local video projection shows a larger-than-life image of the bacterial division and interaction seen through the microvideo camera. Remote participants on the Web interfere with the process by turning the UV light on [Figure 16]. The fluorescent protein in the bacteria responds to the UV light by emitting visible light (cyan and yellow). The energy impact of the UV light on the bacteria is such that it disrupts the DNA sequence in the plasmid, accelerating the mutation rate. The left and right walls contain large-scale texts applied directly on the wall: the sentence extracted from the book of Genesis (right) and the “Genesis” gene (left). The back wall contains the Morse translation.

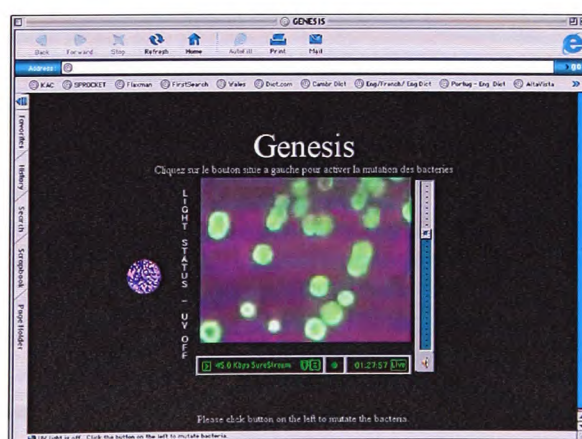


Figure 16 – *Genesis*, transgenic work on the Internet. Remote participants on the Web interfere with the process by turning the UV light on. They are also able to monitor the evolution of the work via live video streaming.

In the context of the work, the ability to change the sentence is a symbolic gesture: It means that we do not accept its meaning in the form we inherited it, and that new meanings emerge as we seek to change it. Employing the smallest gesture of the online world—the click—participants can modify the genetic makeup of an organism located in a remote gallery. This unique circumstance makes evident, on the one hand, the impending ease with which genetic engineering trickles down into the most ordinary level of experience. On the other, it highlights the paradoxical condition of the non-expert in the age of biotechnology. To click or not to click is not only an ethical decision, but also a symbolic one. If the participant does not click, he allows the Biblical sentence to remain intact, preserving its meaning of dominion. If he clicks, he changes the sentence and its meaning, but does not know what new versions might emerge. In either case, the participant faces an ethical dilemma and is implicated in the process.

In the nineteenth century, the comparison made by Champollion based on the three languages of the Rosetta Stone (Greek, demotic script, hieroglyphs) was the key to understanding the past. Today the triple system of *Genesis* (natural language, genetics, binary logic) is the key to understanding the future. *Genesis* explores the notion that biological processes are now programmable, as well as capable of storing and processing data in ways not unlike digital computers. Further investigating this notion, at the end of the first showing of *Genesis* at Ars Electronica '99, the altered biblical sentence was decoded and read back in plain English, offering insights into the process of transgenic interbacterial communication. The mutated sentence read, "LET AAN HAVE DOMINION OVER THE FISH OF THE SEA AND OVER THE FOWL OF THE AIR AND

OVER EVERY LIVING THING THAT IOVES UA EON THE EARTH.” The boundaries between carbon-based life and digital data are becoming as fragile as a cell membrane.

EXPLORING PROTEOMICS AS AN ART MEDIUM

While the first phase of *Genesis* focused on the creation and the mutation of a synthetic gene through Web participation, the second phase focused on the protein produced by the synthetic gene: the “Genesis” protein.

Protein production is a fundamental aspect of life. Multiple research centres around the world focus their initiatives on sequencing, organizing, and analysing the genomes of both simple and complex organisms, from bacteria to human beings. Parallel to genomics (the study of genes and their function) we find proteomics (the study of proteins and their function). Proteomics, the dominant research agenda in molecular biology in the post-genomic world, focuses on the visualization of the three-dimensional structure of proteins produced by sequenced genes. It is also concerned with the study of the structure and functionality of these proteins, among many other important aspects, such as similarity among proteins found in different organisms. The second phase of *Genesis* critically investigates the logic, the methods, and the symbolism of proteomics, as well as its potential as a domain of art making.

In order to arrive at the visualization of the “Genesis” protein, I first explored aspects of its two-dimensional structure: its hydrophilicity and hydrophobicity.⁶ Membranes in an aqueous environment have an attractive or repulsive response to water. The material composition of the membrane and its corresponding surface chemistry determine the interaction with water. This

phenomenon is known as hydrophilicity (affinity for water) or hydrophobicity (little or no tendency to absorb water). The next step was to compare the predicted folding pattern of the “Genesis” protein to another known protein to which it is similar: Chorion. Research in the database of the National Center for Biotechnology Information (which includes all known proteins in all catalogued life forms) indicates that the predicted structure of the “Genesis” protein is functionally related to the Chorion protein found in *Ceratitis capitata* (Mediterranean fruit fly), since it is 39% similar to it. The coincidence (in structural similarity between the “Genesis” protein and the Chorion protein) is particularly significant in the context of the transgenic artwork, *Genesis*, since Chorion is the protein that forms the membrane that serves primarily as a protective barrier for a developing embryo.

With the goal of producing a tangible rendition of the nanostructure of the “Genesis” protein, I researched protein fold homology using the Protein Data Bank, operated by the Research Collaboratory for Structural Bioinformatics (RCSB). I then produced a digital visualization of the “Genesis” protein’s three-dimensional structure.⁷ This three-dimensional dataset [Figure 17] was used to produce both digital and physical versions of the protein. The digital version is a fully navigable Web object rendered both as VRML (Virtual Reality Modelling Language) and PDB (Protein Data Bank) formats, to enable up-close inspection of its complex volumetric structure. The physical rendition is a small solid object produced via rapid-prototyping, to convey in tangible form the fragility of this molecular object.⁸



Figure 17 – The *Genesis* protein.

Quite clearly, genetic engineering will continue to have profound consequences in art, as well as in the social, medical, political, and economic spheres of life. I am interested in creating artworks that reflect on the multiple social implications of genetics, from unacceptable abuse to its hopeful promises, from the notion of “code” to the question of translation, from the synthesis of genes to the process of mutation, from the metaphors employed by biotechnology to the fetishisation of genes and proteins, from simple reductive narratives to complex views that account for environmental influences. The urgent task is to unpack the implicit meanings of the biotechnology revolution and, through art making, contribute to the creation of alternative views, thus expanding the discourse, methods, and goals of genetics to make it more accessible and inclusive.

INTEGRATING GENOMICS AND PROTEOMICS AS ART MEDIA

Bridging the nanoscale of the “Genesis” gene and protein with a more approachable human scale, the third phase focused on giving tangible expression to important aspects of the genomic and proteomic developments of *Genesis*. The project encompasses the production of an artwork that captures and further elaborates key ideas manifested in the first and second phases of *Genesis*. The work produced is entitled *Transcription Jewels* [Figure 18].



Figure 18 - *Transcription Jewels*. Purified *Genesis* DNA in glass bottle and gold cast of rapid prototype of “Genesis” protein.

Transcription Jewels is a set of two objects encased in a custom-made round wooden box. The word “transcription” is the term employed in Biology to name the process during which the genetic information is “transcribed” from DNA into RNA. One “jewel” is a 2" (5cm) genie bottle in clear glass with gold ornaments and 65 milligrams of purified “Genesis” DNA inside. “Purified DNA” means that countless copies of the DNA have been isolated from the bacteria by

which they were produced and accumulated and filtrated in a vial.⁹ The gene is seen here out of the context of the body, its meaning intentionally reduced to a formal entity to reveal that without acknowledgment of the vital roles played by organism and environment, the “priceless” gene can become “worthless.” The other “jewel” is an equally small gold cast of the three-dimensional structure of the “Genesis” protein. By displaying the emblematic elements of the biotech revolution (the gene and the protein) as coveted valuables, *Transcription Jewels* makes an ironic commentary on the process of the commodification of the minutest aspects of life. Both the purified gene in *Transcription Jewels* and its protein are not derived from a natural organism, but rather were created specifically for the artwork, *Genesis*. Instead of a “genie” inside the bottle, one finds the new panacea, the gene. The inert and isolated gene sealed inside the miniature bottle grants no wishes of immortality, beauty, or intelligence. As a result, the irony gains a critical and humorous twist by the fact that the “precious commodity” is devoid of any real, practical application in biology.

EXHIBITING TRANSGENIC ART

All pieces described and discussed above, including the net installation with live bacteria, were presented together in my solo exhibition, *Genesis*, realized at Julia Friedman Gallery, in Chicago, between May 4 and June 2, 2001. While it might be expected that Transgenic Art poses unique problems regarding public exhibition, in reality the presentation of a transgenic artwork is not fundamentally different from the exhibition of other contemporary works, particularly those that include plants and animals. Living organisms require specific care, but transgenic organisms do not require special care simply because they are transgenic. Still, as

a precaution, the “Genesis” bacteria were presented inside a Plexiglas top, mounted on a pedestal. This way the public could see the bacteria but could not touch it. This also prevented the bacteria from coming into contact with the environment. The Plexiglas top also served to filter the UV light, preventing the public from being exposed to it.

The multiple mutations experienced biologically by the bacteria and graphically by the images, texts, and systems that compose the exhibition, reveal that the alleged supremacy of the so-called “master molecule” must be questioned.¹⁰ The *Genesis* project makes evident that “life” is no longer, purely and simply, a bio-chemical phenomenon. Instead, it states that we must consider life as a complex system at the crossroads between belief systems, economic principles, legal parameters, political directives, scientific laws, and cultural constructs.

End Notes

¹ In actuality, genes do not “produce” proteins. As Richard Lewontin clearly explains, “A DNA sequence does not specify protein, but only the amino acid sequence. The protein is one of a number of minimum free-energy foldings of the same amino acid chain, and the cellular milieu together with the translation process influences which of these foldings occurs” (1264).

² I selected the King James English version (KJV) instead of the Hebrew original text as a means of highlighting the multiple mutations of the Old Testament and its interpretations, and also to illustrate ideological implications of an alleged “authoritative” translation. King James tried to establish a final text by commissioning several scholars (a total of 47 worked on the project) to produce this translation, meant to be univocal. Instead, this collaborative effort represents the result of several “voices” at work simultaneously. Most of the Old Testament books were written in Hebrew, while parts of the books of *Daniel* and *Ezra* were written in Aramaic. The King James *Bible* was translated in 1611 after consultation of previous translations to multiple languages, i.e., it is a translation of many translations. In the preface of the authorized version, the translators wrote, “Neither did we think much to consult the Translators or Commentators, Chaldee, Hebrew, Syrian, Greek or Latin, nor the Spanish, French, Italian, or Dutch” (*The Holy Bible*, King James Version, Preface). Following centuries of oral traditions, the *Bible* was written over a long time span by many authors. It is unclear exactly when the *Bible* was written down. However, it is believed that the text was fixed in scrolls during the period from 1400 BC to 100 AD. Since the first versions of the text had no connection between letters, no spaces between words and sentences, no periods or comas, and no chapters, the material encouraged multiple interpretations. Subsequent translations and editions attempted to simplify and organize the text—i.e., to arrest its continuous transmutation—only to generate more versions. The division of the *Bible* into chapters was carried out by Stephen Langton (d. 1227), who later became the Archbishop of Canterbury. Father Santes Pagninus, a Dominican priest, divided the Old Testament chapters into verses in 1528. With the advent of moveable-type printing in 1450, yet newer versions proliferated, all different in their own way, with both deliberate and accidental changes. The biblical passage from KJV employed in my transgenic work, *Genesis*, is emblematic, as it speaks of dominion. King James is the founding monarch of the United States. Under his reign, the first successful colonies were established. In his own words, King James sought to propagate “Christian religion to such people as yet live in darkness” (*The Holy Bible*, King James Version, Preface). The colonizers brought his authorized translation. The genesis of the New World was built upon dominion “over every living thing that moves upon the earth” (*The Holy Bible*, King James Version, 1:26). For more information, see: Kenneth L. Barker, ed. *The NIV: The Making of a Contemporary Translation*. Grand Rapids: Zondervan, 1986; Eugene H. Glassman. *The Translation Debate*. Downers Grove: InterVarsity, 1981; D. A. Carson. *The King James Version Debate*. Grand Rapids: Baker, 1979.

³ I employed Morse Code not out of a technical need, but rather as a symbolic gesture both meant to expose the continuity of ideology and technology and to reveal important aspects of the rhetorical strategies of molecular biology. Samuel Morse embraced the radical Protestant movement of the 1830s known as Nativism. The Nativist platform was racist, anti-immigrant, anti-Catholic, and anti-Semitic. All his life Morse hated and feared American Catholics, supported the denying of citizenship to the foreign born and wrote pamphlets against the abolishment of slavery. In my work, *Genesis*, the translation of the KJV Genesis passage to Morse represents the continuity from fierce British colonialism to the bigotry of Nativist ideology. The industrialization of North America, in tandem with technological hegemony, was based on the gargantuan profits amassed from the slave trade in the eighteenth century. In 1844 Morse sent the first telegraphic message from Baltimore to Washington, D.C.: "What hath God wrought!" For more information, see: T. Standage. *The Victorian Internet*. New York: Berkeley Books (Berkeley paperback edition) 1999. The translation from KJV/Morse to a gene is meant to reveal the continuity between imperialist ideology and the reductionistic view of genetics, both focused on suppressing the complexity of historic, political, economic, and environmental forces that make up social life. For more information, see: Samuel Irenaeus Prime. *Life of Samuel F.B. Morse*. New York: Appleton, 1875; Jeffrey L. Kieve. *The electric telegraph: a social and economic history*. Newton Abbot: David and Charles, 1973; Paul J. Staiti. *Samuel F.B. Morse*. Cambridge; New York: Cambridge UP, 1989. In addition, the Morse code is a central metaphor in molecular biology. In his influential essay, "What is life?" (1943), physicist Erwin Schrödinger promoted an atomistic view of biology and predicted key characteristics of genetic material more than a decade before the structure of DNA was understood. He wrote, "It has often been asked how this tiny speck of material, the nucleus of the fertilized egg, could contain an elaborate code-script involving all the future development of the organism. (...) For illustration, think of the Morse code. The two different signs of dot and dash in well-ordered groups of not more than four allow of thirty different specifications (61). The metaphor of the "code-script" proposed by Schrödinger took center stage in molecular biology and became an epistemological instrument in this field. This begs the question, which I seek to ask with *Genesis*, of how meaning is constructed in science. How do we go from the metaphor of "genes as code" to the "fact" that "genes are code"? Is it by the progressive erasure of the initial conditions of enunciation of a metaphor? For more information, see: Richard Doyle. *On Beyond Living : Rhetorical Transformations of the Life Sciences*. Stanford: Stanford UP, 1997: 25-38.

⁴ This work was carried out with the assistance of Dr. Charles Strom, formerly Director of Medical Genetics, Illinois Masonic Medical Center, Chicago. Dr. Strom is Medical Director, Biochemical and Molecular Genetics Laboratories Nichols Institute / Quest Diagnostics, San Juan Capistrano, CA.

⁵ See: Peter Gena and Charles Strom. "A Physiological Approach to DNA Music." *Digital Creativity: Crossing the Border*. The Proceedings of CADE 2001: The 4th Computers in Art and Design Education Conference. Eds. Robin Shaw and John McKay. Glasgow: The Glasgow School of Art P. 129-134.

⁶ Special thanks to Dr. Murray Robinson, Head of Cancer Program, Amgen, Thousand Oaks, CA.

⁷ Protein visualization was carried out with the assistance of Charles Kazilek and Laura Eggink, BioImaging Laboratory, Arizona State University, Tempe. The software used was MSI 98 Insight II.

⁸ Rapid prototyping was developed with the assistance of Dan Collins and James Stewart, Prism Lab, Arizona State University, Tempe.

⁹ DNA synthesis, assembly, amplification, and purification was carried out with the assistance of Scott Bingham, Associate Research Scientist, Arizona State University, Tempe. Six liters of bacteria were grown and 130 milligrams were produced.

¹⁰ For a critique of the notion of the “master molecule” and of the concept of “code” in genetics, see: Evelyn Fox Keller. *Refiguring Life: Metaphors of Twentieth-Century Biology*. New York: Columbia UP, 1995; Dorothy Nelkin. *The DNA Mystique : The Gene As a Cultural Icon*. New York: Freeman, 1995; Richard C. Lewontin. *The Triple Helix : Gene, Organism, and Environment*. Cambridge: Harvard UP, 2000.

Chapter 8 - GFP BUNNY

Following my investigation with “Genesis”, further research led me to explore the use of green fluorescent protein (GFP) in a mammalian organism. My research was focused on the creation (that is, conceptualisation and production) of an animal that would result from the use of a gene from a jellyfish (GFP) expressed in a rabbit. This process would result in an animal glowing with a green light (maximum emission at 509 nm) when exposed to a blue light of a particular wavelength (maximum excitation at 488 nm). I have called this work “GFP Bunny” and the rabbit herself “Alba” [Figure 19]. This name was selected because the rabbit is an albino rabbit, and the name “Alba” serves the purpose of reinforcing the fact that she is both a transgenic being and a regular albino rabbit. Drawing from conceptual art¹, which has proposed social and discursive practices as forms of art making, I have considered the discussion around this research an integral part of my investigation², and created an online forum specifically to collect public opinions about it. The forum, which is included in the Appendix, covers the period from October 15, 2000 to September 13, 2002.

MAIN OBJECTIVES OF *GFP BUNNY*

Alba is undoubtedly a very special animal, but I want to be clear that her formal and genetic uniqueness are but one component of the *GFP Bunny* artwork. The *GFP Bunny* project is the result of research into a complex social event that starts with the creation of a chimerical animal that does not exist in nature (“chimerical” in the sense of a cultural tradition of imaginary animals, not in the

scientific connotation of an organism in which there is a mixture of cells in the body). It also includes at its core:

1. Ongoing dialogue between professionals of several disciplines (art, science, philosophy, law, communications, literature, social sciences) and the public on cultural and ethical implications of genetic engineering.
2. Contestation of the alleged supremacy of DNA in life creation in favour of a more complex understanding of the intertwined relationship between genetics, organism, and environment.
3. Extension of the concepts of biodiversity and evolution to incorporate precise work at the genomic level.
4. Interspecies communication between humans and a transgenic mammal.
5. Integration and presentation of *GFP Bunny* in a social and interactive context.
6. Examination of the notions of normalcy, heterogeneity, purity, hybridity, and otherness.
7. Consideration of a non-semiotic notion of communication as the sharing of genetic material across traditional species barriers.
8. Public respect and appreciation for the emotional and cognitive life of transgenic animals.
9. Expansion of practical and conceptual boundaries of art making to incorporate life invention.



Figure 19 – *GFP Bunny*. Alba, the fluorescent rabbit.

BIRTH AND CHARACTERISTICS OF THE TRANSGENIC RABBIT

Alba was born in February 2000 at the Institut National de la Recherche Agronomique-INRA (National Institute of Agronomic Research), in Jouy-en-Josas, France³. Alba, the green fluorescent bunny, is an albino rabbit [Figure20]. This means that because she has no skin pigment, under ordinary environmental conditions she is completely white with pink eyes. Alba is not green all the time. She only glows when illuminated with the correct light. To see the glow it is imperative to use a special yellow filter to block the incident blue light, otherwise her white hair would reflect the blue light and the green emission could not be seen. What allows her to glow is a gene called EGFP, an enhanced version (a synthetic mutation) of the original wild-type green fluorescent gene found in the jellyfish, *Aequorea Victoria*. EGFP gives about two orders of magnitude greater fluorescence in mammalian cells (including human cells) than the original jellyfish gene.⁴

FROM DOMESTICATION TO SELECTIVE BREEDING

The human-rabbit association can be traced back to the biblical era, as exemplified by passages in the books *Leviticus* (*Lev.* 11:5) and *Deuteronomy* (*De.* 14:7), which both make reference to “saphan,” the Hebrew word for rabbit. Phoenicians seafarers discovered rabbits on the Iberian Peninsula around 1100 BC and, thinking that these were Hyraxes (also called Rock Dassies), called the land “i-shepan-im” (land of the Hyraxes). Since the Iberian Peninsula is north of Africa, relative geographic position suggests that another Punic derivation comes from sphan (“north”). As the Romans adapted “i-shepan-im” to Latin, the word Hispania was created, one of the etymological origins of Spain. In Book III of his

Geography the Roman geographer Strabo (ca. 64 BC - AD 21) called Spain “the land of rabbits” (34). Later on, the Roman emperor Servius Sulpicius Galba (5 BC - AD 69) issued a coin on which Spain is represented with a rabbit at her feet. A similar coin was issued by the Roman emperor Publius Aelius Hadrianus (Hadrian), who reigned from 117 to 138 AD. Although semi-domestication started in the Roman period, in this initial phase rabbits were kept in large walled pens and were allowed to breed freely. (Zeuner 409-415)

Humans started to play a direct role in the evolution of the rabbit from the sixth to the tenth centuries AD, when monks in southern France domesticated and bred rabbits under more restricted conditions. The rabbit should not be confused with the hare, which is similar in appearance, but in fact belongs to a different species. Studies on the molecular biology of hares and rabbits suggest they diverged and developed separate evolutionary histories approximately 20 million years ago.⁵ Originally from the region comprised by southwestern Europe and North Africa, the European rabbit (*Oryctolagus cuniculus*) is the ancestor of all domestic rabbit breeds. Since the sixth century, because of its sociable nature the rabbit increasingly has become integrated into human families as a domestic companion. However, this is not true in all countries. While in the United States rabbits are among the most popular house animals, in France they are virtually absent from family life. In any case, human-induced selective breeding created the morphological diversity found in rabbits everywhere. The first records describing a variety of fur colours and sizes distinct from wild breeds date from the sixteenth century. While new rabbit species are still being discovered in the wild, as exemplified by the striped rabbit found in Sumatra in 1999, it was not until the eighteenth century that selective breeding resulted in the Angora rabbit,

which has a uniquely thick and beautiful wool coat. (Rochambeaus 145-154)⁶

The process of domestication carried out since the sixth century, coupled with ever increasing worldwide migration and trade, resulted in many new breeds and in the introduction of rabbits into new environments different from their place of origin. While there are well over 100 known breeds of rabbit around the world, “recognized” pedigree breeds vary from one country to another. For example, the American Rabbit Breeders Association (ARBA) “recognizes” 45 breeds in the U.S.A., with more under development. (Wegler 12)

In addition to selective breeding, naturally occurring genetic variations also contributed to morphological diversity. The albino rabbit, for example, is a natural (recessive) mutation, which in the wild has minimal chances of survival (due to lack of proper pigmentation for camouflage and keener vision to spot prey). However, because humans have bred the albino rabbit, it can be found widely in healthy populations. The human preservation of albino animals is also connected to ancient cultural traditions: almost every Native American tribe believed that albino animals had particular spiritual significance and had strict rules to protect them.⁷

FROM BREEDING TO TRANSGENIC ART

GFP Bunny is a transgenic artwork and not a breeding project. The differences between the two include the principles that guide the work, the procedures employed, and the main objectives. Traditionally, animal breeding has been a multi-generational selection process that has sought to create pure breeds with standard form and structure, often to serve a specific performative function.

As it moved from rural milieus to urban environments, breeding de-emphasized selection for labor-oriented behavioural attributes or other applied functions but continued to be driven by a notion of aesthetics anchored in visual traits and on morphological principles. (Gautier 160) Transgenic art, by contrast, offers a concept of aesthetics that seeks to emphasize the social rather than the formal aspects of life and biodiversity, that challenges notions of genetic purity, that incorporates precise work at the genomic level, and that reveals the fluidity of the concept of species in an ever increasingly transgenic social context.

Transgenic art is not about the crafting of genetic *objets d'art*, either inert or imbued with vitality. Such an approach would suggest a conflation of the operational sphere of life sciences with a traditional aesthetics that privileges formal concerns, material stability, and hermeneutical isolation. Integrating the lessons of dialogical philosophy⁸ and cognitive ethology,⁹ transgenic art must promote awareness of and respect for the spiritual (mental) life of the transgenic animal. The word “aesthetics” in the context of transgenic art must be understood to mean that creation, socialization, and domestic integration are a single process. The question is not to make the rabbit meet specific requirements or whims, but to recognize it as an individual (all rabbits are different), appreciated for its own intrinsic virtues, in dialogical interaction.

The rabbit called Alba was born in the context of the artwork entitled “GFP Bunny”. As a result, her well-being is indissociable from the work itself, since neglecting her cognitive, physiological, and emotional needs would mean a neglect of the work itself. Since she is a living animal, it is not possible to ignore this fact and treat her as a traditional art object. Through this research I wish to suggest that a particular kind of interaction is anchored on the notion of personal



Figure 20 – *GFP Bunny*. The author with Alba, the fluorescent rabbit, at the Institut National de la Recherche Agronomique-INRA (National Institute of Agronomic Research), in Jouy-en-Josas, France.

responsibility (as both care and possibility of response). *GFP Bunny* gives continuation to my focus on the creation, in art, of what Martin Buber called dialogical relationship (Buber 124),¹⁰ what Mikhail Bakhtin called dialogic sphere of existence (*Problems of Dostoevsky's Poetics* 270),¹¹ what Emile Benveniste

called intersubjectivity,¹² and what Humberto Maturana calls consensual domains¹³: shared spheres of perception, cognition, and agency in which two or more sentient beings (human or otherwise) can negotiate their experience dialogically. From the perspective of his unique and systematic branch of theoretical biology, Maturana explains the notion of consensual domain with great clarity:

When two or more organisms interact recursively as structurally plastic systems, each becoming a medium for the realization of the autopoiesis of the other, the result is mutual ontogenic structural coupling. From the point of view of the observer, it is apparent that the operational effectiveness that the various modes of conduct of the structurally coupled organisms have for the realization of their autopoiesis under their reciprocal interactions is established during the history of their interactions and through their interactions. Furthermore, for an observer, the domain of interactions specified through such ontogenic structural coupling appears as a network of sequences of mutually triggering interlocked conducts that is indistinguishable from what he or she would call a consensual domain. In fact, the various conducts or behaviours involved are both arbitrary and contextual. The behaviours are arbitrary because they can have any form as long as they operate as triggering perturbations in the interactions; they are contextual because their participation in the interlocked interactions of the domain is defined only with respect to the interactions that constitute the domain. Accordingly, I shall call the domain of interlocked conducts that results from ontogenic reciprocal structural coupling between structurally plastic organisms a consensual domain” (47).

The work is also informed by Emmanuel Levinas’ philosophy of alterity,¹⁴ which states that our proximity to the other demands a response, and that the interpersonal contact with others is the unique relation of ethical responsibility. In my research with transgenic organisms I create art works that accept and incorporate the reactions and decisions made by the participants, be they eukaryotes or prokaryotes.¹⁵ This is what I call the human-plant-bird-mammal-robot-insect-bacteria interface.

In order to be practicable, this aesthetic platform, which reconciles forms of social intervention with semantic openness and systemic complexity, must acknowledge that every situation, in art as in life, has its own specific parameters and limitations. So the question is not how to eliminate circumscription altogether (an impossibility), but how to keep it indeterminate enough so that what human and nonhuman participants think, perceive, and do when they experience the work matters in a significant way. My answer is to make a concerted effort to remain truly open to the participant's choices and behaviours, to give up a substantial portion of control over the experience of the work, to accept the experience as-it-happens as a transformative field of possibilities, to learn from it, to grow with it, to be transformed along the way. Alba is a participant in the *GFP Bunny* transgenic artwork, as is anyone who comes in contact with her, and anyone who gives any consideration to the project. A complex set of relationships between social difference, scientific procedure, interspecies communication, public discussion, ethics, media interpretation, and art context is at work.

As I have indicated before, throughout the twentieth century, artists searching for new directions that could more directly respond to social transformations gave emphasis to process, concept, action, interaction, new media, environments, and critical discourse. Transgenic art acknowledges these changes, and at the same time, offers a radical departure from them, placing the question of actual creation of life at the centre of the debate. Undoubtedly, transgenic art also develops in a larger context of profound shifts in other fields. Throughout the twentieth century, physics acknowledged uncertainty and relativity, anthropology shattered ethnocentricity, philosophy denounced truth, literary criticism broke away from hermeneutics, astronomy discovered new planets, biology found

“extremophile” microbes living in conditions previously believed not capable of supporting life, and molecular biology made cloning a reality.

Transgenic art acknowledges the human role in rabbit evolution as a natural element, as a chapter in the natural history of both humans and rabbits (for domestication is always a bi-directional experience). As humans domesticate rabbits, so do rabbits domesticate their humans. Moving beyond the metaphor of the artwork as a living organism into a complex embodiment of the trope, transgenic art does not attempt to moderate, undermine, or arbitrate the public discussion. It seeks to contribute a new perspective that offers ambiguity and subtlety where we usually only find affirmative (“in favour”) and negative (“against”) polarity. Contrary to the customary treatment of transgenic animals as objects (that is, as disease models)¹⁶, *GFP Bunny* highlights the fact that transgenic animals are regular creatures that could as much part of social life as any other life form, and thus are deserving of as much consideration as any other animal.¹⁷

In developing the *GFP Bunny* project and proposing it to INRA scientists¹⁸ I paid close attention and given careful consideration to any potential harm that might be caused. I decided to proceed with the project because it became clear that it was safe.¹⁹ The genetic sequence responsible for the production of the green fluorescent protein was integrated into the genome through zygote microinjection²⁰. The pregnancy was carried to term successfully. *GFP Bunny* does not propose any new form of genetic experimentation, which is the same as saying that the technologies of microinjection and green fluorescent protein are established, well-known tools in the field of molecular biology. Green fluorescent protein has already been successfully expressed in many host organisms,

including mammals.²¹ There are no mutagenic effects resulting from transgene integration into the host genome. Put another way, green fluorescent protein is harmless to the rabbit. *GFP Bunny* gives continuation, in the context of art, to the fact that humans have played a role in the evolution of rabbits for at least 1400 years.

DIFFERENCES AND SIMILARITIES BETWEEN HUMANITY AND ANIMALITY

Relationships are not tangible, but they form a fertile field of investigation in art, pushing interactivity into a literal domain of intersubjectivity. Everything exists in relationship to everything else. Nothing exists in isolation. By focusing my research on the interconnection between biological, technological, and hybrid entities, I draw attention to this simple but fundamental fact. To speak of interconnection or intersubjectivity is to acknowledge the social dimension of consciousness. Therefore, the concept of intersubjectivity must take into account the complexity of animal minds. In this context, and particularly in regard to *GFP Bunny*, one must be open to understanding the rabbit mind, and more specifically to Alba's unique spirit as an individual. It is a common misconception that a rabbit is less intelligent than, for example, a dog, because, among other peculiarities, it seems difficult for a bunny to find food right in front of her face. The cause of this ordinary phenomenon becomes clear when we consider that the rabbit's visual system has eyes placed high and to the sides of the skull, allowing the rabbit to see nearly 360 degrees. As a result, the rabbit has a small blind spot of about 10 degrees directly in front of her nose and below her chin. (Krempels 1)²² Although rabbits do not see images as sharply as we do, they are able to

recognize individual humans through a combination of voice, body movements, and scent as cues, provided that humans interact with their rabbits regularly and don't change their overall configuration in dramatic ways (such as wearing a costume that alters the human form or using a strong perfume). Understanding how the rabbit sees the world is certainly not enough to appreciate its consciousness, but it does allow us to gain insights about its behaviour, which in turn leads us to adapt our own behaviours in order to make life more comfortable and pleasant for everyone.

Alba is a healthy and gentle mammal. Contrary to popular notions of the alleged monstrosity of genetically engineered organisms, her body shape and coloration are exactly of the same kind we ordinarily find in albino rabbits. Unaware that Alba is a glowing bunny, it is impossible for anyone to notice anything unusual about her. Therefore, Alba undermines any ascription of alterity predicated on morphology and behavioural traits. It is precisely this productive ambiguity, pointedly manifested under special light conditions, that sets her apart: being at once same and different. As is the case in most cultures, our relationship with animals is profoundly revealing of ourselves. Our daily coexistence and interaction with members of other species remind us of our uniqueness as humans. At the same time, it allow us to tap into dimensions of the human spirit that are often suppressed in daily life—such as communication without language—that reveals how close we really are to nonhumans. The more animals become part of our domestic life, the further we move breeding away from functionality and animal labour. Our relationship with other animals shifts as political pressures, scientific discoveries, technological development, economic opportunities, artistic invention, and philosophical insights transform historical conditions. As we

transform our understanding of human physical boundaries by introducing new genes into developed human organisms, our communion with animals in our environment also changes. Molecular biology has demonstrated that the human genome is not particularly important, special, or different. The human genome is made of the same basic elements as other known life forms and can be seen as part of a larger genomic continuum rich in variation and diversity.

Western philosophers, from Aristotle²³ to Descartes,²⁴ from Locke²⁵ to Leibniz,²⁶ from Kant²⁷ to Nietzsche²⁸ and Buber,²⁹ have approached the enigma of animality in a multitude of ways, evolving in time and elucidating along the way their views of humanity. While Descartes and Kant possessed a more condescending view of the spiritual life of animals (which can also be said of Aristotle), Locke, Leibniz, Nietzsche, and Buber are, in different degrees, more tolerant towards our eukaryotic others.³⁰ Our ability to generate life through the direct method of genetic engineering prompts a re-evaluation of the cultural objectification and the personal subjectification of animals, and in so doing it renews our investigation of the limits and potentialities of what we call humanity. I do not believe that genetic engineering eliminates the mystery of what life is; to the contrary, it reawakens in us a sense of wonder towards the living. We will only think that biotechnology eliminates the mystery of life if we privilege it to the detriment to other views of life (as opposed to seeing biotechnology as one among other contributions to the larger debate) and if we accept the reductionist view (not shared by many biologists) that life is purely and simply a matter of genetics. Transgenic art is a firm rejection of this view and a reminder that communication and interaction between sentient and nonsentient actants lies at the core of what we call life. Rather than accepting the move from the complexity of

life processes to genetics, transgenic art gives emphasis to the social existence of organisms, and thus highlights the evolutionary continuum of physiological and behavioural characteristics between the species.

TRANSGENESIS, ART, AND SOCIETY

The question of animal transgenesis should be complemented with an examination of the implications of genetic engineering for humans. The success of human genetic therapy suggests the benefits of altering the human genome to heal or to improve the living conditions of fellow humans.³¹ In this sense, the introduction of foreign genetic material in the human genome can be seen not only as welcome, but also as desirable. Developments in molecular biology, such as the above example, are at times used to raise the spectre of eugenics and biological warfare and with it, the fear of banalisation and abuse of genetic engineering. This fear is legitimate, historically grounded,³² and must be addressed. Contributing to the problem, companies often employ empty rhetorical strategies to persuade the public, thus failing to engage in a serious debate that acknowledges both the problems and benefits of the technology.³³ There are indeed serious threats, such as the possible loss of privacy regarding one's own genetic information, and unacceptable practices already underway, such as biopiracy (the appropriation and patenting of genetic material from its owners without explicit permission).

As we consider these problems, we can not ignore the fact that a complete ban on all forms of genetic research would prevent the development of much needed cures for the many devastating diseases that ravage human and nonhuman

kind. The problem is even more complex. Should such therapies be developed successfully, what sectors of society will have access to them? Clearly, the question of genetics is not purely a scientific matter, but one that is directly connected to political and economic directives. Precisely for this reason, the fear raised by both real and potential abuse of this technology should be channelled productively by society. Rather than embracing a blind rejection of the technology that is undoubtedly already a part of the new biopolitics,³⁴ citizens of open societies should make an effort to study the multiple views on the subject, learn about the historical background surrounding the issues, understand the vocabulary and the main research efforts underway, develop alternative views based on their own ideas, debate the issue, and arrive at their own conclusions in an effort to generate mutual understanding. Inasmuch as this seems a daunting task, drastic consequences may result from hype, opposition, or indifference.

This is where art can also be of great social value. Since the domain of art is symbolic even when intervening directly in a given context,³⁵ art can contribute to reveal the cultural implications of the revolution underway and offer different ways of thinking about and with biotechnology. Transgenic art is a mode of genetic inscription that is at once inside and outside of the operational realm of molecular biology, negotiating the terrain between science and culture. Transgenic art can help science to recognize the role of relational and communicational issues in the development of organisms. It can help culture by unmasking the popular belief that DNA is the “master molecule” through an emphasis on the whole organism and the environment (the context). Lastly, transgenic art can contribute to the field of aesthetics by opening up the new

symbolic and pragmatic dimension of art as the literal creation of, and
responsibility for, life.

End Notes

¹ Ursula Meyer, *Conceptual Art*. New York: Dutton, 1972; Joseph Kosuth, *Art After Philosophy and After : Collected Writings, 1966-1990*. Gabriele Guercio, ed. Cambridge, MA: MIT Press, 1991; Michael Newman and Jon Bird, eds., *Rewriting Conceptual Art*, London : Reaktion, 1999; Rachel Weiss, Luis Camnitzer, Jane Farver, László Beke, eds., *Global conceptualism : points of origin, 1950s-1980s*. New York : Queens Museum of Art, 1999; Alex Alberro and Blake Stimson, eds., *Conceptual Art: A Critical Anthology*. Cambridge, MA: MIT, 2000.

² I originally wished to bring the animal to a domestic setting both to engage in a dialogic relationship with it and to study its behavior and development. This phase of the project was not realized because Paul Vialle, director of the Institut National de la Recherche Agronomique (INRA) in 2000, refused to release the rabbit to me, as previously accorded between Louis-Marie Houdebine and myself. The realization of two out of three projected components of this work, however, was sufficient to communicate my ideas to the public, raise the social and philosophical issues addressed by the work, and generate productive debate.

³ This was accomplished with the invaluable assistance of artist and curator Louis Bec and scientists Louis-Marie Houdebine and Patrick Prunet. Artist, curator, and cultural promoter, Louis Bec coined the term *zoosystémicien* (zoosystemician) to define his artistic practice and his sphere of interest, the digital modelling of living systems. Formerly Inspecteur à la création artistique chargé des Nouvelles Technologies, Ministère de la Culture (Coordinator of Art and Technology for the French Ministry of Culture), Louis Bec was the Director of the festival Avignon Numérique (Digital Avignon), celebrated in Avignon, France, from April 1999 to November 2000, on the occasion of Avignon's status as European cultural capital of the year 2000. Louis-Marie Houdebine and Patrick Prunet are scientists who work at the Institut National de la Recherche Agronomique-INRA (National Institute of Agronomic Research), France. Houdebine is the Director of Research of the Biology of Development and Biotechnology Unit, INRA, Jouy-en-Josas Centre, France. Among his books in French we find: *Le génie génétique, de l'animal à l'homme: un exposé pour comprendre, un essai pour réfléchir* (Paris: Flammarion, 1996); *Les biotechnologies animales: une nécessité ou une révolution inutile* (Paris: France agricole, 1998); and *Les animaux transgéniques* (Paris: Tec et Doc, 1998). In English: *Transgenic Animals - Generation and Use* (Amsterdam: Harwood Academic Publishers, 1997). See also: C. Viglietta, M. Massoud and L.M. Houdebine. "The Generation of Transgenic Rabbits." *Transgenic Animals*. Amsterdam: Harwood Academic, 1997: 11-13. Patrick Prunet is a researcher in the Group in Physiology of Stress and Adaptation, INRA, Campus de Beaulieu, Rennes, France.

⁴ After green fluorescent protein (GFP) was first isolated from *Aequorea victoria* and used as a new reporter system (see: M. Chalfie, Y. Tu, G. Euskirchen, W. Ward, and D. Prasher. "Green Fluorescent Protein as a Marker for Gene Expression." *Science* 263 (1994): 802-805), it was modified in the laboratory to increase fluorescence. See: R. Heim, A. B. Cubitt, and R. Y. Tsien. "Improved

green fluorescence." *Nature* 373 (1995): 663-664; and R. Heim, R. Y. Tsien. "Engineering green fluorescent protein for improved brightness, longer wavelengths and fluorescence resonance energy transfer." *Current Biology*. 6 (1996): 178-182. Further work altered the green fluorescent protein gene to conform to the favoured codons of highly expressed human proteins and thus allowed improved expression in mammalian cells. See: J. Haas, E.C. Park, and B. Seed. "Codon usage limitation in the expression of HIV-1 envelope glycoprotein." *Current Biology* 6 (1996): 315-24. New mutations with greater fluorescence have also been developed. See: Te-Tuan Yang, et al. "Improved fluorescence and dual colour detection with enhanced blue and green variants of the green fluorescent protein." *The Journal of Biological Chemistry*. 273.14 (1998): 8212. For a comprehensive overview of green fluorescent protein as a genetic marker, see: Martin Chalfie and Steven Kain. "Green fluorescent protein: properties, applications, and protocols." New York: Wiley-Liss, 1998. Since its first introduction in molecular biology, GFP has been expressed in many organisms, including bacteria, yeast, slime mold, many plants, fruit flies, zebra fish, many mammalian cells, and even viruses. Moreover, many organelles, including the nucleus, mitochondria, plasma membrane, and cytoskeleton, have been marked with GFP.

⁵ For an account of the history of domestication, see: Frederick Everard Zeuner. *A History of Domesticated Animals*. New York: Harper & Row, 1963; Juliet Clutton-Brock. *Domesticated Animals from Early Times*. London: British Museum, 1981; Roger A. Caras. *A Perfect Harmony: The Intertwining Lives of Animals and Humans Throughout History*. New York: Simon and Schuster, 1996; Achilles Gautier. *La domestication. Et l'homme créa ses animaux*. Paris: Editions Errance, 1990; Daniel Helmer. *La domestication des animaux par les hommes préhistoriques*. Paris: Masson, 1992; and Carl O. Sauer. *Agricultural Origins and Dispersals: The Domestication of Animals and Foodstuffs*. Cambridge, MA: MIT P, 1970. For specific references on the domestication of rabbits see: F. Biadi and A. Le Gall. *Le lapin de garenne*. Paris: Hatier, 1993; G. Bianciotto. *Bestiaires du Moyen Âge*. Paris: Stock, 1980; J. J. Brochier. *Anthologie du lapin*. Paris: Hatier, 1987; "Le lapin, aspects historiques, culturels et sociaux. Ethnozootechnin." n° 27 (1980). For a discussion of rabbit evolution from the perspective of molecular biology, see: C. Su and M. Nei. "Fifty-million-year-old polymorphism at an immunoglobulin variable region gene locus in the rabbit evolutionary lineage." *Proceedings of the National Academy of Science*. U.S.A. 17 August 1999; K. M. Halanych and T.J. Robinson. "Multiple Substitutions Affect the Phylogenetic Utility of Cytochrome b and 12S rDNA Data: Examining a Rapid Radiation in Leporid (Lagomorpha) Evolution." *Journal of Molecular Evolution*. 48. (1999): 369-379.

⁶ Regarding the discovery of new rabbit species, see: Alison K. Surridge, Robert J. Timmins, Godfrey M. Hewitt, and Diana J. Bell. "Striped rabbits in Southeast Asia." *Nature*. 400.726 (19 Aug 1999).

⁷ Detailed information about the spiritual values of individual tribes can be found in the following: Sam D. Gill. *Dictionary of Native American Mythology*. New York: Oxford UP, 1994. See also: Arlene B. Hirschfelder. *Encyclopedia of*

Native American Religions: An Introduction. New York: Facts on File, 2000; Richard Erdoes and Alfonso Ortiz, eds. *American Indian Myths and Legends*. New York: Pantheon Books, 1985. A case that illustrates well the sacred qualities of albino animals for Native American tribes was the birth of "Miracle," the white buffalo calf. Miracle was born on Dave Heider's farm, in Janesville, Wisconsin, on August 20, 1994. The announcement of Miracle's birth prompted the American Bison Association to say that the last documented white buffalo died in 1959. Miracle is held sacred by buffalo-hunting Plains Indians, including the Lakota, the Oneida, the Cherokee, and the Cheyenne. Soon after her birth, Joseph Chasing Horse, traditional leader of the Lakota nation, visited the site of Miracle's birth and conducted a Pipe ceremony there, while telling the story of White Buffalo Calf Woman, a legendary figure who brought the first Pipe to the Lakota people. Following suit, more than 20,000 people come to see Miracle, and the gate to the Heider's pasture and the trees next to it soon became covered with offerings: feathers, necklaces and pieces of colourful cloth. News of the calf spread quickly through the Native American community because its birth fulfilled a 2,000-year-old prophecy of northern Plains Indians. Joseph Chasing Horse explained in a newspaper interview that 2,000 years ago a young woman who first appeared in the shape of a white buffalo gave the Lakota's ancestors a sacred pipe and sacred ceremonies and made them guardians of the Black Hills. Before leaving, she also prophesied that one day she would return to purify the world, bringing back spiritual balance and harmony; the birth of a white buffalo calf would be a sign that her return was at hand. Owen Mike, head of the Ho-Chunk (Winnebago) buffalo clan, said in the same article that his people have a slightly different interpretation of the white calf's significance. He added, however, that the Ho-Chunk version of the prophecy also stresses the return of harmony, both in nature and among all peoples. "It's more of a blessing from the Great Spirit," Mike explained. "It's a sign. This white buffalo is showing us that everything is going to be okay" (Laskin 12).

⁸ In the twentieth century, dialogical philosophy found renewed impetus with Martin Buber, who published the book *I-Thou* in 1923, in which he states that humankind is capable of two kinds of relationship: I and Thou (reciprocity) and I-It (objectification). In "I and Thou" relations, one fully engages in the encounter with the other and carries on a real dialogue. In "I-It relations," "It" becomes an object of control. The "I" in both cases is not the same, for in the first case there is a non-hierarchical meeting while in the second case there is detachment. Martin Buber's dialogical philosophy of relation, which is very close to Phenomenology and Existentialism, also influenced Mikhail Bakhtin's philosophy of language. Bakhtin stated in countless writings that ordinary instances of monological experience--in culture, politics, and society--suppress the dialogical reality of existence. See: Martin Buber. *I and Thou*. New York: Collier, 1987.

⁹ Cognitive ethology can be defined as "the evolutionary and comparative study of nonhuman animal thought processes, consciousness, beliefs, or rationality, and is an area in which research is informed by different types of investigations and explanations" (119-150). A pioneer of ethology, the Estonian zoologist Jakob von Uexküll (1864-1944) devoted himself to the problem of how living beings

subjectively perceive their environment and how this perception determines their behaviour. In 1909 he wrote "Umwelt und Innenwelt der Tiere," introducing the German word "umwelt" (roughly translated, "environment") to refer to the subjective world of an organism. The book has been excerpted in *Foundations of Comparative Ethology*, Ed. G. Burghardt (New York: Van Nostrand Reinhold, 1985). Since Uexküll emphasized the fact that signs and meanings are of the utmost importance in all aspects of biological processes (at the level of the cell or the organism), he also anticipated the concerns of cognitive ethology and biosemiotics (the study of signs, of communication, and of information in living organisms). See: Jacob von Uexküll. *Mondes animaux et monde humain : suivi de théorie de la signification*. Paris: Denoël, 1984. Further contributing to the subjective world of other animals, Donald Griffin first demonstrated that bats navigate the world using biosonar, a process he called "echolocation." See: Donald R Griffin. *Listening in the Dark : The Acoustic Orientation of Bats and Men*. 1958. Ithaca, London: Comstock, 1986. Griffin has since contributed to cognitive ethology with many books, most notably, *The Question of Animal Awareness: Evolutionary Continuity of Mental Experience* (New York: The Rockefeller UP, 1976), *Animal Thinking* (Cambridge: Harvard UP, 1984), and *Animal Minds* (Chicago: U of Chicago P, 1992). Another important pioneering contribution was T. Nagel's article entitled "What is it like to be a bat?" (*Philosophical Review* 83 (1974): 435-405.) In this paper Nagel offered a critique of physicalist explanations of the mind, pointing out that they do not take into account consciousness, i.e. what is the actual life experience of an organism. In this paper, a classic both of cognitive ethology and consciousness studies, Nagel reminds us that what science professes to be objective accounts inevitably omit points of view. In recognition of Griffin's pioneering work, which exhibited the problems of behaviourist and cognitive thinking that fails to acknowledge conscious awareness in mammals and thinking in small animals, several researchers pushed forward the research agenda of cognitive ethology. See: Carolyn A. Ristau, ed. *Cognitive Ethology : The Minds of Other Animals: Essays in Honor of Donald R. Griffin*. Hillsdale, N.J.: L. Erlbaum Associates, 1991. A comprehensive discussion of the multiple views that inform the debate around cognitive ethology, including the critique of those who oppose the very foundational principles of this science, can be found in: M. Bekoff and C. Allen's "Cognitive ethology: Slayers, Skeptics, and Proponents." *Anthropomorphism, Anecdote, and Animals: The Emperor's New Clothes?* Eds. R. W. Mitchell, N. Thompson, and L. Miles. Lincoln, Nebraska: U of Nebraska P, 1993. In his book *Kinds of Minds*, Daniel Clement Dennett makes a general attempt to explain consciousness irrespective of species. He takes the "intentional stance," i.e., the strategy of interpreting the behaviour of something (a living or non living thing) as if it were a rational agent whose actions are determined by its beliefs and desires. He examines the "intentionality" of a molecule that replicates itself, a dog that marks territory, and a human who wishes to do something in particular. In the end, for Dennett it is our ability to use language that forms the particular mind humans have. Dennett believes that language is a way to unravel the representations in our mind and extract units of them. Without language, an animal may have exactly the same representation, but it doesn't have access to any unit of it. See: D. C. Dennett. *Kinds of Minds: Toward an Understanding of*

Consciousness. New York: Basic Books, 1996. For an examination of the rapport between philosophical theories of mind and empirical studies of animal cognition, see: C. Allen and M. Bekoff. *Species of Mind: The Philosophy and Biology of Cognitive Ethology*. Cambridge: MIT P, 1997. Focused studies on the intelligence of non-primate species have also contributed to demonstrate the unique mental abilities of creatures such as marine mammals, birds, and ants. See: R. J. Schusterman, J. A. Thomas, and F. G. Wood, eds. *Dolphin Cognition and Behavior: A Comparative Approach*. Hillsdale, New Jersey: Erlbaum, 1986; A. F. Skutch. *The Minds of Birds*. College Station, TX: Texas A. & M. UP, 1996); Irene Maxine Pepperberg. *The Alex Studies : Cognitive and Communicative Abilities of Grey Parrots*. Cambridge: Harvard UP, 2000. On the question of communication in ants, Deborah Gordon points out that “the way that scientists see animals’ behaviour occurs... [in] a system embedded in the social practices of a certain time and place” (23). Gordon’s field studies of interactions between neighbouring colonies have shown that ants learn to recognize not only their own nest-mates but also ants from neighbouring, unrelated colonies. Her field studies have led to further research concerning communication networks within ant colonies. For a more exhaustive examination of the problem, see: D. M. Gordon. *Ants at Work: How an Insect Society is Organized*. New York: Free Press, 1999. The key contribution of Gordon’s book is to undue the popular perception that ant colonies run according to rigid rules and to show (based on her fieldwork with harvester ants in Arizona) that an ant society can be sophisticated and change its collective behaviour as circumstances require. Finding inspiration in Charles Darwin’s book *The Expression of Emotions in Man and Animals* (New York: D. Appleton and Company, 1872), Jeffrey M. Masson and Susan McCarthy make a convincing case for animal emotion. See: J. M. Masson and S. McCarthy. *When Elephants Weep: The Emotional Lives of Animals*. New York: Bantam Doubleday Dell, 1995. On the minds of nonhuman primates, see: D. L. Cheney and R. M. Seyfarth. *How Monkeys See the World: Inside the Mind of Another Species*. Chicago: U of Chicago P, 1990; S. Montgomery. *Walking With the Great Apes: Jane Goodall, Dian Fossey, and Birutė Galdikas*. New York: SUNY P, 1991; S. Savage-Rumbaugh and R. Lewin. *Kanzi: The Ape at the Brink of the Human Mind*. New York: Wiley, 1994; A. E. Russon, K. A. Bard, and T. Parker, eds. *Reaching into Thought: The Minds of the Great Apes*. Cambridge: Cambridge UP, 1996; F. M. de Waal. *Bonobos: The Forgotten Ape*. Berkeley: U of California P, 1997.

¹⁰ According to Michael Theunissen, “Buber sought to outline an “ontology of the between” in which individual consciousness can only be understood within the context of our relationships with others, not independent of them” (271-272).

¹¹ For Bakhtin, dialogic relationships “are an almost universal phenomenon, permeating all human speech and all relationships and manifestations of human life—in general, everything that has meaning and significance” (*Problems of Dostoevsky’s Poetics* 40).

¹² On the formation of “ego” or subjectivity through language, and the notion that it is only through language that we are conscious (i.e., are “subject” at all), see: Emile Benveniste. “Subjectivity in Language.” 1966. *Problems in General*

Linguistics. Trans. Mary Elizabeth Meek. Coral Gables, Florida: U of Miami P, 1971. 223-230. Echoing Buber, Benveniste's position is that when a person says "I" (i.e., when an individual occupies a subject position in discourse), he or she takes one's place as a member of the intersubjective community of persons. Thus, in being a subject/person, he or she is not simply an object/thing. Benveniste was certainly not the only to consider the intersubjective nature of human experience. Wlad Godzich wrote, "For Kant, the fact that the individual could not experience the object as it was in itself required the postulation of another dimension among individuals: intersubjectivity" (Arac and Wlad 46). When Edmund Husserl considered in retrospect his lectures of 1910/11, he wrote, "My lectures at Göttingen in 1910-11 already presented a first sketch of my transcendental theory of empathy, i.e. the reduction of human existence as mundane being-with-one-another to transcendental intersubjectivity" (417). For Maurice Merleau-Ponty our not-sameness to each other is not a flaw, but is the very condition of communication: "the body of the other—as bearer of symbolic behaviours and of the behaviour of true reality—tears itself away from being one of my phenomena, offers me the task of a true communication, and confers on my objects the new dimension of intersubjective being" (*Primacy of Perception* 17-18). For Merleau-Ponty it is in the ambiguity of intersubjectivity that our perception "wakes up" (*Primacy of Perception* 17-18). For a critical analysis of Merleau-Ponty's position on intersubjectivity, see: Robert M. Friedman. "Merleau-Ponty's Theory of Intersubjectivity." *Philosophy Today* 19 (Fall 1975): 228-42. Jürgen Habermas also gave the concept of intersubjectivity a central place in his work. Giving continuation to one of the projects of the Frankfurt School (the critique of the notion that valid human knowledge is restricted to empirically testable propositions arrived at by means of systematic inquiry professed to be objective and devoid of particular interests), Habermas finds in intersubjectivity a means of opposing theories which base truth and meaning on individual consciousness. For him, intersubjectivity is a communication situation in which "the speaker and hearer, through illocutionary acts, bring about the interpersonal relationships that will allow them to achieve mutual understanding" ("Some Distinctions in Universal Pragmatics" 157). In "The Theory of Communicative Action," Habermas further explains his view of intersubjective communication: "When a hearer accepts a speech act, an agreement comes about between at least two acting and speaking subjects. However this does not rest only on the intersubjective recognition of a single, thematically stressed validity claim. Rather, an agreement of this sort is achieved simultaneously at three levels. . . . It belongs to the communicative intent of the speaker (a) that he perform a speech act that is right in respect to the given normative context, so that between him and the hearer an intersubjective relation will come about which is recognized as legitimate; (b) that he make a true statement (or correct existential presuppositions), so that the hearer will accept and share the knowledge of the speaker; and (c) that he express truthfully his beliefs, intentions, feelings, desires, and the like, so that the hearer will give credence to what is said" (307-308).

¹³ For an earlier discussion of "consensual domains," see Maturana's "The organization of the Living: A Theory of the Living Organization." *The International journal of Man-Machine Studies*. 7 (1975): 313-332. Still in

“Biology of Language: The Epistemology of Reality,” Maturana explains the term autopoiesis: “There is a class of dynamic systems that are realized, as unities, as networks of productions (and disintegrations) of components that: (a) recursively participate through their interactions in the realization of the network of productions (and disintegrations) of components that produce them; and (b) by realizing its boundaries, constitute this network of productions (and disintegrations) of components as a unity in the space they specify and in which they exist. Francisco Varela and I called such systems autopoietic systems, and autopoietic organization their organization. An autopoietic system that exists in physical space is a living system (or, more correctly, the physical space is the space that the components of living systems specify and in which they exist” (36). See also: H. R. Maturana and F. G. Varela. *Autopoiesis and Cognition: The Realization of the Living*. Boston: Reidel, 1980. This book was originally published in Chile under the title *De Maquinas y Seres Vivos*, Editorial Universitaria, 1972.

¹⁴ Emmanuel Levinas wrote, “Proximity, difference which is non-indifference, is responsibility” (139). Partially influenced by the dialogical philosophy of Martin Buber, Levinas sought to go beyond the ethically neutral tradition of ontology through an analysis of the “face-to-face” relation with the Other. For Levinas, the Other cannot be known as such. Instead, the Other arises in relation to others, in a relationship of ethical responsibility. For Levinas, this ethical responsibility must be regarded as prior to ontology. For his insights on Buber’s work, see: E. Levinas. “Martin Buber and the Theory of Knowledge.” *The philosophy of Martin Buber*. Ed. P. Schilpp. La Salle, IL: Open Court, 1967. 133-150.

¹⁵ There are three types of cell: Prokaryotes, Eukaryotes, and Archae. Prokaryotes are unicellular organisms (e.g., bacteria) that lack a nuclear membrane and membrane-bound organelles. Eukaryotes are unicellular (e.g., yeast) or multicellular organisms (e.g., humans) that have a nuclear membrane surrounding genetic material and numerous membrane-bound organelles dispersed in a complex cellular structure. All cells in multicellular organisms are eukaryotic. Eukaryotes include most organisms (algae, fungi, protozoa, plants, and animals) except viruses, bacteria, and blue-green algae. Another major domain of life is called Archaea, microorganisms with genetic features distinct from prokarya and eukarya. The DNA of Archea is not contained within a nucleus. Many Archae live in harsh environments, such as thermal vents in the Ocean and hot springs. Most methane-producing bacteria are actually Archae.

¹⁶ John M. Taylor and Jianglin Fan. Transgenic rabbit models for the study of atherosclerosis. *Frontiers in Bioscience* 2, June 15, 1997: 298-308; J. Miyazaki, and F. Tashiro (1993). Transgenic models of insulin-dependent diabetes mellitus. *ILAR News* 35 (2): 37-41; Dante Scarpelli and others. *Transgenic Animal Models in Biomedical Research*, Proceedings of a Symposium held at the National Institutes of Health, Bethesda, Maryland, Nov. 4-5, 1992.

¹⁷ On the question of the welfare of transgenic animals, see: C. J. Moore and T. B. Mepham. “Transgenesis and Animal Welfare.” *ATLA*. 23 (1995): 380-397 and

L.F.M. van Zutphen and M. van der Meer, eds. *Welfare Aspects of Transgenic Animals*. New York: Springer, 1997.

¹⁸ See endnote 3 of this chapter.

¹⁹ By this I mean that the process was expected to be (and in fact was) as common as any other rabbit pregnancy and birth. This is due to the fact that transgenic technology has been successfully and regularly employed in the creation of mice since 1980 and in rabbits since 1985. See: J. W. Gordon, G. A. Scargos, D. J. Plotkin, J. A. Barbosa, and F. Ruddle. "Genetic Transformation of Mouse Embryos by Microinjection of Purified DNA." *Proceedings of the National Academy of Science. U.S.A.* 77 (1980): 7380-7384; J. W. Gordon and F. Ruddle. "Integration and Stable Germ Line Transformation of Genes Injected into Mouse Pronuclei." *Science*. 214 (1981):1244-1246; R. E. Hammer, V. G. Pursel, C. E. Rexroad, Jr., R. J. Wall, D. J. Bolt, K. M. Ebert, R. D. Palmiter, and R. L. Brinster. "Production of Transgenic Rabbits, Sheep and Pigs by Microinjection." *Nature*. 315 (1985): 680-683; James M. Robl and Jan K. Heideman. "Production of Transgenic Rats and Rabbits." Ed. Carl A. Pinkert. *Transgenic Animal Technology: A Laboratory Handbook*. San Diego: Academic Press, 1994. The term transgenic was first used by J.W. Gordon and F. Ruddle in their 1981 paper. For additional information on expression of GFP in rabbits, see: T. Y. Kang, X. J. Yin, G. J. Rho, H. Lee, H. J. Lee. "Cloning of Transgenic Rabbit Embryos Expressing Green Fluorescent Protein (GFP) Gene by Nuclear Transplantation." *Theriogenology*. 53.1 (2000).

²⁰ The zygote is the cell formed by the union of two gametes. A gamete is a reproductive cell, especially a mature sperm or egg capable of fusing with a gamete of the opposite sex to produce the fertilized egg. Direct microinjection of DNA into the male pronucleus of a rabbit zygote has been the method most extensively used in the production of transgenic rabbits. As the foreign DNA integrates into the rabbit chromosomal DNA at the one-cell stage, the transgenic animal has the new DNA in every cell. For detailed discussion of the methods and applications of microinjection technology, see: J. C. Lacal, R. Perona, and J. Feramisco. *Microinjection*. New York: Springer, 1999. The first successful creation of transgenic mice using pronuclear microinjection was reported in 1980: J. W. Gordon et al. "Genetic Transformation of Mouse Embryos by Microinjection of Purified DNA." *Proceedings of the National Academy of Science. USA*. 77 (1980): 7380-7384. The new gene was proven to have been integrated into the mouse genome, but it did not express. The first visible phenotypic change in transgenic mice was described in 1982 for animals expressing the rat growth hormone sequence: R. D. Palmiter et al. "Dramatic Growth of Mice that Develop from Eggs Microinjected with Metallothionein-Growth Hormone Fusion Genes." *Nature*. 300 (1982): 611-615. Following transgenic mice creation, rabbits, sheep and pigs were also created (see note 17). Several hundred transgenic expression papers are published each year. It is also worth mentioning the creation of the first cloned rabbit: Patrick Chesné, Patrick et al. "Cloned Rabbits Produced by Nuclear Transfer from Adult Somatic Cells." *Nature Biotechnology*. 20.4 (April 2002): 366 - 369.

²¹ See endnote 2 of this chapter.

²² For a more comprehensive examination of vision in rabbits and other animals, see: R. H. Smythe. *Vision in the Animal World*. New York: St. Martin's, 1975.

²³ In Part I of Book IX of *The History of Animals*, written ca. 350 BC, Aristotle recognizes the complexity of animal emotional states: "Of the animals that are comparatively obscure and short-lived the characters or dispositions are not so obvious to recognition as are those of animals that are longer-lived. These latter animals appear to have a natural capacity corresponding to each of the passions: to cunning or simplicity, courage or timidity, to good temper or to bad, and to other similar dispositions of mind" (478). Although in the first chapter of the *Metaphysics* Aristotle attributes forms of reason and intelligence to animals, in another book (*Politics*) he claims that humans are the only animal capable of logos (Book VII, Part XIII): "Animals lead for the most part a life of nature, although in lesser particulars some are influenced by habit as well. Man has rational principle, in addition, and man only" (183). Also in the *Politics*, Aristotle compares animals to slaves (Book I, Part V): "the use made of slaves and of tame animals is not very different; for both with their bodies minister to the needs of life" (8). See: Aristotle. *The works of Aristotle* (London, Oxford Univ., 1966).

²⁴ In his 1637 "Discourse on the Method," Descartes insists on an absolute separation between human and animal. For him, consciousness and language create the boundary of being between humankind and animals. Descartes stated that "beasts have less reason than men," and that in fact "they have no reason at all" (45). For Descartes, since animals do not have a recognizable language, they lack reason, and as a result are in his view like automata, capable of mimicking speech but not truly able to engage in discourse that enables and supports consciousness. The by-product of this view is the ascription of animality to the domain of the unconscious. This manoeuvre did not escape the attention of semiotician Charles Sanders Peirce, who criticized Descartes: "Descartes was of the opinion that animals were unconscious automata. He might as well have thought that all men but himself were unconscious" (234).

²⁵ In *An Essay Concerning Human Understanding* (Book II, Chapter XI), John Locke writes, "If it may be doubted whether beasts compound and enlarge their ideas that way to any degree; this, I think, I may be positive in that the power of abstracting is not at all in them; and that the having of general ideas is that which puts a perfect distinction betwixt man and brutes, and is an excellency which the faculties of brutes do by no means attain to. For it is evident we observe no footsteps in them of making use of general signs for universal ideas; from which we have reason to imagine that they have not the faculty of abstracting, or making general ideas, since they have no use of words, or any other general signs" (208). Even though Locke denied animals the faculty of abstract thought, he still did not agree with Descartes in considering animals automata. Still in the same chapter, Locke writes, "if they [animals] have any ideas at all, and are not bare machines, (as some would have them,) we cannot deny them to have some reason" (208). In his partial rejection of the Cartesian theory of knowledge, John Locke proposed

two sources of ideas: sensation and reflection. By means of the difference between ideas of sensation and ideas of reflection, Locke distinguished man from animals: animals had certain sensory ideas and a degree of reason but no general ideas (i.e., abstraction ability) and as a result no language for their manifestation. For Locke, abstraction is firmly beyond the capacity of any animal, and its is precisely abstract thought that plays a fundamental role in forming the ideas of mixed modes, on which morality depends.

²⁶ For Gottfried Leibniz, animals did not have self-consciousness and the power to recognize eternal truths, which for him were characteristics of the souls of men. He wrote, "I am also inclined to believe that there are souls in the lower animals because it pertains to the perfection of things that when all those things are present which are adapted to a soul, the souls also should be understood to be present. . . . But no one should think that it can with equal justice be inferred that there must also be minds in the lower animals; for it must be known that the order of things will not allow all souls to be free from the vicissitudes of matter, nor will justice permit some minds to be abandoned to agitation. So it was sufficient that souls should be given to the lower animals, especially as their bodies are not made for reasoning, but destined to various functions—the silkworm to weave, the bee to make honey, and the others to the other functions by which the universe is distinguished" (84).

²⁷ In *The Metaphysics of Morals* (Metaphysical First Principles of the Doctrine of Virtue), Kant states that we as human beings are distinguished from other animals by our capacity to set ends for ourselves, which is only possible for a rational being. See: Kant, Immanuel. *The Metaphysics of Morals*. Cambridge: Cambridge UP, 1991. esp. pp. 381, 384-85, 392. For Kant the moral faculty of humans was directly connected to the fundamental property of reason. He did not find in nature the origin of morality, and thus denied animals membership in the (moral) kingdom of ends. For Kant, the sense of moral duty is inherent in humans (but not animals): "animals are not self conscious and are there merely as a means to an end. That end is man." Continuing, he says, "our duties towards animals are merely indirect duties towards humanity" (122). In other words, Kant believed one should not harm animals because in doing so one indirectly would damage humanity (one might see another human as less human and become prone to other kinds of cruelty). See also: Kant. "Duties to Animals and Spirits." *Lectures in Ethics*. Ed. L. Infield. New York: Harper and Row, 1963. esp. pp. 239-241.

²⁸ In his seminal essay "On Truth and Lies in a Nonmoral Sense" (1873), Friedrich Nietzsche (who once stopped a man from beating his horse) wrote, "As a 'rational' being, [a person] now places his behaviour under the control of abstractions. He will no longer tolerate being carried away by sudden impressions, by intuitions. First he universalises all these impressions into less colourful, cooler concepts, so that he can entrust the guidance of his life and conduct to them. Everything which distinguishes man from the animals depends upon this ability to volatilise perceptual metaphors in a schema, and thus to dissolve an image into a concept" (84). In this essay, Nietzsche states that what we call "truth" is only "a mobile army of metaphors, metonyms, and anthropomorphisms" (84). For him arbitrariness prevails within human experience: what one ordinarily

calls “truth” is nothing but the invention of fixed conventions for practical purposes, particularly those of security and consistency.

²⁹ Buber expounds on the I-Thou relationship between human and non-human animals: “Man once “tamed” animals, and he is still capable of this singular achievement. He draws animals into his atmosphere and moves them to accept him, the stranger, in an elemental way, and to respond to him. He wins from them an often astonishing active response to his approach, to his addressing them, and moreover a response which in general is stronger and director in proportion as his attitude is a genuine saying of Thou. Animals, like children, are seldom able to see through any hypocritical tenderness. But even outside the sphere of taming a similar contact between men and animals sometimes takes place—with men who have in the depths of their being a potential partnership with animals, not predominantly persons of “animal” nature, but rather those whose very nature is spiritual” (125).

³⁰ For a comprehensive examination of the approaches to animality within the Western tradition, and for a philosophical contribution towards a more respectful understanding of non-human animals, see: Elisabeth Fontenay. *Le silence des betes*. Paris: Fayard, 1998.

³¹ On September 14, 1990 researchers at the U.S. National Institutes of Health performed the first (approved) gene therapy procedure on four-year old Ashanti DeSilva. Born with a disease called severe combined immune deficiency (SCID), she lacked a healthy immune system and was vulnerable to every passing germ. In Ashanti's gene therapy procedure, doctors grew her own white blood cells in the lab, inserted the missing gene into the cells, and then reintroduced the genetically modified blood cells back into her bloodstream. The therapy strengthened Ashanti's immune system to the point that she became able to live a regular life, but the procedure was not a permanent cure. The process must be repeated every few months. See: Ira H. Carmen. “Debates, Divisions, and Decisions: Recombinant DNA Advisory Committee (RAC) Authorization of the First Human Gene Transfer Experiments.” *American Journal of Human Genetics*. 50.2 (February 1992): 245-260; T. Friedmann. “A Brief History of Gene Therapy.” *Nature Genetics* 2.2 (October 1992): 93-98. A similar case took place in France in 2000. See: Marina Cavazzana-Calvo, Salima Hacein-Bey, Geneviève de Saint Basile, Fabian Gross, Eric Yvon, Patrick Nusbaum, Françoise Selz, Christophe Hue, Stéphanie Certain, Jean-Laurent Casanova, Philippe Bousso, Françoise Le Deist, and Alain Fischer. “Gene Therapy of Human Severe Combined Immunodeficiency (SCID)-X1 Disease.” *Science*. 288. (28 April 2000): 669-672.

³² For a brief overview of the history of eugenics, see: Joel D. Howell. “The History of Eugenics and the Future of Gene Therapy.” *Journal of Clinical Ethics*. 2.4 (Winter 1991): 274-278. For a comprehensive critical history, see: Daniel J. Kevles. *In the Name of Eugenics : Genetics and the Uses of Human Heredity*. Cambridge: Harvard UP, 1997.

³³ A case in point is the notorious example of Monsanto's claim that it seeks to feed the world, and the rebuke from 24 African delegates to the Food and Agriculture Organization (FAO) negotiations on the International Undertaking for Plant Genetic Resources, June 1998. (Bruno 291).

³⁴ See: Michel Foucault. "The Birth of Biopolitics." *Michel Foucault: Ethics, The Essential Works I*. Ed. P. Rabinow. London: Penguin, 1997: 73-79. In his essay on biopolitics at the end of *History of Sexuality, Volume 1*, Foucault argues in reference to the eighteenth century that "[f]or the first time in history, no doubt, biological existence was reflected in political existence; the fact of living was no longer an inaccessible substrate that only emerged from time to time, amid the randomness of death and its fatality; part of it passed into knowledge's field of control and power's sphere of intervention" (142).

³⁵ Here I use the word "symbolic" in the sense that the artwork is not just an entity to be regarded for its intrinsic and unique properties or just a pragmatic way of accomplishing a goal, but also (and always) a means of producing a world of understanding. My use of the word is partially motivated by Erwin Panofsky's application of Ernst Cassirer's *Philosophy of Symbolic Forms* (3 Vol., 1923-29). Panofsky says that perspective is "one of those 'symbolic forms' in which 'spiritual meaning' is attached to a concrete, material sign and intrinsically given to this sign" (40-41).

Chapter 9 - THE EIGHTH DAY

In this chapter I will investigate the integration of telepresence (in this case, the remote control of a robot through the Internet) with transgenic organisms. As I will demonstrate, my research (embodied in the work entitled *The Eighth Day*) has led me to position transgenics inside the robot (to provide partial control of its behaviour) and outside (to both naturally respond to the robot's movements and to provide visual stimuli to Internet participants who see the space from the perspective of the robot).

The Eighth Day is a transgenic artwork that investigates the new ecology of fluorescent creatures that is evolving worldwide. I developed this work at the Institute for Studies in the Arts, Arizona State University, Tempe, where it was exhibited in 2001.¹ While fluorescent creatures exist in isolation in laboratories, seen collectively they form the nucleus of a new synthetic bioluminescent system. The piece brings together living transgenic life forms and a biological robot (biobot) in an environment housed under a clear, four-foot diameter Plexiglas dome [Figure 21], thus making visible what it would be like if these creatures did, in fact, coexist in the world at large.

TRANSGENIC ECOLOGIES

As the viewer walks into the gallery, she first sees a blue-glowing semisphere against a dark background. This semisphere is the four-foot dome, aglow with its internal blue light². She also hears the recurring sounds of water washing ashore. This evokes the image of the Earth as seen from space. The water sounds function both as a metaphor for life on Earth (reinforced by the

spherical blue image) and resonate with the video of moving water projected on the floor. Thus, in order to see *The Eighth Day*, the viewer is invited to “walk on water.”



Figure 21 – *The Eighth Day*, transgenic installation linked to the Internet. The piece brings together living transgenic life forms and a biological robot (biobot) in an environment housed under a clear, four-foot diameter Plexiglas dome.

The Eighth Day presents an expansion of biodiversity beyond wild life forms. As a self-contained artificial ecological system, it resonates with the words in the title, which add one day to the period of creation of the world as narrated in the Judeo-Christian Scriptures. All of the transgenic creatures in *The Eighth Day* are created through the cloning of a gene that codes for the production of green fluorescent protein (GFP). As a result, all creatures express the gene through bioluminescence and their glow is clearly seen by all gallery viewers³. The

transgenic creatures in *The Eighth Day* are GFP plants [Figure 22], GFP amoebae [Figure 23], GFP fish [Figure 24], and GFP mice [Figure 25].⁴



Figure 22 – *The Eighth Day*, transgenic installation linked to the Internet (GFP plants, detail).

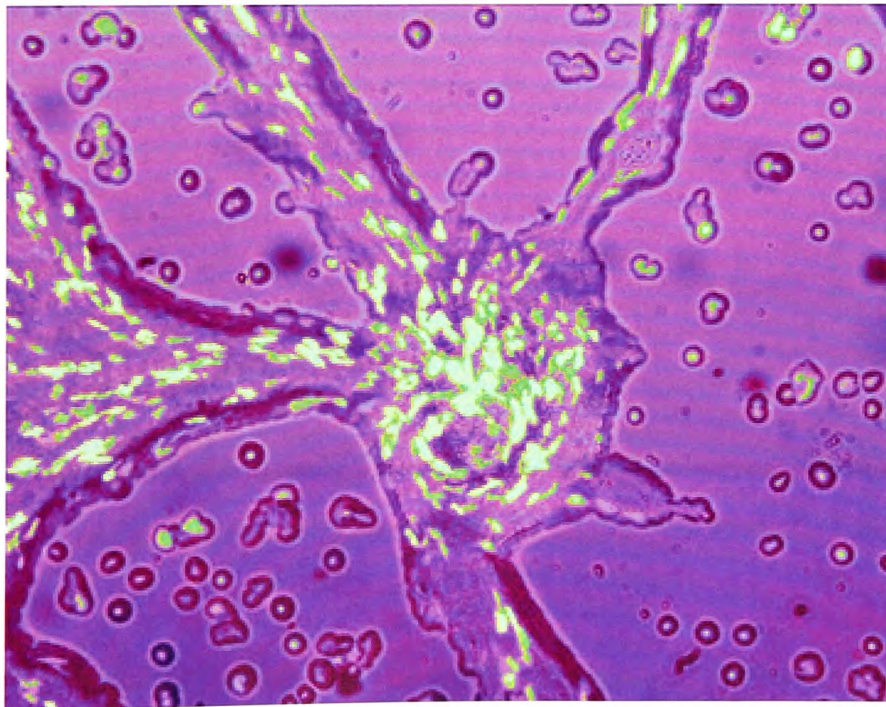


Figure 23 – *The Eighth Day*, transgenic installation linked to the Internet (GFP amoebae, detail).



Figure 24 – *The Eighth Day*, transgenic installation linked to the Internet (GFP fish, detail).

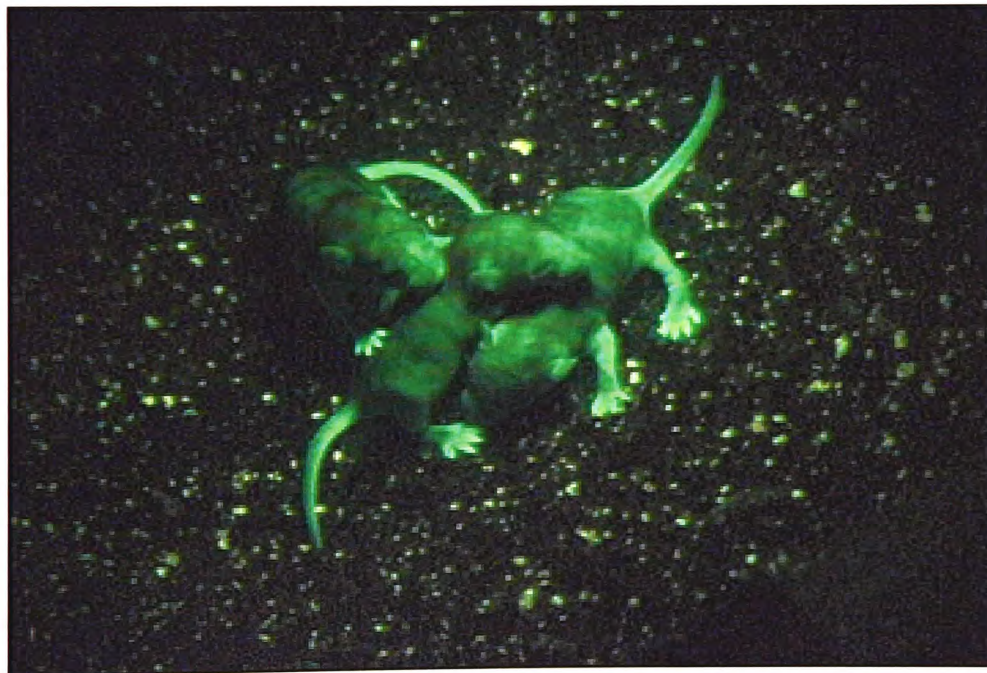


Figure 25 – *The Eighth Day*, transgenic installation linked to the Internet (GFP mice, detail).

While one might think that *The Eighth Day* is purely speculative (about a hypothetical future), a closer examination of contemporary developments reveals that science fiction has turned science into fact. With *The Eighth Day*, I draw

attention to the fact that a transgenic ecology is already in place.⁵ Transgenic crops are cross-pollinated by insects that fly from one place to another.

Transgenic animals are found in farms worldwide. Transgenic fish and flowers are being developed for the ornamental global market. Transgenic fruit-as-vaccine are being developed in several countries. New varieties of animals and vegetables are being developed, such as pigs with spinach genes, grapevines with silkworm genes, and potatoes with genes of bees and moths.⁶ We do not grasp the complexity of this cultural transformation when driving by a cornfield, when putting on a cotton shirt, or when drinking a glass of soymilk.

The Eighth Day dramatizes this condition by bringing together beings originally developed in isolation in laboratories, now selected and bred specifically for *The Eighth Day*. Selective breeding and mutation are two key evolutionary forces. *The Eighth Day* literally touches on the question of transgenic evolution.

TRANSGENIC BIOROBOTICS

A biobot is a robot with an active biological element within its body that is responsible for aspects of its behaviour. The biobot created for *The Eighth Day* [Figure 26] has a colony of GFP amoebae called *Dictyostelium discoideum*⁷ as its “brain cells.” When amoebae divide or move in a particular direction, the biobot exhibits dynamic behaviour inside the enclosed environment. Changes in the amoebal colony (the “brain cells”) are monitored by the biobot and cause it to move throughout the exhibition.



Figure 26 – *The Eighth Day*, transgenic installation linked to the Internet (biobot, detail).

The body of the biobot functions as a bioreactor, nourishing and culturing the amoebal colony. The biobot has a biomorphic form and the “amoebal brain” is visible through the transparent bioreactor. These “brain cells” form a network within the bioreactor, ceasing individual behaviour and functioning as a single larger multi-cellular organism in response to environmental stimuli. Together with the internal sensing unit⁸ and a computer, this amoebal network constitutes the “brain structure” of the biobot. The internal sensing unit is responsible for tracking amoebae movement and the computer issues commands to the biobot’s legs in response to such movement. The biobot has six legs.⁹ When the amoebae

move in the direction of a given leg, that leg contracts, causing the biobot to lean forward. Often one leg contracts while another stretches back to its original position, creating a more complex sequence of movements. Ascending and descending, or leaning and stretching motion becomes a visual sign of amoebal activity.

The biobot also functions as the avatar of Web participants inside the environment. Independent of the movement of the biobot, Web participants are able to control its visual system¹⁰ with a pan-tilt actuator. The autonomous ascent and descent, leaning and stretching motions provide Web participants with a new perspective of the environment. The overall perceivable behaviour of the biobot is a combination of activity that takes place in the microscopic network of the amoebae and the macroscopic human network. Humans and amoebae “meet” in the body of the biobot and affect each other’s experience and behaviour, producing through their coupling an ephemeral “consensual domain.”¹¹

TRANSGENICS AND THE INTERNET

In the gallery, visitors are able to see the terrarium with transgenic creatures both from inside and outside the dome. As they stand outside the dome looking in, someone online sees the space from the perspective of the biobot looking out [Figure 27], perceiving the transgenic environment faces or bodies of local viewers. An online computer in the gallery also gives local visitors an exact sense of what the experience is like remotely on the Internet.

Local viewers may temporarily believe that their gaze is the only human gaze contemplating the organisms in the dome. However, once they navigate the Web interface they realize that remote viewers can also experience the



Figure 27 – *The Eighth Day*, transgenic installation linked to the Internet (biobot's point of view, detail).

environment from a bird's eye point of view, looking down through a camera mounted above the dome [Figure 28]. They can pan, tilt, and zoom, seeing humans, mice, plants, fish, and the biobot up close. Thus, from the point of view of the online participant, local viewers become part of the ecology of living creatures featured in the work, as if enclosed in a websphere.

By enabling participants to experience the environment inside the dome from the point of view of the biobot, *The Eighth Day* creates a context in which participants can reflect on the meaning of a transgenic ecology from a first-person perspective.



Figure 28 – *The Eighth Day*, transgenic installation linked to the Internet (bird's eye point of view, detail).

THE TRANSGENIC HUMAN CONDITION

The tangible and symbolic coexistence of the human and the transgenic shows that humans and other species are evolving in new ways. It dramatizes the urgent need to develop new models with which to understand this change, and calls for the interrogation of difference taking into account clones, transgenics and chimeras.

The Human Genome Project (HGP) has made it clear that all humans have in their genome sequences that came from viruses,¹² acquired through a long evolutionary history. This shows that we have in DNA in our bodies from organisms other than the human. Ultimately, this means that we too are transgenic. Before deciding that all transgenics are “monstrous,” humans must

look inside and come to terms with their own “monstrosity”—that is, with their own transgenic condition.

The common perception that transgenics are not “natural” is incorrect. It is important to understand that the process of moving genes from one species to another is part of wild life (without human participation). The best example is the bacterium called “agrobacterium,” which enters the root of plants and communicates its genes to it. Agrobacterium has the ability to transfer DNA into plant cells and integrate the DNA into the plant chromosome.¹³

The Eighth Day suggests that romantic notions of what is “natural” have to be questioned¹⁴ and the human role in the evolutionary history of other species (and vice versa) has to be acknowledged, while at the same time respectfully and humbly marvelling at this amazing phenomenon we call “life.”

¹ *The Eighth Day* team: Richard Loveless, Dan Collins, Sheilah Britton, Jeffery (Alan) Rawls, Jean Wilson-Rawls, Barbara Eschbach, Julia Friedman, Isa Gordon, Charles Kazilek, Ozzie Kidane, George Pawl, Kelly Phillips, David Lorig, Frances Salas, and James Stewart. Additional thanks to Andras Nagy, Samuel Lunenfeld Research Institute, Toronto; Richard Firtel, University of California, San Diego; and Chi-Bin Chien, University of Utah, Salt Lake City.

² The light source is Schott KL 2500 LCD with dichroic filter.

³ The glow is seen through the filter Omega Optical GFP (515 nm).

⁴ It is important to point out that all organisms were in excellent health and had all of their needs taken care of on a daily basis, before, during, and after the exhibition.

⁵ This is true primarily in the USA, since many crops in the USA (corn, cotton, canola, and soy, for example) are transgenic, but also increasingly in other parts of the world, most notably Argentina, Canada, and China. In fact, the American Association for Health Freedom indicated in 2001 that more than 60% of processed food in the United States contains genetically engineered ingredients, including baking mixes, soft drinks, cereals, soups, cooking oils, salad dressings, juices, canned foods, crackers, snacks and baby food. This figure was reinforced by a survey by the International Food Information Council.

⁶ The new pigs were created in Japan by a team coordinated by Norio Murata, a professor at the National Institute for Basic Biology. See: "Scientists Insert Spinach Gene into Pigs to Cut Fat." *Mainichi Shimbun*. (January 24, 2002): 21. The grapes with genes found in the silkworm larvae were developed to resist Pierce's disease by a team led by Dennis Gray, a University of Florida professor of developmental biology. On May 15, 2001, the U.S. Patent and Trademark Office issued a joint patent for the technology to the University of Florida and the U.S. Department of Agriculture. The potatoes with genes of bees and moths were developed to fight potato blight fungus, the same that caused the Great Irish Potato Famine of 1845. See: Milan Osusky et al. "Cationic Peptide Expression in Transgenic Potato Confers Broad-Spectrum Resistance to Phytopathogens." *Nature Biotechnology*. 17. (1 Nov 1999): 45 and Trisha Gura. "Engineering Protection for Plants." *Science*. (March 16 2001): 2070.

⁷ *Dyctiostelium discoideum* is also known as slime mold. Slime molds are classified in a major group called the eukarya (or eukaryotes), which includes plants and animals.

⁸ The internal sensing unit is composed of (1) blue LED array to stimulate amoebae to glow green; (2) PC17YC microscopic color video camera (1/3" color CCD imager; 450 lines of resolution; 2 lux minimum illumination; 74 degree field

of view); (3) a special yellow filter for the camera that enables it to block the blue light and image the green glow. The light source is an array of blue LEDs. The filter is Omega Optical GFP (515 nm). Customized software tracks changes in the video image and passes the data to another software, which instructs the biobot legs to move.

⁹ The biobot legs are made of a Nylon variant called Nylatron, a material that contains solid lubricants that impart toughness, low coefficient of friction, and good abrasion resistance. Its muscles are made of shape-memory alloy, a material that undergoes thermoelastic transformation, i.e., that has the ability to return to a predetermined shape when heated.

¹⁰ The eye of the biobot is composed of a PC63XP monochrome mini video camera (70 degree field of view; 380 lines of resolution, 1 lux low light rating).

¹¹ A “consensual domain” does not imply consensus; rather, it signifies consensuality, a coincidence of the sensuous. See note 13 in the previous chapter.

¹² See T. A. Brown. *Genomes*. Oxford: Bios Scientific Publishers, 1999: 138; and David Baltimore. “Our genome unveiled.” *Nature*. 409 (15 February 2001): 814-816. In private email correspondence (28 January 2002), and as a follow up to our previous conversation on the topic, Dr. Jens Reich, Division of Genomic Informatics of the Max Delbrück Center in Berlin-Buch, stated, “The explanation for these massive [viral] inserts into our genome (which, incidentally, looks like a garbage bin anyway) is usually that these elements were acquired into germ cells by retrovirus infection and subsequent dispersion over the genome some 10 to 40 millions ago (as we still were early apes).” The HGP also suggests that humans have hundreds of bacterial genes in the genome. See: “Initial sequencing and analysis of the human genome.” *International Human Genome Sequencing Consortium*. 409.6822 (15 February 2001): 860. Of the 223 genes coding for proteins that are also present in bacteria and in vertebrates, 113 cases are believed to be confirmed. See p. 903 of the same issue. In the same correspondence mentioned above, Dr. Reich concluded, “It appears that it is not man, but all vertebrates who are transgenic in the sense that they acquired a gene from a microorganism.”

¹³ This natural ability has made a genetically engineered version of the agrobacterium a favorite tool of molecular biology. See: L. Herrera-Estrella. “Transfer and expression of foreign genes in plants.” Diss. Laboratory of Genetics, Gent University, Belgium, 1983; P. J. J. Hooykaas and R. A. Shilperoort. “Agrobacterium and plant genetic engineering.” *Plant Molecular Biology*. 19 (1992): 15-38; J.R. Zupan and P. C. Zambryski. “Transfer of T-DNA from Agrobacterium to the Plant Cell.” *Plant Physiology*. 107 (1995): 1041-1047.

¹⁴ See: Frank Burbage, ed. *La Nature*. Paris: Flammarion, 1998.

CHAPTER 10 - CONCLUSION

In this dissertation I have demonstrated that Telepresence and Transgenic art constitute new art forms. To this end, in the course of my research from 1998 to 2001, I have created, produced, documented, and discussed art works created according to these two categories. I have also created works in which these categories are integrated. In the preceeding pages I have shown how, in the course of my research, I have developed new aesthetic experiences through modes of communication that include the invention of new objects, interfaces, network topologies and life forms, as well as non-conventional hybridisation of standard systems and processes.

The word “telepresence” started to circulate in science during the early 1980s, primarily in reference to telerobotics. In 1986 I started to employ it in reference to artworks that explored telerobotics as a new art medium. In the preceding pages, I have shown that the intellectual origins of telepresence art are found in the introduction of actual telecommunications media in art by 1960s conceptual artists (primarily telephone, telex and fax), often to create installations, performances, and other propositions typical of the period. In the 1970s and early 1980s, telecommunications art evolved into a more mature and independent art form, and became the focus of many artists worldwide. While in some cases artists used local cable television and satellite links, oscillating between unidirectional broadcasts and bi-directional experiments, in many other instances artists coupled their desire for networking—already present in mail art, for example—with the unique, real-time possibilities of electronic media. The first commercially available videophone and slow-scan television systems were

particularly important at that stage. In the late 1970s, but particularly in the early 1980s, the incipient hybridisation of analogue telecommunications media with digital technologies gave birth to the field of telematics, expanding dramatically possibilities for artists. National videotext projects, which enabled individuals to access remote databases with a graphical interface over regular phone lines, and international time-sharing systems, which allowed multiple individuals to be on-line simultaneously, were some of the first telematic frontiers. Telepresence art branched out of this context, to merge the virtual quality of telematic space with the hardscape of physical environments and to combine digital networks with biological processes. The increasing convergence of digital systems with molecular biology led to research with transgenic art, in which what is visualized on the computer screen acquires real biological expression, further reducing the practical and conceptual gap between these two areas formerly perceived as firmly distinct.

The telepresence works documented here are entitled *Teleporting An Unknown State - Web Version* (1998-2001) and *Uirapuru* (1999).

Uirapuru was shown from October 15 to November 28, 1999, at the InterCommunication Centre (ICC), Tokyo. In this work, a flying fish hovers above a forest in the gallery, responding to local as well as Web-based commands. Audio and video from its point of view are streamed on the Web. Local and remote participants interact with the avatar of the flying fish in a virtual world. When this happens the flying fish sings in the gallery. Pingbirds (robotic birds) sing Amazonian bird songs in the gallery in response to the rhythm of Internet traffic. Pingbirds monitor the rhythm of the Internet by sending ping commands

to a server in the Amazon. This work unites telepresence, multi-user virtual reality, and networking into a single realm of experience.

Teleporting An Unknown State - Web Version (1998-2001). It was shown from October 24 to November 7, 1998 at Kibla Art Gallery, in Maribor, Slovenia. This is a Web interactive installation that allows online participants to send light from eight areas of the world to a single seed planted in a physical gallery. The plant depends on light sent by Web participants to be able to perform photosynthesis and grow in a completely dark room. This work uses the notion of teleportation of particles (photons) to create the metaphor of the Internet as a life-supporting system. The light is transmitted to the plant through a 9-image grid available on the Web. This grid has a live image of the video projection over the earth in the middle, and black rectangles around it. Clicking on each of the eight rectangles retrieves its corresponding image (a live webcam view from the corresponding city showing its sky). The image is at once seen on the Web and projected over the plant in the gallery. After its initial presentation at Kibla in 1998, the work was perfected and shown in its final version at the following venues: San Francisco Art Institute, San Francisco, California, February 7 - March 24, 2001; Alyce de Roulet Williamson Gallery, Art Center College of Design, Pasadena, California, May 13 - July 1, 2001; Austin Museum of Art, Austin, Texas, July 20 - September 18, 2001; The Atlanta College of Art Gallery, Atlanta, Georgia, October 11 - November 25, 2001.

The transgenic artworks documented here are entitled *Genesis* (1999), *GFP Bunny* (2000), and *The Eighth Day* (2001).

Genesis was first shown at Ars Electronica 99 and presented online and at the O.K. Center for Contemporary Art, Linz, from September 4 to 19, 1999.

Genesis is a transgenic artwork that explores the intricate relationship between biology, belief systems, information technology, dialogical interaction, ethics, and the Internet. The key element of the work is an “artist’s gene,” a synthetic gene that was created I created by translating a sentence from the biblical book of *Genesis* into Morse Code, and converting the Morse Code into DNA base pairs according to a conversion principle specially developed by the artist for this work. The sentence reads: “Let man have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moves upon the earth.” It was chosen for what it implies about the dubious notion of divinely sanctioned humanity’s supremacy over nature. The *Genesis* gene was incorporated into bacteria, which were shown in the gallery. Participants on the Web could turn on an ultraviolet light in the gallery, causing real biological mutations in the bacteria. This changed the biblical sentence in the bacteria. The ability to change the sentence is a symbolic gesture: it means that we do not accept its meaning in the form we inherited it, and that new meanings emerge as we seek to change it. *Genesis* has been shown at Centro Cultural Itaú, São Paulo, Brazil, June 15 to September 24, 2000; Exit Art, New York, September 9 to October 24, 2000; Woodstreet Gallery, Pittsburgh, January 19 to March 10, 2001; Arizona State University, Tempe, Arizona, March 22 to May 11, 2001; Julia Friedman Gallery, Chicago, May 4 to June 4, 2001; Yokohama Triennale, Yokohama, Japan, September 2 to November 11, 2001; Fundación Telefónica, Madrid, Spain, September 12 to November 18, 2001.

GFP Bunny centered on the creation of a green fluorescent rabbit. The rabbit emitted green light when (and only when) it was illuminated with a special blue light and when it was observed through a special filter that blocked the blue

light, allowing the visualization of the green emission. The first phase of the *GFP Bunny* project was completed in February 2000 with the birth of the transgenic rabbit, Alba, in Jouy-en-Josas, France. The second phase was the debate, which reached audiences in many countries and transcended the circumscription of the art public.

The Eighth Day is a transgenic artwork that investigates the new ecology of fluorescent creatures that is evolving worldwide. *The Eighth Day* was exhibited in 2001 at the Institute for Studies in the Arts, Arizona State University, Tempe. While fluorescent creatures are being developed in isolation in laboratories, seen collectively they form the nucleus of a new and emerging synthetic bioluminescent system. The piece brings together living transgenic life forms and a biological robot (biobot) in an environment enclosed under a clear 4 foot diameter Plexiglas dome, thus making visible what it would be like if these creatures did, in fact, coexist in the world at large. The transgenic creatures in *The Eighth Day* are GFP plants, GFP amoebae, GFP fish, and GFP mice. *The Eighth Day* presents an expansion of biodiversity beyond wild type life forms. As a self-contained artificial ecological system, it resonates with the words in the title, which add one day to the period of creation of the world as narrated in the Judeo-Christian Scriptures. All of the transgenic creatures in *The Eighth Day* are created through the cloning of a gene that codes for the production of green fluorescent protein (GFP). As a result, all creatures express the gene and glow with a green light that is visible with the naked eye through a special filter.

The creation of life in the context of art inevitably adds a unique ethical dimension to the specific aesthetic issue of each work. The artist makes it evident for the general public that molecular biology is not a rarefied language spoken by

experts beyond the reach of ordinary citizens. The work of the artist is a stimulus for layperson debate. Through accessible visual means, the work of the artist helps the public understand how close the consequences of the biotech revolution are to the individual. In this sense, the artist reinforces the discussion. In art, the question is not one of practical application of scientific knowledge, because the emphasis is not on a given process and its result. Rather, in art the key gesture is one of cognitive intervention at a symbolic, not practical, level. It is precisely because corporate genetic engineering leads humans and other life forms towards a relationship of subject to object, that it becomes urgent to conceptualise and experience other, more dignified relationships with our transgenic other. The transgenic artworks documented above sought to address this need by creating spheres of intersubjective relationships.

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