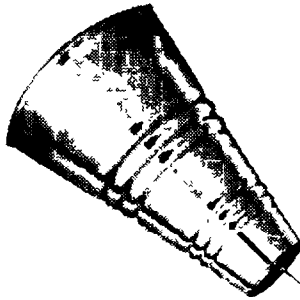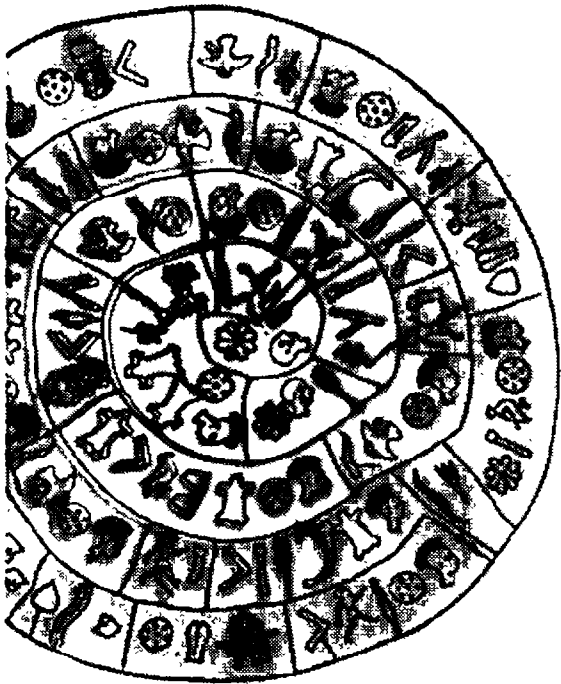# Actes

Proceedings

6e
Symposium
des **arts**
électroniques

septembre 1995

6th
International
Symposium on
Electronic **Art**

September 1995

ISEA95 montréal

Crédits / Credits

Conseil d'administration / Board of Directors
• Louise Poissant, présidente / president
• Henry See, vice-président / vice-president
• Luc Courchesne, vice-président / vice-president
• Denis Martineau, trésorier / treasurer
• Alain Mongeau, secrétaire / secretary

Équipe de direction / Direction Team
Alain Mongeau, Directeur du programme / Program Chair
Monique Savoie, Directrice générale / Executive Director
Nancy Tobin, Directrice de production / Production Director

Comité d'honneur / Honorary Committee
• Francois Colbert, Hautes Études Commerciales
• Francis Fox, Martineau Walker
• Germaine Gibara, Caisse de dépôt
et de placement du Québec
• Monic Houde, Bell Canada, Communications
• Daniel Langlois, Softimage
• Paule Leduc, Université du Québec,
Enseignement et recherche
• Marcel Masse, Conseil de la langue Française

Comité international / International Committee
Roy Ascott (United Kingdom) • Paul Brown (Australia)
• Hank Bull (Canada) • Juergen Claus (Germany)
• Derrick de Kerckhove (Canada) • Sara Diamond (Canada)
• Anne-Marie Duguet (France) • Vera Frenkel (Canada)
• Craig Harris (USA) • Theo Hesper (Indonesia)
• Robin G King (Canada) • Machiko Kusahara (Japan)
• Roger F Malina (USA) • Joelle Metzger (France)
• Simon Penny (USA) • Rejane Spitz (Brazil)
• Minna Tarkka (Finland) • Wim van der Plas (Netherlands)
• Roman Verostko (USA) • Gary Warner (Australia).

Comité artistique / Artistic Committee
• Michael Century, Événements spéciaux / Special Events
• Luc Courchesne, Marché des arts nouveaux /
New Media Market + Multimediale
• Greg Garvey, Conférences / Conferences
• Denis Martineau, Événements spéciaux / Special Events
• Éric Mattson, Cabaret électronique / Electronic Cabaret
• Alain Mongeau, Expositions / Exhibitions
• Bruce Pennycook, Concerts / Concerts
• Don Ritter, Performances / Performances
• Cynthia Beth Rubin, Conférences / Conferences.

Comité des conférences / Conference Committee
Greg Garvey (co-responsable / co-chair) , Cynthia Rubin (co-responsable / co-chair), Michael Century, Arthur Kroker, Alain Mongeau, Stephen Sarrazin, Henry See

Composition des jurys / Jury Composition
Expositions / Exhibitions
Renée Bourassa, Bill Davison, Daniel Dion, Kurt Hibchen, Lucie Marchand, Denis Martineau, Eric Mattson, Alain Mongeau, Danièle Racine, Cynthia Rubin, Henry See, Gisèle Trudel, Bill Vorn

Performances / Performances
Dena Davida, Eric Mattson, Alain Mongeau, Celia Moreno, Don Ritter

Concerts / Concerts
Yves Daoust, alcides lanza, Bruce Pennycook, Alain Thibault, Marc Tremblay

Commanditaires et colllaborateurs / Sponsors and collaborators

Avec l'appui de / With the support from

Ministère du Patrimoine (Canada)
Ministère des Ressources humaines (Canada)
Centre for Information Technology Innovation (CITI) -
Industry Canada
Conseil de recherche en sciences humaines du Canada
(CRSH)
Ministère des affaires étrangères (Canada),
Relations culturelles internationales
Conseil des arts du Canada
    Programme Explorations
    Office des tournées
    Arts médiatiques
Ministère de la Culture et des Communications (Québec)
Ministère de l'Industrie, du Commerce, de la Science et de la Technologie, direction de la diffusion de la science et de la technologie (Québec)
Service des loisirs, des parcs et du développement communautaire, module de la sécurité du revenu, Ville de Montréal
Conseil des arts de la Communauté urbaine de Montréal (CACUM)
Office des congrès et du tourisme du Grand Montréal

Ministère de la Culture et de la Francophonie (France) :
Délégation des arts plastiques, Département des affaires
internationales
Accord Canada-France
Consulat de France à Montréal
Concordia University
McGill University
Université de Montréal
Université du Québec à Montréal
University of Vermont, Burlington
Bell
Microserv
Microsoft
Silicon Graphics Inc
Sygraph

Avec la collaboration de / With the collaboration of

Association pour la création et la recherche
électroacoustiques du Québec (ACREQ)
Australian Film Commission
Banff Centre
British Council
CEGEP de Maisonneuve
Centre Copie-Art de Montréal
Centre d'art holographique et photonique de Montréal
Chaire de gestion des arts de l'École des Hautes Études
Commerciales
Communauté électroacoustique canadienne CRIM
Écran Humain
FIVA Online 95
Galerie Graff
Galerie de l'UQAM
Goethe Institute
Image du futur/ Cité des arts et des nouvelles technologies de
Montréal
Innovitech
Institute for Studies in the Arts (ISA), Arizona State University
sity
IRCAM (France)
La Biosphère
La Centrale
Lufthansa
McLuhan Centre (University of Toronto)
MITE AVISTA lab (Concordia University)
Montanaro Dance
Musée d'art contemporain de Montréal
Centre NAD

Place des Arts
PRIM
RISQ
Société d'esthétique du Québec
Société Radio-Canada (réseau FM)
SOFTIMAGE
Spectra
Tangente
Vox Populi (Mois de la photo)
· Z.A. Productions (France)
Zentrum fur Kunst und Medientechnologie, Karlsrühe
(Allemagne)
Zone Productions

Endossement / Endorsement
ISEA95 Montréal est endossé par l'Inter-Society for the
Electronic Arts, un organisme-parapluie regroupant des
institutions, organismes, artistes et scientifiques actifs dans le
domaine des arts technologiques. Le Symposium international
des arts électroniques, créé en 1988, vise à promouvoir un
traitement critique et interdisciplinaire des problématiques de
l'art technologique. / ISEA95 Montreal is endorsed by the
Inter-Society for the Electronic Arts, an umbrella organization
grouping a wide range of electronic art institutes, organiza-
tions, as well as artists, scientists and other interested parties.
The International Symposium on Electronic Art, conceived in
1988, is dedicated to promote a critical and interdisciplinary
approach to the problems and potentials of electronic art.

ISEA95 montréal
307, rue Ste-Catherine Ouest, bureau 310
Montréal, Québec, H2X 2A3
Canada
T: (514) 990-0229
F: (514) 842-3795
Email: isea95@er.uqam.ca
WWW: http://lecaine.music.mcgill.ca/index.html

Table des matières / Table of Contents

WORMHOLING IN CYBURBIA, AND OTHER PARANATURAL PLEASURES

By Roy Ascott

100143.100@compuserve.com

W ormholing

The "wormhole" is one of the more potent metaphors to have come from the new physics, a science which has been conspicuous in its relevance to the developing aesthetic of interactive art, and most notably in issues concerning the relationship between the artwork and the viewing subject in the negotiation and creation of meaning. Wormholes are found tunnelling in quantum foam. Technically, as Kip Thorne (1) of Caltech describes it, a wormhole is a "handle" in the topology of space, connecting two widely separated locations in our universe. The wormhole promises the rapid transit of particles and also - if recent proposals published by the Royal Astronomical Society of Great Britain are to be believed - people, from one layer of reality to another, from one time frame to another, from one galaxy to another, in micro seconds or virtually within no time at all. Certainly this metaphor commands attention in any account of the direction in which we are now moving culturally, artistically, and perhaps spiritually . Quantum foam may not mean much to us on an everyday level of experience, but tunnelling through what might be called "datafoam" from one hyperlinked layer to another, shooting the wormholes from one telepresence to another, from one website to another, actually zapping from one mind to another, and faster than light should allow, is a perfectly reasonable aspiration of all of us living and working in the telematic, post-biological universe. For the artist it is becoming a creative necessity.

Transformation is the commanding concept of interactive, virtual, networked, multimedia art - the transformation, that is, of meanings, images, forms, and perhaps of oneself and even the world - and it is the rapidity of transfer, the speed of shift between states that we value most. Overarching this constant flux, which is both semantic and psychic, are the two great infinities that frame our consciousness: the mind of the universe and the universe of our mind. These are the two classic undecidables which we are increasingly coming to apprehend as one, as a unity of consciousness, even maybe of self, and of whose universal connectivity we are indivisible parts. As artists voyaging into the 21st century, we are simultaneously facing out toward the galaxies and inwards to the deepest recesses of the brain.

isea95@er.uqam.ca   T : (514) 990-0229
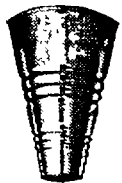
ISEA95 montréal

The Royal Astronomical Society's 1995 publication of Some thoughts on the implications of faster than light travel by Ian Crawford gives credence to the idea that wormholes could be stabilised and manipulated to create short cuts for humans between any two points in space. This publication coincides with the founding of the Interstellar Propulsion Society whose goal is to get us to the stars. Crawford contradicts Einstein's assertion that because bodies have infinite mass at the speed of light, no amount of energy can make them go faster, arguing that one way is for them to pass through wormholes, rifts in the fabric of space caused by intense gravitational fields such as those found around the collapsed stars known as black holes. He is opening the theoretical possibility of us entering a wormhole from one point and leaving it at another, possibly thousands of light years away. Rapid transition, instant transformation and total teleportation are equally the goals of our telematic, hypermediated culture.

Roger Penrose argues that the mechanism for consciousness and cognition may involve quantum gravitational phenomena, acting through microtubules in neurons. He is not without powerful detractors such as Patricia Churchland who can find no evidence that quantum coherence involving super radiance occurs in microtubules. But Penrose sees them to have properties that could make certain quantum-mechanical phenomena possible. Microtubules, because they involve both quantum mechanics and conscious thought, provide the opportunity for noncomputationality - intuition - in human cognition. In the view of Penrose, quantum gravity may provide a an adequate theory of the collapse of the quantum-mechanical wave function, which via microtubules must play a key role in consciousness. For the artist, Penrose is preferred over Churchland for the aesthetic simplicity of his model which can be visualised as combining an elegant biotechnical form, the tube, with a richly metaphysical concept, the collapse of the wavefront.

It seems that tunnelling through wormholes can describe behaviour at both macro and micro levels of our universe and of our consciousness. In this broader definition, to wormhole is a verb whose use value can be found in all of the interactive arts. What we are doing as we dig deep into richly layered datafields is wormholing, what we do as we penetrate deep into the Web is wormholing. We wormhole in the brain as we search for new associations, new connections, new meanings. It's a kind of cognitive tunnelling. It's the subtly of our capacity to wormhole artistically and intellectually that gives us our identity as creative individuals, just as it will be our capacity to wormhole in the quantum foam that will allow us to emerge as players in the galactic scheme of things. The telematic culture weaves its global webs so densely that tunnelling between disparate sites, a kind of worldwide wormholing, is an inevitable consequence.

We wormhole too, telepathically. We always have done so. Science holds back its formal recognition of the fact as obstinately as it held back from acknowledging the paradoxes of

the quantum world. But increasingly the paradigm is changing. This is reflected in the remarks of Isao Karube, a leading-edge technologist of Tokyo University. "Kiko-jutsu is now in fashion (an Asian discipline which develops the inner energy called Ki) Even I could move a static piece of paper with my force, like this! This energy might possibly be measured by a sensor, perhaps a quantum wave sensor that works on a completely different theoretical basis. Now that people's attention is turning towards the inner world, in the developed countries where materialism has reached saturation point, the future of electronics depends on the problem of what sort of approach to take towards the brain, the neurons, and the mind" (2). And at Qinghan University in Peking, research into "qigong" seeks to apply extra sensory perception, X-ray vision and telekinesis to the control of molecular structure, to horticulture , medicine and the exploration of space.

Just as the electronics revolution, which led from telecommunications to the computer, is now taking place in the human brain and extending our conception of mind, so artistically we are moving towards a culture of bioelectronics, cyberspirituality, intelligent architecture and the self-organising, self-referential, self-aware systems of artificial life. We have entered the noetic domain, and consciousness is at the top of our agenda. Electronic art is soon to become bio-electronic art, just as the primary element of its practice, the microchip is about to become the molecular bio chip, and the digital computer is giving way to the neural network. We are moving towards the spiritual in art in ways that Kandinsky could hardly have imagined, such that telepresence will be accompanied by teleprescience, and cybernetic systems will integrate with psychic systems, mutating into what could be called psybernetics.

A noetic infrastructure is forming within the Net which could lead to a spiritual awakening. The artist could be the first to take an important evolutionary step, leading us through art to the transcendent state of collective intelligence and the distributed mind of the telematic domain. The activity of the hypercortex - networked mind - is creating what in eastern philosophy would be called a 'subtle body', a psychic envelop for the planet, Gaia attaining a new level of consciousness. We may see the emergence of some kind of shamanic system within the global Net, rooted in this interactivity between minds, stimulating the visionary powers of the hypercortex. Such a system will be consulted for knowledge as much as the encyclopaedia was consulted in the past. But whereas the dream of Diderot, planetised into the Xanadu of Ted Nelson , and now being realised in the hypermedia of Web sites and CD ROM online, dealt with existing knowledge and events, this system would be an engine of intuition - futures oriented, generating visions, constructive scenarios, creating new knowledge in unforeseen and unimagined ways.

This visionary system would relate to knowledge as art relates to its new media, within the canon of apparition, emer-

gence, coming-into-being. We shall leave behind the aesthetic of appearance, the surface look of the world, , materialist objectivity and expressive representation. Both knowledge-work and art-work will commonly constitute an interstitial practice, that is work located at the intersections of biology, art, cognitive science, engineering, mysticism and electronics, mediated by the global Net.

The emerging human faculty of cyberception (3) is enabling us to enter into both inner and outer worlds more deeply and more richly than our unaided natural senses hitherto permitted. This evolving symbiosis of mind, technology and living systems confers upon us a great responsibility for the kind of worlds we construct. The artist, after being suspended for the last thirty years in a state of post-modern moral weightlessness, is now subject to the gravity of ethics, and must find new values and a new morality

The primary issue in art of the next thirty years will be that of consciousness; bioelectronics, intelligent molecules, the "chip in the brain", will determine the precise nature of our cultural translation to the noetic culture. Once the interface moves into the brain, once electronic sensors routinely utilise biological elements, once semiconductor devices use living micro-organisms, the artificial neural networks will join with our own biological neural networks into a seamless cognitive whole. The Net has the effect of releasing mind, distributing intelligence, collectivising thought, allowing for a kind of collaborative consciousness. The Net also has the effect of extending itself, of reaching out, finding new nodes and niches to spread to. The economy of networks both regional and global, activated by both baddies (transnational corporations) and goodies (local cooperatives), is a growing economy. No part of the planet ultimately will be excluded. Far from being a grid of solipsistic indulgence, it sets out vital pathways of information between individuals, cultures and economies in ways that no other technology or ideology has been able to achieve. It will not cease to spread until the whole planet is in a state of total connectivity. This is not simply a strategy of late-capitalist marketeering but a spiritual aspiration such as Teilhard de Chardin has described.

The finger wagging of such well meaning but confused moral arbiters as Julian Stallabras in the New Left Review over the "wondrous but specious technology [which] threatens to act as another curtain between those who consume it and the condition of the world" (4) serves only to mask a lack of constructive thought and creativity in the face of the realities of post-biological life. The cyberphobes of academia completely misunderstand the positive social implications of interactive systems. Like the old ideological art, whose dystopian despair merely provided ballast to late post modernist misery, they miss the point entirely. Democracy, as Marilyn Ferguson once reminded us, is not a political state but a spiritual condition. Far from "excluding the poor" and preventing them from appearing "as subjects with their own voices", and rather than there being

"a danger of them receding even further from the consciousness of the comfortable", it is expressly a spirit of inclusiveness, collaboration and social involvement which not only marks out the ambitions, projects and protocols of artists working in cyberspace but it is inherent in the very connectivity of the technology itself. What most of these old-media theorists, living off the back of our artistic innovation and exploration, fail to grasp is that interactive art is not some kind of extension of television, and that their old discourses and diatribes are completely redundant if not perniciously irrelevant. You can only recycle Walter Benjamin a limited number of times before those insights which were so perspicacious in the era of "silver" reproduction become quite leaden and dull in the silicon age.

Knowledge is escaping from books and from those who exercise cultural control through and by their production. It is this fact more than perhaps any other which is causing the fear and loathing that so many academics exhibit towards cyberspace and the telematic culture. The plight of the third world as a presumed exclusion zone of the global networks is nothing as far as they are concerned compared to the lost preeminence of the Word whose power they have scrabbled so assiduously to master.

Cyburban living
The wormhole, in the fullness of its metaphorical reach, identifies the next great challenge for urban design. With the advent of smart materials and self-regulating systems promising the emergence of an intelligent architecture, urban design is becoming cyburban design, and it is there in the cyburbs that we shall need to be able to wormhole effortlessly between real and virtual locations, meeting with real bodies and telepresences in the same continuum.

It is wormholes, too, which will bring virtual goods into the real kitchen, or virtual clothes onto our real backs. The unity of the domestic house with its fixed functional areas, is about to be exploded and fragmented just as the unitary nuclear family is becoming nonlinear and multi relational. Walls no longer separate and privatise but, as datascreens, open out onto dataspace; doorways are either realtime or wormtime, our passage is either continuous and discrete or discontinuous and dispersed. We walk or wormhole. We can be at home and itinerant, grounded and displaced both at the same time.

Even the simplest of things are losing their place, slipping from the domestic repertoire. Think of the table. Our relationship to the transfer and creation of energy from a variety of substances both natural and engineered calls for new forms of ingestion and consumption, new methods of preparation and presentation, and new social rituals to contain them. The table too much identifies with the old unitary family, living and working within a unified frame of time and place. The domestic hearth, always the focus of conversation, dreams and kinship, is being replaced by a telematic matrix whose capacity to pro-

vide a space for reflection and social solidarity, as well as learning and recreation, albeit on a more global scale, will be no less human. Where once the domestic environment embraced and supported all our closest relationships, our companionship, our hospitality, our celebrations, now increasingly we make our home in the interspace between the virtual and the real, tunnelling between the interstices of the Net.

The domestic environment is becoming the reticulate environment with all the protection, pleasure and pursuit of happiness that the home was intended to sustain: from the safe containment of the Dome, to the supportive embrace of the Net. And just as, historically a fixed, permanent base, forced upon itinerant peoples by the exigencies of a changing ecology, or by the economy of climate, could bring traumatic changes to the society and to the sense of self, so too can we expect that the transition from domestic life to reticulate living will bring great problems as well as great possibilities. We are at that turning point in our evolution where we can contemplate the redesign of ourselves and of our mode of living.

Similarly, the city must gather up its suburbs, dislocate its centre, redesignate and redistribute its functional parts. If Architecture cannot respond radically to the advent of smart materials, intelligent systems, and nano-engineering, then we shall be unable to realise the vision of a sensuous city to complement our post-biological condition. How then shall we accommodate the technology of consciousness, house the cybernaut, service the telemadic traveller, or farm artificial life? In this respect it is not simply cyburban design which is on the line but our own bionic evolution. Our children move effortlessly through cyberspace, networking with their peers as they navigate the world's knowledge. With bio-technology as the context of their personal growth and telematic interactivity as their sense of community, what structures will they see fit to inhabit, what conception of the city can we prepare for them?

In so far as the psychology of architecture is concerned, psycho-therapy for intelligent buildings may be more appropriate than putting ourselves in analysis. It is enough to think of all the psychotic and schizophrenic places we know: maladjusted buildings, dysfunctional apartment blocks, overbearing high rises, passageways and bridges lacking in self confidence, paranoid parking lots, depressed elevators and over excited exits.

As for the economy of leisure, we have so exhausted the imaginative potential of theme parks, quaint villages, and sites of the simulated past, and tourism has so saturated the imagination of the inflight couch potato, the vacation voyeur, that new initiatives will be sought. This will call for the creation of rapid transition zones, urban wormholes, that allow us to move rapidly between recreational fantasies, between new architectural hypotheses, in the spirit of open-ended play. Being there instantly, wherever there is, no matter how far, is the Internet's contribution to the idea of foreign travel. It will not belong be-

fore this becomes the demand in the physical, geographical domain of packaged vacations. Although it may never become a commercial reality, the wormhole will certainly survive as an overworked metaphor.

The Hopi have in the floor of each of their kivas a ritual hole called the sipápuni, which represents the place of emergence from the previous world into this fourth world. The entire architecture, one could say the entire culture, is built round this point of emergence, around the concept of emergence and creation. It could be called, in our present terms, a wormhole, a passage of paradigmatic transition. Where shall we locate the sipápuni which brings us into the fifth world, the paranatural, post-biological domain? This is as important a question for urban design as it was for the Hopi.

Wormholes, quantum tunnelling, spiritual channelling, telepathic connectivity, microtubular quantum wave collapse - in every case we are dealing with metaphors of the transformation and transplantation of mind, matter and energy. Our increasing understanding and utilisation of bio electronics means that we have now not simply the ability but the obligation to investigate the psychic and spiritual spheres. For much of this century, art discourse has scorned any mention of the spirit, just as science had left the mind well alone, apart from dancing to the tune of the Freudian fantastic. Cognitive science is relatively new and its studies in consciousness are setting up quite radical trajectories of research. Just as the electronics revolution, which led from telecommunications to the computer, is now taking place in the human brain and extending our conception of mind, so artistically we are moving towards a culture of bioelectronics, cyberspirituality, intelligent architecture and the self-organising, self-referential, self-aware systems of paranatural life. We are witnessing the advent of noetic culture.

The artist has always approached the mind from the outside in. In the West we have attempted to understand mind as a discrete entity, as a finite whole. But telematically mind is without boundaries, it is infinite and dimensionless. We are just emerging from a kind of psychological police state in which the unified mind, the singular personality was the ideological norm.

Paranatural pleasures

Paranature is Nature II (5), the new nature with which we are bionically co-evolving. Paranature does not exist alongside nature proper but absorbs its, recontextualises it. Nature hitherto has always been the a priori context within which or against which creative work in art, science and engineering has always been set. Paranature is growing beyond nature, technologically assisting in nature's many inadequacies. Living systems do not always provide the best solution to human needs. And a part of Paranature is the bio electronic body. What precisely this body will be and how precisely it might be defined is a question which falls as much in the province of art as it does in those of bio-engineering or ethics. We know already that it is not easy to

4

discriminate between where the body ends and where the environment begins, particularly when the environment is both virtual and actual, non-linear and telematic. The location of the instruments of mind is fuzzy, lying both inside and outside of the brain. The faculty of cyberception which is superseding our natural cognitive and perceptual abilities is as much the product of the artificial environment as of our own internal restructuring. As we engage in personal transformation, self-creation, and the flexibility of identity, the boundaries of gender are eroding. The decline of the modern world, with its relentless fixation on materialism, which in art was translated as an endless preoccupation with surface and appearance, is bringing about a renewed interest in the spirit, an interest in what moves living things, in process, in coming-into-being, in what the Japanese call "ki". Paranature also leads us to reconsider the paranormal and parapsychological, aspects of experience which were largely suppressed or denied in industrial society. Databasing in the telepathic ganzfield may yet become a viable option in our pursuit of rapid information processing. We know, from recent CIA disclosures if nothing else, that remote viewing can be both efficacious and quite reliable. Our aim is to see that artificial systems, machines and finally architecture not only acquire consciousness but participate in some sense in paranormal life. If our paranatural environment is to display the intelligence that can anticipate our desires as much as it responds to them, then intuition must become as much a part of its constituent systems as cognition. An artificial environment displaying intuitive behaviour is likely to be a creative environment. We may see the day when an aesthetics of self-organisation can be proposed.

For artificial intelligence to acquire consciousness it must attain quantum uncertainty; creative possibilities could arise out of the indeterminacy of neural networking. Now that we can not only get single electrons to store information but, with single-electron logic, to process information as well, and now that the age of the single electron device is near, neuronal modelling of the human brain is feasible. For the artist this is less a matter of performing a more profound analysis of brain behaviour as opening up new regions of intuition and associative thought. It suggests the possibility of a kind of nano-navigation where our multimedia explorations will go deep into the nano-field of particle consciousness. Our bodies will host the molecular chips which process these navigations. Nanotechnology will give us the tools to re-materialise art from screen-based media to world-based paranatural life.

Our understanding of our environment largely depends on our sensory systems, and inversely the very environment that we wish apprehend is constructed by us, notably by the devices we set up in order to interrogate it . These devices are largely digitally equipped to process vast quantities of data captured by artificial sensing systems which far exceed the limitations of our own sensorium and our powers of cognition. Without cyberception to navigate our paranatural environment and to negotiate for new meanings we should be isolated and alien-

ated from the artificial intelligence which surrounds us. The development of our paranatural abilities is such that we are becoming as unlike our biological forebears as they were unlike the apes. This evolutionary gap can be expected to widen exponentially as the technology of cyberception and artificial consciousness develops.

Paranature is producing an environment in which many cherished institutions, practices and perceptions are feeling challenged, threatened, or just plain redundant. The cyberstress that the new technologies and new media exert upon the Culture of Representation is felt as much at the larger political level as it is in individual, personal experience. The impact of telepresence, bionic diversity, distributed knowledge, collaborative creativity, and paranatural life on our sense of self, what it is to be human, indeed of the status and legitimacy of every day reality, is more than most traditional discourses can bear. The breaking point however need not mean the death of culture or the incoherence of consciousness but the revitalisation of our whole state of being and a renewal of the conditions and construction of what we choose to call reality.

Telematic culture concerns the global connectivity of persons, of places, but above all, of mind. The Internet is the crude infrastructure of an emergent consciousness, a kind of global brain. The Net is prodigious in its empowerment of associative thought - the thought of the artist - that aspect of cognition which leads most often to creativity. It is the intelligence of neural networks. It is leading us to the collective intelligence of a planetary hypercortex. Art is always first a matter of consciousness, without a spiritual dimension it atrophies. The artist working with digital technologies must always be asking the question "is there love in the telematic embrace?" (6). Our focus shifts from the plastic arts to the xenoplastic arts, the arts of connectivity and interaction. It not only brings people together across great distances, it brings ideas together across great differences.

There are three orders of art within the paranatural world. The first is translational, storing existing material artworks in digital space; the second concerns the production of art in digital space; the third is transformational, where the observer becomes an integral part of the creative system. Art of the third order, be it digital, paranatural, technological, online, virtual, or unequivocally post-biological, will be intrinsically interactive. In this context, the art object cannot be understood as a thing-in-itself any more than a quantum state can be independent of our observation of it.

First order art, however concrete and materially substantial in its origin, cannot be immune to the global telematisation of culture. What ever its physical makeup or material disposition, it will henceforth find itself at some stage of its history in the Net. Its function there is largely referential. There will always be a loss in translation since no digital simulation can wholly reproduce the tactility of a surface or the precise resolu-

tion of form. The gain, for some, is that the backlit image is often more compelling than a light reflecting surface.

Art of the second order does not originate in pigment, canvas, or steel, but from its inception is composed of pixels, digitally destined from the start for the computer screen and to slip easily into the Net for instant world wide consumption. Aesthetically it mirrors painting or drawing in the traditional sense: a picture is rendered, forms are composed, a work of aesthetic finality is created. You may navigate it but it is basically a closed world. In both cases the Net remains a delivery system, an archival source, a catalogue of holdings. Contrary to its frequent claims to do so, this second order art neither challenges the traditional plastic arts nor renders them redundant. It simply extends the repertoire of artistic images and ideas, reaching those parts of the globe that other gallery mechanisms cannot reach.

There is an art which exists only in the Net, for the Net and by the Net alone. This is integral to art of the third order. It uses the computer not as a video terminal, through which you view objects of art, as a kind of digital carousel projector, and not as an electronic paintbrush, but as a screen of operations, an interface, which enables you to enter into a process of manipulation and transformation of images, texts and sound. It deals not so much with the behaviour of forms and the aesthetic of appearance, as with forms of behaviour and the aesthetic of apparition, of coming-into-being. Our interaction is with its multimediated form and its many layered meanings. The viewer is active in the creation of art and with the creation of meaning. In this context ownership of ideas and images is not so much a problem for the artist as a possibility for the viewer. In the Net, to see is to own! To receive is to possess. It's not just that whatever arrives at your particular interface from wherever on the Net is yours to keep but that it is yours to transform. The capacity to transform and be transformed is a primary functional determinant of art of the third kind.

Virtual Reality has long been heralded as the prescription for the art of the 21st. century. The present state of the art is arid and dry. Art in the post-biological culture will be moist. It is from here with its nanotechnology of molecules, its bio electronic systems and its artificial genetic structures, that the paranatural world will emerge. We shall work with forces never worked with before, and sense things which have never been sensed before. This is the phase in our culture where art , science and engineering will most truly converge, where as artists we may finally become partners in evolutionary change rather than simply expressive or analytical bystanders.

Paranatural practices both electrify the classical pleasures of nature and extend them onto another plane. We continue to explore, navigate, surf and play. But we can also distribute ourselves in space and in time. We can enjoy a loved-one's telepresence as much as we once feared their absence. We no longer hold a mirror up to nature but have it reflect what we want it to be. The artistic pleasures of expression and representation of what we have seen and felt give way to those of the construction and co-evolution of what we envision and wish to experience. The seasons remain but the cycles of transformation multiply. The poverty and disease of the old nature (which included of course human nature) will not disappear. But the consciousness and culture that can arise in a paranatural world, founded as it is in a context of connectivity, reciprocity, interaction and amelioration, is more likely to embody love and compassion than the societies constrained by tradition, non-communication and fear that those in the natural world have had for so long to endure.

Notes

(1) Kip S. Thorne, *Black Holes and Time Warps: Einstein's Outrageous Legacy*, Norton, NY, 1994

(2) Hiroaki Yanagida, ed., *Technology's New Horizons, Conversations with Japanese Scientists*, Oxford University Press, 1995

(3) Roy Ascott, "The Architecture of Cyberception", in Leonardo Electronic Almanac, Volume 2, N° 8, MIT Press Journals, August 1994

(4) Julian Stallabras, "Empowering Technology": The Exploration of Cyberspace, in New Left Review, N° 211, May/June 1995

(5) Roy Ascott, "Nature II", *Esthétique des arts médiatiques*, Tome II, Poissant, L., ed., Presses de l'Université du Québec, 1995; "Nature II, Telematic Culture and Artificial Life", Convergence, Vol.1, No. 1, Libby, London, 1995; "Zurück zur (künstlichen) Natur", Kultur und Technik im 21 Jahrhundert, Kaiser, G et al., eds., Campus Verlag, Frankfurt, 1993.

(6) Roy Ascott, "Is there Love in the Telematic Embrace?", Art Journal, New York, 1990, Vol.49 N°3 and in *Theories and Documents of Contemporary Art*, Stiles, K. & Selz, P., Eds., University of California Press, January, 1996

THE BABBAGE DISEASE

THE IDEOLOGY OF INTERACTIVITY

By Doug Back

ursldoug@oncomdis.on.ca

We seem to have a difficulty dealing with our past, mostly we ignore it, certainly no one has written a historical/critical textbook that I can use in my art history class. If anyone knows of one please tell me.

We seem to have adopted this future perfect/past imperfect stance from the people that engineer our tools for us.

This medium, the computer medium and the people that use it seem to be mesmerized by the future potential of it, it is rarely backwards looking and thus rarely reflective. A medium totally numbed out by it's own reflection and of course apolitical. Being apolitical is a choice but it is difficult to have freedom without a history to reflect upon.

We have come along way since the mid 70's when the field was totally open and untainted by the territorial markings of other artists and the dogma of other media. So surely we should have, by now, come to terms with our present condition. But no, we seem to be stuck in some future place were everything about technology is OK.

This seems to born out in the relationship we have with our audience.

I'm sure we have all had the experience in which a person at an opening takes you aside to inform you that you could make a lot of money off your product if only you would make certain changes to your piece. Or in your piece they see a brave new world, rarely do they see the work itself. But somehow the work is a point of departure into the near future. Even our public refuses to concentrate on that which is in front of them.

Where did this attitude come from? It would seem to be born into the technology at its earliest roots with Charles Babbage, who was awarded the first government grant to produce the first computer in the 1890's because the hand calculated logarithmic tables, in which the Industrial Revolution was to depend on, were full of mistakes. The navigation tables had ships running aground and the tables on iron plate stresses were blowing up steam engines.

His accepted proposal defined the difference engine, the first programmable calculator, but he abandoned it because he envisioned the analytical engine. Which would have been, although mechanical and steam powered, a true computer.

He felt very hard done by that he was being held to his original proposal. He did however advance the state of machine

7

tools which gave England a technological edge at the beginning of the Industrial revolution. The government was happy with this, so the pattern was set for technological development of the computer.

The Babbage disease runs rampant in our electronic consumer products even today, it seems that when ever I visit someone they ask me to program some part of their house, be it a thermostat, a VCR, Microwave oven, a digital voice answering machine.

The technicians and engineers that design these products have the Babbage disease, their focus is on chasing new gizmos not producing usable products. The products are abandoned with out a human interface because they come up with a better way to do it during the construction of the current project. The current project becomes unchallenging, uninteresting, part of the drab here and now. They finish it only because the company they work for must have something to put on the market. They are not very helpful to the poor technical writer.

My neighbour was just telling me about his new Vista 100 phone and all the features on it. I wondered why he bought it since many of the features are not available where we live in the country. I could see the Babbage disease at work in the consumer.

I my self am indeed guilty of building tools and systems. I don't believe that Lotus SmartSuite or some other product will be everything I need to use my computer to the maximum, I haven't really been effected by any computer technology since I saw the ad for the Altair. I am guilt of abandoning many pieces of technology just as I was getting to know how to use them really well. Only as I get older do I begin to dig in my heels and surf As Norman White puts it on the trailing edge of technology.

Interactive technology and much of its terminology comes from the militaries inability to couple competent computer recognition systems to their very effective weapons platforms.

There many distressing photos taken in the early interactive labs.

A particularly hideous image from the early sixties, is of a cat strapped into the nose cone of nuclear missile, doing its best to avoid electrical shocks by pressing switch pads that keep a dot of light centered on the cross hairs of the guidance Cathode Ray Tube. This is an image I try to recall before I convince myself to buy a new computer.

The latest airborne computers still have difficulty telling the tanks from the trees. So most modern weapons need a person crammed into it somewhere as an analog image processor.

High-tech weapons are made for war and as always to lull the public into a sense of security. Rather than follow a dry and well tread man-machine interface talk. I would like to talk about war and its relationship with the public perception of the moral.

Just for fun I will trace the rise and fall of electronic art movements as they relate to various wars both hot and cold.

The first modern phase of technologically based art works was the short lived Futurist Movement in Pre World War one Italy. Technology and war, was thought of by these artists, as some kind of giant enema which would rid the world of priests and art galleries and pull Europe screaming into the twentieth century.

Unfortunately the mechanization of death by military technology was perfected in this war and the moral implications produced a rather infertile ground for public acceptance of technologically based art works. And besides many of the Futurists, who were among the first volunteers, died in the trenches.

This Luddism was broken after the Second World War, where the technological superiority of the United States was the seen as the reason for good triumphing over evil and saving the entire world. Immediately after the war, technology was put to work luring women out of the work force and back into the home via time saving appliances.

The cold war spawned the Internet and computer technologies. The Experiments in Art and Technology or EAT was instigated during this period. In it a large numbers of artists were directing the resources of the military/industrial complex to produce art works.

The Vietnam War which showed nightly, examples of a technologically illiterate people being annihilated by computer controlled bombers crushed this movement with only a few artists like Norman White and John Whitney Sr. (who had learned to use the technology on their own rather than direct engineers, surviving the moral backlash against technology.

The active portion of the cold war, the space race, and a number of renegade engineers brought about the microprocessor. A third wave of artists, full of McLuhan, Ted Nelson and technologically competent came out of the closet along with the miracle of the micro-computer.

In the present day the gulf war, who's heroes were patriot missiles and A-10 tank destroying airplanes has brought us to the current surge in popularity for artists working with technology.

There is a picture of Konrad Zuze building the Z-1 computer in his parents Berlin Apartment. Zuze is arguably the first person to build a working computer. The picture is dated 1939. While Zuze works totally absorbed on his machine, out on the streets the Brown Shirts are goose stepping down the roads and kicking in windows. This unwillingness to be engaged in the real world is something the electronic arts community is frequently accused of.

Before I dig a hole and bury the interactive art movement, I will leave us an possible out;

The last vestments of European colonial power reside within the language of academia and high art.

The new, world colonizing power is the culture of technology. Perhaps this is why art talk does not properly map onto "technological" art and why interactive artists have some difficulty engaging in a wider art dialogue. It could very well be that we just have to develop our own critical language, write our own historical texts and pray for some new colonial curators and critics.

CRITICAL FRICTION

IN YOUR FACE, REAL SPACE

By Doug Back

ursldoug@oncomdis.on.ca

A rtists have always used new technologies... the first person that blew paint through a hollow stick to reproduce an image of their hand on a cave wall was using technology. As Jean Piché has said "a flute is a machine and a piano is a very complex machine".

I was looking at a Windsor Newton painting products catalog recently and the photographs in it show hands mixing paint with a mortar and pedestal, no where in it is any hint of a production line or the large powerful computers this company must own, certainly much more powerful than anything I could afford. The painting crowd is still in denial.

The arguments about whether artists should engage with computer technology or not, are dead. Affordable computer technology has been in the hands of the general public and artists for fifteen years. Computers are old tech.

The discussion about whether artists should engage with high technologies or not are now in the hands of those artists dealing with bio/medical art, Orlan, Joe Davis and Stelarc.

The only determining factor on the popularity of electronic art is whether electronic technology is in current public moral favour, and the coverage of the gulf war certainly has put computer technology in a favourable light in the west.

Now that our field has aged significantly and we are secure in our place in art history we can look forwards to openly discussing the factions within electronic art, the In Your face artists and... I guess we would have to call them the In Your Machine artists, the political artists and the apolitical artists.

One thing that this field has sorely lacked is critical friction and critical friction is what will make or break technologically based art works.

The other is a bit of perspective in relation to art, in the holistic sense.

I have brought with me slides of the works of two artists which influenced me tremendously as a young art student..., way back in the late 70's. As a matter of fact they started me in electronic art. One could be labeled as In Your Face, the other as In A Machine artist.

We will start with Bruegel's "Hunters in the Snow" also known as "Return of the Hunters" circa 1565, because it is my favourite interactive audio installation work. I have a special affinity for this piece probably because I was born in rural/suburban Canada.

isea95@er.uqam.ca   T : (514) 990-0229

ISEA95 montréal

This painting is made specifically to trigger auditory memory responses in the brain through visual clues. Auditory memories seem to be rather good at retrieving bodily experiences.

The triggers, for me, often start with the sound of the creaking sign by the bonfire, because I have experienced and have very fond memories being around bon fires when it is very cold out. It reminds me of the feeling of freezing on one side and being toasty on the other, the feeling of turning around to keep the warmth moving through the body.

Or I may enter the piece off in the distance with the sound, very familiar to me, of people skating on a pond.

The next time I enter the painting I may begin with the group of hunters and that special sound that your feet make trudging through snow, in the woods, at minus 10 degrees. I may hang around with the hunters because I have done that, and I like remembering the sound dogs make when they are travelling in a group. I have also really enjoyed the sound of crows as you disturb their territory. I have also laboured carrying heavy objects over ice.

As an interactive piece it is truly seamless. Problems with data access are only limited by my own internal retrieval speeds. But then again any truly good piece of art is truly interactive.

As I pondered Bruegel as a young art student it occurred to me that it doesn't matter which medium you use to make art, all you are really doing is pulling up memories in the viewers brain. This is the only media available to you as an artist.

I found this thought very liberating because at the time I was a painter.

Before you think I am a total, romantic flake, I would like to introduce you to the other artist which has had profound effects on me. Paulo Uccello was more of the ilk of a tool or system builder/user. If this was done on a VAX in the 70's this piece would be even more of a historical landmark.

My favourite Uccello painting is his "Battle of San Romano" executed in 1455, Uccello was trained as an Gothic artist and was kind of born again when he got into the new technology of perspective. What I admire about his paintings is his obvious utter failure to marry gothic art and perspective. It is the friction of these two incompatible belief systems that make his paintings work.

I do not, however, engage in the content of this painting like I do that of Bruegel. Uccello's work is very different investigation than Bruegel's, as different as hardware and software.

Uccello, I think, would have been a VR artist were he alive today. Working on building tools and systems. The content of the work voyeuristic and a show piece for the technology.

Uccello taught me that art and science or technology can and should co-exist in one place. That part of the reason that our world is in such a mess is that we educate scientists and artists as two separate cultures and don't provide them with a common language or meeting ground.

In my piece entitled "Dummer Weather" which duplicates the weather conditions at my home in a remote location via a modem and a large servo-motor controlled fan, I was working in the vein of Uccello.

When my body temperature is recorded and played back through the seat of a chair as in "Brain Bag" I am working in the vein of Bruegel. I play both sides of the street.

I started when this field was pretty much unclaimed territory, at the third wave of modern techno-art that came with the introduction of the microprocessor.

I wire-wrapped my own computer, have learned several languages, and gone through several operating systems in that time. Each and every one of these changes came with the requisite 5:00 in the morning hack sessions. At the end of each session a new gizmo or language would come out. I would panic at falling behind and losing the respect our culture has for the technical wizard. It certainly seems that curators of techno-art want those artists that deal with the leading edge. The Uccellos of the twentieth century.

But there comes a time when an artist just has to dig in their heels, things get in the way like relationships, children etc. The appeal of staying up till 5 in the morning night after night learning a new language when you have not exhausted the potential of an older language seems to dissipate with age.

I no longer learn tech for the glory of the edge, just enough to be familiar with the materials I use. I don't build art through technicians or electronic kits because for me I would be losing the ability make my materials do something beyond the constraints of the manufacturer. It takes 5 -10 years to become a proficient writer, dancer, painter or interactive artist and there is no application software out there to make you one any faster.

VIRTUAL SKIN:

ARTICULATING RACE IN CYBERSPACE

By Cameron Bailey

71572.24@compuserve.com

I s "race" corporeal? Is that all there is to one of the most complex and contested discourses of the modern era — skin, eyes, lips and hair? Clearly not. Most theories of race reject a biological basis altogether in favour of a tangle of social, political and psychic forces that work their strange and funky work on each one of us every day. Thats how it goes in the real world.

But what about cyberspace — and here I'm concentrating on online communication: the Internet, commercial online services, bulletin board systems. Do the same laws apply? Recent writing on electronic communication systems insist that despite its disembodied nature, cyberspace remains what Michael Benedikt calls a familiar social construct 'with the ballast of materiality cast away' (4). That means race may function in much the same way that it does in the world where we are more directly accountable to our bodies. It may mean that, but it's hard to tell, because very few of the thinkers currently probing into cyberspace have said a word about race.

Faced with the delirious prospect of leaving our bodies behind for the cool swoon of digital communication, the leading theorists of cyberspace have addressed the philosophical implications of a new technology by retreating to old ground. In a landscape of contemporary cultural criticism in which the discourses of race, gender, class and sexuality have often led to the next leap in understanding — where, in fact, they have been so thoroughly used as to turn sometimes into mantra — these interpretive tools have come curiously late to the debate around cyberspace. It may be that the prevailing discussion of digitally assisted subjectivity has focused not on the culture of cyberspace as it exists today, but on the potential of cyberspace, on utopian or dystopic visions for tomorrow. Since we never reveal ourselves so much as when we dream, it's worth noting that most speculations on the future of cyberspace return questions of race to the margins. Volumes such as Michael Benedikt's Cyberspace: First Steps and Scott Bukatman's Terminal Identity barely mention the subject at all; only writers like Donna Haraway and Vivian Sobchack have taken the question of cybernetic identity beyond a direct relationship between technology and a unified, representative, obvious human subjectivity.

But does race matter? Can it sustain itself in the shifting space of virtual communities? It would seem clear that the safety of binary oppositions —self/other, black/white, male/female, straight/gay, writer/reader — would evaporate in the forcefully

uncertain world of electronic discourse. A message comes and goes without a face, communication takes place without bodies to ground it, to provide the deeper layers of meaning below the surface upon which we all depend. This is especially important given the extent to which social interaction depends on embodied communication, on stable, known genders, sexualities, races and classes being somewhere present in the communicative act. Without this there would be no power flowing through communication, and without the flow of power, what would we have to say to one another?

Cyberspace communication challenges all that. In the online world, identity is often chosen, played with, subverted, or foregrounded as a construct. There appears to be in this a demonstration of the freedom provided by disembodied communication, the ludic element that is central to cyberspace activity in general, as well as the influence of 25 years of postmodernity. What makes cyberspace so interesting as a public sphere is how none of the usual landmarks can be trusted. Also, the old economy of readers and writers, speakers and listeners is turned sideways; with the simultaneity and multidirectionality of online communication, authority is won and lost with such frequency that it becomes nearly irrelevant.

But online interaction is anything but a utopia of democratic communication. Feminist critics have pointed out how cyberspace is gendered to reproduce boring phallocratic limits on expression. Many have noted that the ideal of unfettered democracy touted by so many champions of the Internet contains its own ideological dead weight. Like the democracy of the ancient Greeks, todays digital democracy is reserved for an elite with the means to enjoy it. So it is with race. Existing racial discourses find their way into cyberspace, not simply as content, but as part of the shaping structure of the place. As with any other arena where identities are produced and exchanged, this aspect of cyberspace rests on the question of representation.

I want to look at issues of representation at both the social and personal level, to distinguish between what Kobena Mercer and Isaac Julien call representation as delegation and representation as depiction. In social terms, it's necessary to examine how variant communities are constructed online, as well as the access that different communities have to communication technology. In the United States, for instance, there is a growing movement among African Americans to resist being excluded by those corporations getting ready to wire the suburbs for the forthcoming ideology — aka information — superhighway. While this is primarily a consumer issue that only grazes deeper questions of engagement with the apparatus, there comes with this mobilization a push for greater technological literacy among blacks and other disenfranchised people.

In personal terms, we need to explore what it means to construct identity without the aid of racial and cultural markers like physical appearance, accent, and so on. Here, I will be dealing exclusively with those forms of electronic communication that depend on text instead of any figurative representation of the physical body — i.e. Internet newsgroups, online forums, e-mail, and text-based environments like Multi-User Dungeons (MUDs). On the surface it would seem that these are literary domains similar to an exchange of correspondence or the letters page of a newspaper. One presents oneself in language as is done in all forms of writing, which requires all the acts of identity construction, selective editing and lies committed by anybody who has ever written anything. But online communication adds something more — speed and uncertainty. MUDs operate in close-to-real time, providing an instantaneity that remains disembodied like writing but is nonetheless immediate like the telephone. And the literary contract between writer and readers becomes blurred. In the world of Internet newsgroups, mailing lists and electronic bulletin board systems (BBSs), writers post messages simultaneously to individuals and to groups sharing a similar interest. The question of address becomes more complex. Also, the way in which these messages are retrieved and read gives the reader a power akin to the hiphop sampler's authority over source music — it's a consumer's market. All of this uproots the online writers sense of his or her centred self. If identity is created solely through text and the text is as fluid as this, things fall apart in interesting ways.

My own first experience of virtual community came in Rock Dundo, Barbados, 1969, when I first jacked in to a smooth, plastic, khaki-coloured View Master^{TM}. My mother, thousands of kilometers away in Canada, sent me both the machine and its software — disks that brought to life before my eyes images I had never seen before: Niagara Falls and Flowerpot Island and Toronto City Hall in stereoscopic vision. It would be two decades before I tried on a VR helmet, but I knew the thrill of virtual reality right then. I was transported. Every time I returned to that machine I left the postcolonial sunshine behind for the marvels of Canada. Immersed in the depth, resolution and brightness of those images I became a part of Canada, sharing an experience with every tourist who had paused to get a good look at new City Hall, who had marveled at the Falls. More importantly, by entering these images, I could share the desire for the spectacle of Canada with my mother, who had recently immigrated there. What's interesting is that this period, from the late 60s to the late 70s, saw both the rapid disintegration of first-world national-ethnic boundaries, as more and more immigrants arrived in western metropoles from Asia, the Caribbean, Africa and Latin America, and the beginnings of the Internet and other online networks.

Now, as I produce these words on a newer piece of fetish hardware — a matte-black IBM ThinkPad^{TM} — I can extend into corners of cyberspace, remaking myself by will and accident, reading and misreading others. It's exhilarating at first, but it's not new. As Stuart Hall and others have pointed out, migration is central a part of the postcolonial experience, and it

necessarily involves shifting identity. It's the nature of Asian and African new-worlders to pass through different allegiances, belief systems and accents — for me it was Wembley, Rock Dundo and now Toronto — as a common part of life. At the same time, one develops a hyper-awareness of the relationship between physicality and identity. Like women, like lesbians and gays, people of colour living in Western metropoles live a crucial part of their existence as body-people, as subjects named and identified through their flesh. One need only hear "Monkey!" or "Water-buffalo!" screamed at you on the street every once in a while to be reminded of that.

Much of this begins with Rene Descartes, who has caught unimagined hell from countless thinkers for dividing the self into mind and body functions so cleanly. Cyber-theorists return to his work not only for its mapping of space, but also for its notion of the split subject, consciousness split from flesh. In selected bits, Descartes does indeed appear binary. However, in the process of his argument one finds a struggle to name the differences between mind and body, a struggle that belies his more definitive conclusions. What remains important is that indeterminacy. Consciousness meets corporeality in countless guises; sometimes they swap clothes.

What's come to be called Cartesian space, however, is much more fixed. As Sally Pryor and Jill Scott note, the cybersubject within Cartesian space remains distinct and apart from his or her virtual environment, because Cartesian space requires a vantage point outside of the spatial field, and gives a primacy to looking at and moving forward. This is the principle of the most popular video games, and it is a way of being in the world to which boys respond with a particular glee.

The cybersubject as defined by most current theorizing is not only gendered, but also has a clear cultural specificity that derives from a calcification of the questions that run through Cartesian thought. Steven Whittaker defines the typical cyberspace enthusiast as someone who desires embodiment and disembodiment in the same instant. His ideal machine would address itself to his senses, yet free him from his body. His is a vision which loves sensorial possibility while hating bodily limits. He loves his senses and hates his body! (45)

It sounds as lurid as I Was A Teenage Cyborg, though not so innocent. Pryor and Scott remind us of the link between this mind-body split and related oppositions like self-other, subject-object and male-female; they also insist on remembering the power that inheres in these oppositions — one side desirable, the other a threat.

So, taking the preferred side of the handful of primary couplets of identification, the cybersubject as currently figured is male, white, straight, able-bodied and ruling class. So what? Any identity that occupies the shadow half of these categories (i.e. female, black, queer...) remains lashed to his or her body.

Whole libraries of feminist thought tell us that a woman's identity has historically been defined and maintained through the body. The same holds true for Africans in the West, Aboriginal people, and so on. Biology is destiny. Physiology is law. Subjecthood lies over the horizon. This becomes especially interesting in a domain which privileges giving up the body so eagerly. That process is neither universally simple or universally desirable.

It's important to distinguish here between the cybersubject as a figure produced by current thought about cyberspace, and the actual people who enter cyberspace every day. In the same way that film theory distinguishes between the cinematic spectator as a function of the cinematic text, and so-called "real-world" viewers of movies, we must note that the cybersubject defined above is produced by still limited notions of the experience of cyberspace, and has a relationship to, but is in no way co-extensive with, the millions who communicate online or enter virtual reality. Cyberspace is built for that unified subject, but inhabited by a happily chaotic range of subjectivities.

Freeing up movement, communication and sensation from the limitations of the flesh might be the promise of digital experience, but the body will not be abandoned so easily. We have said that the quality of imagination is what allows all manner of disembodied experience, from being "immersed" in narrative to the spatial metaphors of cyberspace. Returning to Descartes, his notion of imagination appears suddenly pertinent: an "application of the cognitive faculty to a body intimately present to it — a body, therefore, that exists" (109). An awareness of the physical, "real" body is crucial to the disembodied projections of cyberspace. The physical body remains as a referent. Cyberspace wouldn't make sense without it. Here lies the connection between race and cyberspace. Western racial discourse began in a scientistic attempt to account for physical differences among people. Even when its meaning had left any pretense at science behind and extended into social and political spheres, the fact of the body remained. Skin, eyes, lips and hair endured as a powerful referent, ready to be drawn upon as evidence. At its most abstract, racial discourse still involves an imaginative act that relies on the physical body. Habeas corpus, or there's nothing to discuss.

I want to turn now to the notion of a cyberspace community. There's a Bantu proverb that's relevant, which says, quite plainly, that a human being is a person through (other) people."

With its mail, discussion groups, bulletin boards and shareware, with its geography and its idiom, cyberspace simulates community, a community more dependent on imagination than most. In Benedict Anderson's schema, a nation coheres around three principles: to be limited, to be sovereign, and to be a community. "Regardless of the actual inequality and exploitation that may prevail in each," he says, "the nation is always conceived as a deep, horizontal comradeship".

So what is the nature of the online community? First, the economics of online communication require that participants have access to a computer, a modem and a telephone line. Cancel tens of millions of North Americans. Until recently, Internet access required membership in an elite institution — a university, government department or major corporation. Millions more gone, but not evenly across the board. In the United States, African Americans and Hispanics are over represented among those without Net access, as are Aboriginal people in Canada. Owning the means of participation is a class issue, and another example of how class is racialized in North America.

Beyond economics, there is a somewhat harder to quantify culture of cyberspace. The Net nation deploys shared knowledge and language to unite against outsiders: Net jargon extends beyond technical language to acronyms both benign (BTW for "By the way") and snippy (RTFM for "Read the fucking manual"). It includes neologisms, the text-graphical hybrids called emoticons, and a thoroughgoing anti-"newbie" snobbery. Like any other community, it uses language to erect barriers to membership. It's worth noting that Anderson suggests print culture is crucial to the formation of nations. The Internet is nothing if not a riot of publishing, often about and on top of itself. Popular guides like Brendan Kehoe's Zen and the Art of the Internet, as well as the countless lists of Frequently Asked Questions serve to provide a body of common knowledge and therefore enforce order on the Net. There is in these codes of language, and in the very concept of "netiquette", something of the culture of suburban America; one gets the sense that these structures are in place not simply to order cyberspace, but to keep chaos (the urban sphere) out. It's no stretch to suggest that in the turn to cyberspace, the white middle-class men who first populated it sought refuge from the hostile forces in physical, urban space — crime, poor people, desperate neighborhoods, and black and brown folks. In writing about a BBS called New York Online, Noah Green compares the hermetic concerns of most BBSs to white flight from urban reality. New York Online, he says, promises "a virtual community that's a complement to, not an escape from, an existing physical one." Most of its membership — "50 per cent minority and 40 per cent female" — lives in Brooklyn. The norm, however, remains closer to Michael Heim's vision of the alienated subject-under-siege, where "our communities grow more fragile, airy, and ephemeral, even as our connections multiply."

So the suburban ideal of postwar North America returns in virtual form: communication at a safe distance, community without contact. Is it any wonder that when movies visualize the Net's matrix of communication, it so often resembles the cool, aerial patterns of a suburb at night?

Following from Benedict Anderson, we can say that the online nation has constructed itself as a community that is not by stated principles racist, but, because of the way nations are always constructed, has built affinities (and by definition, ex-

clusions), that have the effect of shunting aside certain voices, languages and vernaculars. However, this historical condition is now in tremendous flux as the online world grows to become a collection of communities. Time magazine has shrieked that "now that the population of the Net is larger than that of most countries in the world... the Internet is becoming Balkanized" (43). I prefer to see the change as more in keeping with the established, decentralizing spirit of the Net. Now at a transitional stage before commerce stomps in, cyberspace is more open to the free play of subcultures than it ever was. Some examples:

• Soc.culture.african.american is one of the busiest of Usenet newsgroups, accumulating hundreds of posts every few hours.
• Dozens of other newsgroups are devoted to a variety of self-defined cultural communities. The speed, anonymity and diffusion of newsgroup debate mean that subjects usually confined to safe, private conversation among friends or family are given semi-public airing on Usenet. Genocide theories and interracial dating are perennials in soc.culture.african.american; everything from assimilation to eating dogs comes up in soc.culture.asian.american." In addition to this kind of debate, Aboriginal activists use alt.native and soc.culture.native to get the word out on local struggles and call for support from the online community.
• African American cyberspace activist Art McGee compiles and distributes regular surveys of mailing lists, newsgroups and BBSs of interest to African Americans. The catalogue of mailing lists numbers more than 60, including lists devoted to the Association of Black Sociologist, Cameroonian students studying in London, and departed jazz guru Sun Ra. McGee's signature line is: "The revolution will not be televised, but the proceedings will be available online."
• NativeNet, an online network organized in part by Aboriginal artists working through the Banff Centre For the Arts, spans North America.
• The sale and exchange of digitized porn images caters increasingly to racial fetishes, with white and Asian women carrying the highest currency. The narratives of interracial desire remain popular on porn BBSs, and even on African American porn BBSs like Ebony Shack, images of black male-white female scenarios sometimes outnumber all other configurations.
• As Aboriginal people and people of colour organize online, so do far-right, white-power organizations. Alt.politics.nationalism.white rivals soc.culture.african.american in popularity — and both are riddled with ridiculous junk posts.

To sum up here, the discourse of race is, by history and by design, rooted in the body. Cybersubjectivity promises the fantasy of disembodied communication, and yet it remains firmly connected to bodies through the imaginative act required to project into cyberspace. What cybersubjectivity actually offers is re-embodied communication. So how should I re-embody myself amidst the Net's possibilities for self-presentation?

Should I announce myself racially, give myself a secure racial identity? As an experiment, I conducted a poll in a mainstream cyberspace venue — CompuServe's African American forum, asking how participants situated themselves online.

What was most interesting about the response was how quickly the thread moved away from the question of how one identifies oneself to a more manageable debate about racism. From what I've been able to glean in this and other online conversations, many African Americans (my survey was limited in sample) are unwilling to probe too deeply into what part racial identity plays in their conception of themselves, on what part of them stays black when they present no "evidence" of blackness. Race is either "taken for granted" or deliberately left unspoken. It seems that the prevailing view among the people of colour who communicate regularly online is that racial anonymity, even if it's a pretense, is a practical pretense. Given that cyberspace is already a racialized domain, this sort of virtual transvestism is by no means neutral. In an another era it used to be called passing.

There is another option. Taking a cue from the adolescent white boys who invented so much of cyberculture, I could play. I could also try to extend my engagement with cyberspace beyond the ludic economies of North American teenagers to include trickster traditions, signifying, and elements of spirituality that lie outside Western rationalism. That way subjectivity need not be a fixed racial assertion nor a calculated transvestism; it could be more fluid, more strategic.

Even better, I could go all the way back to that View Master^{TM}, holding it up to the bright Barbados sun so I could see Canada better. This might be some kind of an answer: maybe I can reach for the ecstasy of projected community and irresolvable difference, and claim them both in the very same moment.

DE L'ANIMAT À L'INFILTRAT

ÉLÉMENTS D'ÉPISTÉMOLOGIE FABULATOIRE

L'émergence de la vie artificielle dans les réseaux

Par Louis Bec

C onsidérations

La discipline de la Vie Artificielle a été officiellement fondée lors d'un workshop organisé par le Centre d'Études Non Linéaires de Santa Fe, en 1987, au Laboratoire National de Los Alamos.

Elle a été défini comme un champ très large d'investigation associant de nombreux domaines de recherche, de connaissance et d'expression.

Quelques années après, il semble que, pour un grand nombre de chercheurs, les modélisations d'organismes artificiels et de mondes synthétiques, ne peuvent trouver d'autres justifications que dans le cadre des protocoles scientifiques éprouvés.

Or si, pour la validité de ses fondements, il a été décisif que la Vie Artificielle se développe à partir des sciences du vivant et des technosciences, en s'appuyant sur les théories biologiques les plus actuelles, elle ne peut se départir, sous peine de réduction graves, des apports artistiques, éthiques, esthétiques et épistémologiques qui la travaillent à différents niveaux et qui lui donnent une pertinence accrue.

Ces apports, en témoignant d'un impact de plus en plus fort sur la société, proposent, eux aussi, des évaluations probantes, parce qu'ils participent à l'élaboration d'un imaginaire collectif et éclairent par la même une part des positionnements psychosociologiques, idéologiques, économiques et industrielles[1]

Ainsi en s'efforçant d'appréhender les mécanismes du vivant par une modélisation analogique, il semble que les chercheurs en le confisquant quelque peu, amoindrissent de façon significative le champ prospectif de la vie artificielle, en accordant au discours scientifique une valeur exclusive de vérification. Celui-ci, tout en demeurant opératoire pour les éléments biologiques du donné, ne se justifient plus en regard d'artefacts heuristiques construits comme "du presque vivant".

Ainsi les grandes aires d'exploration de formes de vie différentes qui nous étaient promises, de biologies aventurées hors des chaînes carbonées, d'organismes évoluant dans des milieux paradoxaux, extrêmes et communicatoires, hostiles ou fictionels, sont abandonnées au profit de ligne de recherche classique s'appuyant sur les origines de la vie, les théories de l'évolution, l'éthologie ou les algorithmes génétiques. On voit clairement que la vie artificielle peut se définir comme une méthodologie limitée aux déchiffrements des phénomènes d'une biologie **paroissiale**[2].

Il apparaît très vite, que cette réduction confortablement "scientifique" est, en fait une **entorse épistémologique** qui tend
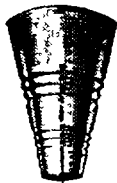
à s'inscrire de façon durablement inquiétante dans les fondements de la Vie Artificielle. Elle tourne notamment le dos à la révolution décisive des modes de communication liés au numérique, qui sera déterminante pour son futur.

Ses enjeux et l'étendue de son activité ne cadrent plus exactement avec le site épistémologique et esthétique qui devrait être son site originel, c'est pourquoi au lieu d'être prospectif, son développement s'incurve et se boucle. Il tend à revisiter de façon récursive, l'ensemble des théories habituelles de la biologie.

Cette tendance à une vérification normée, s'appuie sur un concept dépassé de simulation qui laisse entendre que ne peut être simulé, que ce qui existe déjà dans le donné.

C'est pourquoi la question de son site de développement épistémologique à partir duquel les théories et les pratiques de la Vie Artificielle se déploient, est primordiale.

Heureusement, les mutations qui s'annoncent, permettent déjà de repérer d'autres modes d'expression notamment à travers la colonisation du Cyberspace par insémination dans les réseaux ou par les nouvelles formes de chimérisations entre le vivant et l'artificiel.

Hors les artefacts de la vie artificielle ne sont pas condamnés fatalement à être **biomimétiques**[3].

Parce qu'ils résultent avant tout d'une activité cognitive.

Et cette activité cognitive résulte elle, du lent travail de céphalisation qui s'est opéré à travers des phases évolutives, adaptatives et techniques du vivant. Celle-ci se sont organisées au cours de l'hominisation à partir des capacités proprioceptives jusqu'à l'avènement des niveaux symboliques supérieurs actuels.

C'est bien par ce qu'il existe, à la pointe d'un des embranchements des classifications, un site cognitif de cet ordre de complexité, implanté dans le support de la matière vivante dont le projet, dans une bien curieuse logique du vivant, est de transférer du biologique cognitif dans du dispositif technologique, que la vie artificielle est une entreprise rendue possible.

Elle ne peut être en aucun cas une voie mineure de la biologie, mais au contraire une excroissance proliférante du vivant.

C'est parce que les tendances prospectives de la vie artificielle développent une étonnante trajectoire, une trajectoire d'extériorisation des principes de viabilité, de foisonnement et d'exploration du vivant, que peuvent s'envisager, présentement des **biodiversités technologiques** et la création possible de formes de vie inédites et d'univers virtuels, comme une amorce possible pour une seconde révolution darwinienne.

Ainsi la vie artificielle doit se dégager progressivement des modes de penser et des méthodologies élaborés dans un socle épistémologique naturaliste inadéquat, basé sur un présupposé positiviste, à savoir la prépondérance accordée à l'étude d'une nature donnée.

Elle doit s'efforcer d'éclaircir et d'affirmer au contraire sa position et ses projections au sein d'un **socle épistémologique constructiviste**, à partir des sciences de l'artificiel, des sciences de la cognition, des sciences du signal et de la communication, des technologies et des entreprises expérimentales artistiques les plus avancées.

Reconduire la césure qui s'est développée entre les méthodologies scientifiques, la conception et l'imagination, constituerait un recul inconcevable, en regard du rôle que la vie artificielle est appelée à jouer en tant qu'outil d'adaptation inventive et symbolique dans l'avenir de nos sociétés.

Se couper des explorations artistiques novatrices, des projections esthétiques, des considérations éthiques et économiques... serait contraire à cet esprit de synthèse indispensable pour déchiffrer notre époque.

Ce serait, de plus pour son avenir scientifique, une profonde erreur qui la renverrait à un gadget de plus, dans la panoplie positiviste et mécaniste des sciences du vivant.

La vie artificielle comme biomimétique

La vie artificielle se constitue autour de deux approches différentes.

- La première a pour objectif de construire des artefacts du vivant à partir de substances non organiques sur des supports numériques ou robotiques...
- La seconde tend à élaborer des "créatures biologiques" à partir de substances organiques en intervenant dans les processus métaboliques, comme pour les chimères xénoplastiques ou les organismes transgéniques...

Ces deux grandes orientations appartiennent à des niveaux de conscience, de connaissance et d'imagination différents.

Si elles se rejoignent dans certaines disciplines comme, par exemple, les disciplines qui traitent des organes artificiels ou qui proposent des hybridations du vivant avec des dispositifs technologiques interactifs...elles n'en conservent pas moins leurs propres spécificité.

Il est évident que les chimérisations organiques, les manipulations génétiques, ou les interventions artistiques sur et dans la matière vivante elle-même[5], nécessitent une stricte soumission aux lois du vivant.

La réussite de l'expérience étant hypothéquée par la survie métabolique du modèle, la biomimétique est donc inévitable.

Par contre, la construction d'artefacts techniques est moins inféodée matériellement aux conditions fonctionnelles du vivant. Elle s'est édifiée sur une relative abstraction des propriétés générales qui le caractérisent, en mettant en avant des aspects systémiques, structurels et comportementaux. Puis elle s'est ingéniée à les "porter" sur des supports numériques ou des construits technologiques comme les robots.

C'est pourquoi, d'autres paramètres "vitaux" devraient pouvoir être envisagées.

Ils pourraient déborder l'étude de la vie telle qu'elle est, pour mettre en projet des vies telles qu'elles pourraient être.

Cela entraînera vraisemblablement une redéfinition extensive du vivant et de ses déterminants qui seraient élargis au "presque vivant". Il faudra, tout comme il existe des facteurs d'iconicité de la représentation, établir des facteurs d'artificialité du vivant qui permettront de mieux modéliser les limites de ses nouveaux territoires.

L'analyse de certains "postulats" modélisateurs fournit un bon matériel pour évaluer l'importance et les limites de la dérive biomimétique.

Bien qu'en considérant la vie comme une propriété de certaine forme d'organisation et non pas comme une propriété intrinsèque de la matière, la Vie Artificielle n'a pu totalement se dégager du substrat théorique et méthodologique propre à la biologie et aux épistémologies positivistes et réalistes.

Elle s'est appuyée sur trois types de fonctions fondamentales du vivant pour les inscrire en tant qu'opérateurs centraux dans ses modélisations et dont on peut observer les applications à travers les automates cellulaires ou algorithmes génétiques...

- L'autorégulation qui permet de gérer les fonctions de l'organisme par contrôle.
- L'autoconservation qui a pour objectif le maintient en vie, par l'apport énergétiques et les réactions biochimiques.
- L'autoreproduction qui s'affirme par la capacité de prolifération de la vie.

La caractérisation des propriétés du vivant est importante pour la vie artificielle.

Aussi de nombreux critères ont été avancés pour permettre de déterminer si un système naturel ou artificiel est vivant ou non. Ceux de Belin et Farmer[6] qui sont les plus complets, demeurent néanmoins ambigus.

Ils ont été établi à partir de l'observation d'organismes terrestres et ne peuvent bien sur, se débarrasser de cet ascendant.

Le manque de précision ou la trop grande généralisation de la définition des propriétés du vivant applicables à de nombreux objets, tend à renforcer l'appareillage référentiel au désavantage d'une approche mieux cernée de l'artificialité de la vie.

Il en va de même pour la modélisation des milieux ou des univers virtuels.

On sait la place déterminante que tiennent ceux-ci dans les diverses interactions qui s'établissent d'une part entre le milieu lui-même et les organismes et, d'autre part entre les organismes entre eux.

Le plus souvent, les modélisations de la vie artificielle implémentent des situations qui sont triviales pour des biologistes, des physiciens, des éthologistes.

Elles simulent des univers souvent considérés comme virtuels dans lesquels les phénomènes du vivant se développent à partir des paramètres rencontrés dans les milieux marins, aériens, les milieux extrêmes ou hostiles et dans l'espace.

La pesanteur, la pression, la température, l'humidité, la viscosité, la densité, la luminosité, etc... demeurent comme autant d'éléments qui fournissent à des niveaux divers des données pour ces simulations.

Ils modifient les phénomènes d'adaptation, les comportements, la motilité ou la motricité, les facteurs d'évolution, de co-évolution, d'apprentissage, de reproduction...et donc biomimétisent inévitablement les modélisations proposées.

Les artefacts n'échappent pas eux non plus aux tendances biomimétiques.

Pourtant l'élaboration d'une typologie établie sur une population de plus en plus conséquente d'artefacts que la vie artificielle réalise, peut s'avérer intéressante.

Elle peut rendre compte non seulement de l'évolution de celle-ci, mais aussi de certaines tendances, qui sous l'action de différents facteurs, montre qu'un écart se creuse entre une grande partie des modélisations actuelles et les impératifs de la biomimétique.

Les prolégomènes de cette typologie qui devrait déboucher sur une taxonomie, font apparaître plusieurs phases d'évolution.

Il existe à partir des tendances biomimétiques premières, une voie qui s'ouvre à des formes d'autonomie et d'auto-organisation de plus en plus complexes.

Deux grandes directions semblent s'affirmer plus précisément.

- La première infiltre et colonise le Cyberspace. Elle vise à promouvoir une prolifération d'organismes bio-culturels dans les réseaux de communication[7].
- La seconde suscite diverses procédures d'artificialisation du vivant à travers des dispositifs interactifs, elle tend à enchâsser la matière vivante au coeur d'agencements technologiques complexes, pour lui conférer un statut "de mode d'expression énergétique" à par entière.

Les artefacts produits sous régime biomimétiques sont des **ANIMATS** et des **ADAPTATS.**

Ceux qui émergent actuellement peuvent être classés sous les noms d'**AMPUTATS,** d'**INFILTRATS,** d'**ONDULATS** ou de **PROLIFERATS .**

Les ANIMATS, du terme proposé par Stewart W. Wilson pour désigner des artefacts répondent aux attributs conventionnels du vivant : **la mobilité et le mouvement.**

Ils sont capables de comportements de divers niveaux d'autonomies et d'auto-organisation.

Les ADAPTATS interagissant avec les paramètres du milieu. Ils sont capables de répondre aux différents stimuli, en développant des paliers graduels d'apprentissage, des comportements d'intelligence collective et des structures dynamiques par les algorithmes génétiques.

Ce binôme **ANIMAT/ADAPTAT** est symptomatique de l'entreprise qui s'est donnée pour objectif l'étude de façon orthodoxe de la vie telle qu'elle est.

Il est composé de modélisations :

- **d'automates cellulaires** qui sont en fait des univers synthétiques, gouvernés par des règles simples et qui s'auto-reproduisent. Il y a plusieurs classe d'automates :
  1. Les automates cellulaires qui évoluent vers des états fixes et homogènes.
  2. Les automates cellulaires qui aboutissent à des structures périodiques simples.
  3. Les automates cellulaires qui évoluent vers des comportements chaotiques, caractérisés par des attracteurs étranges et des structures apériodiques.
  4. Les automates cellulaires d'où émergent des motifs globaux complexes.

- **d'algorithmes génétiques**, qui sont des programmes qui évoluent de façon analogue à la sélection naturelle. Ils associent la diversité du hasard avec une survie adaptée :
  Ils ne se limitent pas à une simple exploration aléatoire. Ils tirent parti de l'historique des recherches par le biais de la transmission de solution les mieux adaptées d'une génération de solution à une autre.
  Les algorithmes génétiques travaillent sur la structure des solutions et non sur les solutions elles-mêmes.

- **d'intelligence collective** dont le modèle est l'essaim d'abeille. Il est basé sur une modélisation qui permet à des agents simples possédant une information minimum, de résoudre des problèmes complexes par des comportements qui émergent des interactions entre les agents.

- **de morphogénèses dynamiques,** qui simulent le processus appelé morphogénèse par lequel un être vivant modèle sa forme et acquiert ses caractéristiques, autrement dit comment il développe son phénotype à partir de son génotype.
  Les fractals, les L-systems, croissance des plantes, les biomorphs... en sont autant d'exemples.

- **de robotique** dont certains types de robots sont munis de systèmes qui permettent des adaptation à des situations nouvelles, des modifications de la structure syntaxique et de systèmes évolutifs apprentissage, adaptation, autonomie.
  R.Brooks : robot utilisant des algorithmes génétiques dont les codages évoluent dans le temps.

Le poids d'une épistémologie positiviste et réaliste a pesé fortement sur les orientations de la vie artificielle.

La connaissance que s'est donnée pour but de constituer progressivement la science, est une connaissance de la réalité considérée comme indépendante des observateurs ou des modélisateurs.

Elle est sous-tendue par le fait qu'il existe une réalité qui présente des formes de permanence indépendante et antérieure à son observation.

Cette connaissance n'est connaissance que si elle reflète le monde tel qu'il est.

Or ces postulats sont contraires à ceux de la vie artificielle. Ils se construisent autour d'un **projet** de connaissance et non pas d'un objet, Ils opèrent à partir des constructions et des représentations de l'expérience cognitive. Ils visent bien plus à une modélisation de la cohérence plutôt qu'à une modélisation de la correspondance.

La vie artificielle comme niche technobiomologique[8]

- La vie artificielle est en train d'opérer un glissement épistémologie qui devrait lui garantir une vocation légitime d'exploration, de colonisation et de propagation.

- Après s'être adonnée, durant un temps, à des activités théoriques et pratiques de modélisations fondatrices sur des bases biomimétiques et tout en poursuivant ses recherches précédentes, elle s'insinue maintenant dans un nouvel espace plus adéquat, enfin totalement et réellement artificiel, celui des réseaux de communication numérique.

- C'est donc pour une part, dans cet environnement **technobiomologique**, composé de **niches techno-écosystémiques** et de **trajectographies zoologiques,** qu'elle entend instaurer son site d'épistémologie constructiviste et fourbir ses instruments heuristiques pour d'autres extrapolations du vivant.

- Ce nouvel environnement possède une couche physique constituée de câbles, de circuits hertzien, de fibres optiques, de satellites, d'ordinateurs, de puces, etc...
  Dans cet environnement, les machines sont reliées aux machines, les puces de silicium sont interconnectées, l'information est d'abord traitée dans un minuscule réseau interne puis transmise dans un immense réseau de connexions, selon des procédures diverses.
  Elle circule sous forme d'impulsion lumineuses et électriques.
  Cet espace artificiel est devenu maintenant planétaire. Son étendue et son volume sont déterminés par l'énergie qui le traverse, le nombre, la vitesse et les propriétés physiques des messages qu'il transmet, par la propagation des ondes lumineuses...
  Il est "encastré" dans l'espace "naturel" qu'il modifie et artificialise fortement. Il est contigu et tangent aux milieux extrêmes de cet espace, qu'il prolonge en les surdimensionnant.
  Il peut favoriser l'émergence de vies binaires inédites, constituant en quelque sorte une **hypotechnozoologie capable apparaître dans tous les terminaux de visualisation du réseau** . Il peut être considéré comme un pourvoyeur virtuel de définitions élargies du vivant.

- Il peut en modeler les comportements, mettre en évidence d'autre types de capacité adaptative, établir une **technozoosémiotique** du codage, de la cryptographie, ou incuber des colonies d'intelligence distribuée, se multipliant dans toutes les dimensions et la complexité du réseau.

Il peut engendrer des activités duplicatives par des artefacts techniques d'autoréplication, générer des morphogénèses dynamiques non linéaires, mémorisants des séquences numériques propres aux protocoles de communication ou "teratologiser" des biomorphs par mutations provoquées par des ensembles de convention qui stipulent comment l'information numérique doit être échangée entre les programmes, etc...

- Car, non seulement il est soumis aux procédures numériques et donc peut héberger tout type de modélisations interactives, compatibles avec les conditions du milieu, mais encore, ses potentialités de transmissions électroniques et optoélectroniques, lui permettent d'offrir à une **techno-ambulobiomologie** inaugurale, un espace de circulation et d'échanges permanents pour des formes "locomotions" inédites.
  En plus des aspects matériels, cet environnement possède une multitude de strates[9] qui assurent les fonctions différentes et importantes à l'intérieur du réseau. Elles peuvent toutes jouer un rôle primordial dans les conditions d'émergence de formes de vies technologiques.

- Mais à travers ces potentialités, ces spécificités, cette variabilité, cette ubiquité, quelles morphogénèses peuvent émerger et se développer?
  Dans cet environnement parcouru de flux, de symboles[10], de signaux électriques se propageant à la moitié de la vitesse de la lumière, quel type de vie peuvent apparaître?
  L'ensemble de ces opérations s'exerçant sur les modélisations du vivant, entraîne nécessairement des mutations structurelles, textuelles, texturelles, comportementales, par codage-décodage, par cryptographie, par compression/décompression/dépression des "transformées"[11], c'est à dire des représentations et de leurs interprétations.
  Quelle morphogénèse **hypophanique**[12], quelle ambulobiomologie peut se constituer, si les formes nouvelles qui émergent, n'étant contenu ni dans un programme interne, ni dans un programme externe, sont de pures création résultants du jeu des perturbations aléatoires de l'environnement sur les mécanismes de l'auto-organisation?
  Quel "métabolisme" pour des organismes modélisés, décomposées selon les protocoles de communication, circulant entre les ordinateurs, segmentés en paquet par multiplexage et orientés par des routeurs, les knowbots[13].

- Le vivant est aussi présent dans cet environnement, d'une autre façon.
  A coté des nanotechnologies implantées au sein des organismes, des corps appareillés et des assistances aux déficiences corporelles et mentales par des organes artificiels, les nouvelles entreprises d'hybridation du vivant et de l'artificiel s'inscrivent aussi dans le réseau par le biais même des computers.

- Un certain nombre de laboratoires[14] testent les propriétés des molécules biologiques, notamment des protéines issues d'une bactérie, la bacteriorhodopsine, pour construire des composants d'ordinateurs, qui par un déplacement intramoléculaire occasionné par la lumière, pourraient servir de commutateur.

- Avec des molécules possédant des états stables, on peut coder des chiffres binaires et fabriquer des composants plus petits et mille fois plus rapides. On utilise des techniques hybrides de liaisons biomoléculaires avec des semi-conducteurs (chimérisation au premier niveau) pour fabriquer des portes logiques. Cela permet une flexibilité des dispositifs électroniques par la mise en place d'architectures parallèles pouvant effectuer plusieurs traitements simultanés et augmenter les capacités de stockage des informations en trois dimensions.

- Ce qui est recherché implicitement peut-être, c'est la reproduction des possibilités d'apprentissage du vivant et plus particulièrement humaines, afin d'obtenir un système d'intelligence artificielle plus pertinent.

- Curieux retour des choses, la **rhodopsine** est présente dans la rétine des mammifères et contient un chromophore qui absorbe la lumière. Elle engendre un signal que les fibres nerveuses propagent vers le cerveau.
  Celui-ci, en fait procédera, en aval, grâce à la rhodopsine, à l'interprétation des signaux transmis et des images restaurées, qu'elle aura codé numériquement en amont.

- Ainsi, du "modélisateur vivant" comme agent concepteur, capteur et transmetteur, à travers du vivant hybridé par protéines/semi-conducteur, comme agent codeur, et du vivant technologique comme agents émergeants du réseau numérique, jusqu'à l'agent vivant récepteur qui interprète les déterminants apparents du vivant contenus dans les informations, en s'artificialisant lui-même, **une boucle d'artificialisation du vivant, se boucle.**
  Elle associe les artefacts et les modélisateurs dans une étroite co-évolution. Nous nous trouvons face à une entreprise généralisée de chimérisation qui dépasse l'objet scientifique biologique initial.

- Le défi est bien là. Est-ce qu'une espèce symbolique comme la notre, issue d'une longue phylogenèse et placée dans le site épistémologique constructiviste qui est le sien, peut créer un tel écart cognitif, qu'elle serait en mesure de proposer des systèmes cohérents de forme de vie élargies, n'obéissant pas aux principes de vie qui sont les siens et qu'elle pourrait de plus considérer comme vivant ? sans se transformer elle-même?

- Dans tous ces cas, l'identification et la dénomination sont inséparables de la réalisation d'un système de référence. Il s'agira, comme aurait pu le dire Adamson, de chercher dans ce nouvel environnement la cohérence d'une systématique et d'organiser ses généralisations dans un cadre de concepts qui établissent les bases d'une future taxonomie numérique d'organismes du "presque vivant".

- L'identification et la dénomination ont à voir avec la mémorisation des phénomènes, dans leurs disparitions et dans leurs réapparitions modifiées. De plus il n'est pas possible d'appréhender un ensemble aussi vaste de phénomènes, qui n'occupe pas d'espace formel, qui se décemente en partie ou en globalité.

- Comment classifier l'asymptomatique, le métamorphique, le fugace?

Il est possible de tenter une première approche de clarification à partir de certains aspects qualitatifs de artefacts. En voici quelques exemples.

- Les **Amputats**[15] peuvent être définis comme des organismes qui à des fin de viabilité et d'adaptation s'amputent stratégiquement d'une ou de plusieurs de leurs propriétés. Dans un environnement de réseaux les amputats sont des artefacts du vivant qui obéissent à différents traitements du signal, le plus souvent de compressions d'images et de données qui peuvent être considérées comme des amputations opérés par des techniques de codage, de compression et de confidentialité cryptographique.

- Les **Infiltrats** sont des artefacts qui possèdent la capacité de circuler de façon autonome dans les réseaux de communications.

- Les **Proliferats** sont des artefacts qui possèdent la capacité de coloniser les milieux et de créer des **niches techno-écosystémique**, des zoosystèmes qui, comme des fermes font des élevages de toutes sortes d'organismes virtuels, stoqués dans des étables-mémoires supervisées par une corporation internationale de zoosystémiciens, soit comme des marres de **soupes technoprébiotiques** font des préparations pour des coacervats[16] artificiels ou se constituent en immenses réserves pour des organismes latents et fluctuants qui surgiront comme des diables, dans les pièges des interfaces, en traces fulgurantes ou en agrégats auto-organisés.

© Louis Bec 1995
Zoosystémicien

Notes

[1] " L'arrivée de "l'Artificial Life" sera l'événement historique le plus significatif depuis l'apparition de l'homme.
L'impact sur l'humanité et la biosphère pourrait être énorme, bien plus grand que la révolution industrielle, les armes nucléaires et la pollution de l'environnement. Nous devons nous engager dans l'émergence des organismes artificiels, ils peuvent être soit un désastre terrible pour la terre, soit être la plus belle création de l'humanité..." Doyne Farmer (Artificial Life II Santa Fé 87).
[2] Ce terme est employé par certains chercheurs pour désigner le domaine restreint de la biologie terrestre.
[3] La biomimétique désigne tout ce qui tend à mimer les éléments du vivant.
[4] Chimères zoologiques réunissant des parties d'organismes différents.
[5] Le travail artistique de chirurgie esthétique et de modélisation du vivant d'Orlan.
[6] La vie est une structure dans un espace temps, plutôt qu'un objet matériel spécifique.

- La vie implique un mécanisme d'autoreproduction.
- Un être vivant comprend une description de lui-même qu'il utilise pour se reproduire.
- Un être vivant possède un métabolisme qui convertit la matière ou l'énergie de l'environnement dans les formes et les fonctions utiles à l'organisme.
- Un être vivant interagit fonctionnellement avec son environnement.
- Un être vivant est composé d'un ensemble de structures interdépendantes qui constituent son identité.
- Une forme vivante est stable malgré les perturbations de son milieu.
- Les êtres vivants ont une capacité d'évolution au niveau des générations successives de l'espèce.
[7] Le travail de Thomas Ray et son projet Tierra.
[8] Les technobiomes sont des espaces où le vivant et les technologies sont étroitement intriqués
[9] Couche physique (câble, circuit hertzien, fibre optique, ordinateur, puce....)
- Couche de protocole (comment les bits doivent être matérialisés dans les ordinateurs, dans les systèmes de transmissions).
- Couche de liaison/réseau/transport (émission, réception, transmission, compression, formation de paquet d'information(cryptographie, autonomie du déplacement, routeur...).
- Couche de gestion (gestion des connections, association de dialogue, encombrement, vitesse, flux).
- Couche de représentation (représentation des informations et des données).
- Couche réseaux des réseaux (interconnexion, routeurs, transcodage).
[10] " Biologistes et linguistes ont observé un nombre impressionnant de propriétés communes à la vie et au langage depuis leur émergence consécutive. Ce sont deux systèmes porteurs d'informations et orientés vers un but. Ils requièrent tous les deux la présence de messages sous-jacents. Depuis la première apparition d'un minimum vital, le statut spécial attribué aux organismes vivant en vertu de leur origine et de leur dessein repose sur l'existence de messages codés qui spécifient les structures moléculaires et jouent le rôle d'instructions transmises de génération en génération. Les analyses du code génétique, découvert et déchiffré à notre époque par la biologie moléculaire et celle du code verbal, scrupuleusement étudié par des générations de linguistes ont révélé une série d'analogies de configuration remarquable.
R Jakobson, "Vie et langage" *Dialectique* n° 7, 1974.
[11] Nom donné aux images compressés
[12] Ce terme désigne la capacités des morphogenèses numériques à surgir du dessous des apparences.
[13] Les knowbots sont des robots logiciels qui gèrent les calculs effectués en parallèle sur différents sites et communquent les uns avec les autres.
[14] Centre Keck d'électronique moléculaire Centre d'information de l'Université de Syracuse
[15] Pour les questions d'esthétique sur l'autonomie et les systèmes modélisés cf. "Du Renfloué" texte integral du cinquieme cours donné par le Professeur Louis BEC, durant la 4 eme Université d'été de ZOOSYSTEMIQUE de Sorgues, Juillet 91).
[16] Terme utilisés par Oparine pour désigner les premières molécules artificielles dans ses recherches de l'origine de la vie. cf "Artificial Life and Russian Biologists of the early 20th C". Conférence Louis Bec , Médialogie Moscou 94

EMERGING ARCHITECTURES IN THE VIRTUAL SCAPE

ARCHITECTURE OF (IM)POSSIBILITIES

By Dr. Julio Bermudez
& Debra Gondeck-Becker

bermudez@arch.utah.edu

F ramework

Digital space is an electronic medium that serves as an artificial environment for architectural work. At least two different architectural conceptualizations of this electronic world are available:

1. digital space is a studio for the development and testing of architectural products aimed at classical reality. Classical reality is understood as the natural and sociophysical world wherein we carry on our lives. In this interpretation, digital space depends on the rules and laws of the physical world and its value is tied to being a (representational) instrument for worry-free experiments and simulations. Utilizing digital space as a studio continues the historical tradition of using depictions to design, describe, reflect, or document buildings aimed for classical reality.

2. digital space, a reality of representations, is also a virtual place with nature, functions, aesthetics, order, etc., not necessarily following or referring to classical reality. In this immaterial world, people may work, meet other people, seek entertainment, find and generate information, etc. According to this interpretation, architecture should play a major role in the conceptualization, organization, and design of such an alternative reality. In other words, digital space is an environment in its own right that has no other justification than offering alternative experiences, structures and events to those of classical reality.

In this presentation we will investigate the potential of architecture within a digital space understood in the last sense.

Introduction

Producing architecture for digital space suffers from the conscious and unconscious preconceptions of what architecture has been and is in classical reality. At first sight, it would seem reasonable to think that the best way to study the emerging architectures of/for virtuality is to challenge the most basic tenets of traditional architecture. For instance, developing physically impossible architectures (i.e., totally unbuildable) might help us to liberate from imported constrains and thus open the true possibilities of a cyber-architecture.

isea95@er.uqam.ca   T : (514) 990-0229

ISEA95 montréal

Such an approach, however, would repeat experiences already available in the field (e.g., the works of Ledoux, Piranesi, Woods, etc.) and, what might be worse, may divert us from considering/studying the true architectural potential of the digital (due to its anti-reality stand).

Traditional architecture has had to conform to the inexorable laws of nature. The unavoidable infrastructure of classical reality has caused architecture to develop as a physical, stable, containing and inert object. In other words, there exists an a-priori relationship between the basic infrastructural constrains of an environment and the type of architecture that may evolve there. As digital space need not follow the rules of reality, it appears acceptable to reflect on the potential of cyber-architecture by investigating the digital rules that are ultimately alien to those governing the world wherein architecture has developed. We call these new digital laws the laws of potential.

Concentrating in what is infrastructurally unique to the cyber and its impacts in the act of architectural thinking and making (and in part to avoid the innate conditioning of classical reality) requires the analysis of those normal laws of the digital world that go against the natural laws of classical reality to offer a more useful methodology.

Our questions then are what are the laws of the Cyber, and how does architecture respond to these? The approach will be as direct, simple and conceptual as possible. There will be two parts to this presentation. The first one will focus on the ontology of construction in cyberspace and how it challenges our most traditional conceptions of architecture. The second part will explore the necessity of architecture to organize the cyber-experience and its implications in the development of a new architecture.

Part 1 : The infrastructural laws of potential

We have grown accustomed to electronic operations that defy the laws of the natural world. These days any software includes commands such as "save", "undo", "copy", "erase", "find", etc., whose implications we rarely reflect upon but nonetheless are remarkably puzzling. First, one must realize that it is these simple commands that mark, establish and sustain virtual existence within the cyber. For they create the operational realm or basic infrastructural order. Second, these commands cannot be performed in classical reality (at the very least not with the same degree of perfection and/or ease). Third and most importantly, these digital actions generate ontological and architectural potentials of unprecedented kinds.

It is intriguing that few philosophers and intellectuals have taken on these issues as subjects of investigation. If on one hand, ontological questions are somewhat out of date in late 20th century discourse (pushed aside by epistemology, linguistics-logic, and ethics), on the other hand it would seem pertinent that some attention should be placed in events and situations never before encountered and which characterize a large part of what drives our civilization.

It is particularly interesting to use architecture to conduct such a study. After all, traditional architecture has been the discipline associated with visions of reality based on classical ontologies of stability and materiality. Perhaps, for this very reason, architecture appears as the perfect platform from which one may question the ontological status of matter upon which most of our Western civilization has been built since the time of Aristotle. If architecture can let go of the idea of being as a permanent and independent entity, then any discipline can.

We will first analyze the laws of potential by studying the infrastructure of the cyber as represented by ordinary digital commands such as "save", "undo", "erase", "copy" and "find/go to". These commands will help us explore what architecture could be like in cyberspace.

The saving command is perhaps the most puzzling of all the ordinarily available digital actions. Saving generates ontological and architectural states that are inconceivable in classical reality:

The RAM state (that which is in progress and not yet saved). RAM allows that two different states of reality coexist very much like those described in the Shrodinger's cat paradox of quantum physics. There is that which is already saved (i.e., original state) and there is that which is in the process of being changed (new state). The nature of such an in-progress production/entity not yet saved is quite remarkable. Which one is the true entity/event? Is it the one that was saved earlier and thus is secured and stable, or is it the new one being built but not yet saved?

The progressive digital doing-undoing-saving creates a field of action in which fields of continuity (defined by that which is stable throughout the changes) and fields of discontinuity (that which is not) begin to form. The field of continuity is the only stable digital area and the closest it comes to the traditional notion of architecture. As the latest moves continue to unfold, there is an increasing ontological difference between the first and late states. The more a particular event/entity endures in RAM, the more its likelihood of becoming saved, thus existing in a stable form.

In other words, the RAM state creates the conception of architecture as a fuzzy cloud with a more or less stable center and whose ultimate manifestation awaits the act of saving. RAM architecture thus acquires a quantum formal existence that goes beyond the concept of liquidity advanced by Novak. It seems that the metaphor of gaseousity (something quite alien to the traditional idea of architecture) is a more appropriate model to conceive the impact of the laws of potential in architecture. This is a new, highly challenging proposition that is only possible in digital space.

The limbo state (that which is in process of being saved). The act of saving or not saving is the mechanism by which co-existing (defined and undefined) states of architectural reality are collapsed into one. At one point (while the RAM content is being recorded) there exists a period in which the entity exists nowhere and yet it does. As it becomes real in the digital world, it also becomes crystallized in a constructive albeit immaterial act. Issues of replacing the pre-existing saved versions or creating new versions are relevant (see below).

Considering the lack of security and stability (i.e., looseability) of the RAM state, it is understandable that the saving command is called as such. To save means (1) to rescue (free, release, liberate), (2) to keep (protect, safeguard, conserve, preserve, maintain), and (3) to store (accumulate, gather, collect, reserve, amass). At the same time, saving also brings issues of frugality and economical thrift. All these meanings are quite common to the practice of architecture and life in general, and suggest intriguing design potential when associated with the other dimensions of cyberspace.

That which is saved (the stable construct secured in memory). Traditional architecture could be clearly associated with this digital (saved) state, of unchangeable quality. However, there exist significant differences. First, a saved digital entity is in theory eternal (assuming a continuous availability of energy). Second, saving, as memory, is a magnetic disturbance and not a clearance of disorder. The save command allows for alternative constructions. As in quantum reality, different versions of the world may be generated, saved, and interfaced with.

The undo command is also fascinating. The temporal direction of classical reality (entropy) precludes the full reversion of an action once it has been carried out. There is always some mark (memory) and cost involved in such operation. However, in digital space, one can always undo. This implies a reality of certain temporal symmetry (unlike classical reality). In order to allow the undo, digital reality must keep in RAM the previous state(s), thus creating various realities at once. As a result, what is being made partakes with what was before such an action, thus creating a quantum field of multiple existences. An architecture of uncareness and of true (im)possibilities are its results. Having to pay little or no cost for making errors, the law of undo also creates low levels of pressures at the time of action which allows for high levels of exploration (positive) or a lack of attention and commitment (negative).

Architecture has always been about doing. In a way, an architecture of undo is antiarchitecture. Architecture cannot be undone except by demolition. To undo architecture is to tear it apart, it is to challenge the very character of construction. It is not deconstruction but rather unconstruction. The concept of unconstruction is strange as it implies an almost careful removal or erasure of the constructed.

Undo and erase are very much alike although the former eliminate an entity forever whereas the latter restores the previous state, hence implying a selective, controlled erasure. To erase is to delete memory. To erase is death in digital space but even the erasure may be undone. In addition, as one can always select areas to erase, the careful erasure or undo may create inconceivable alternative states/entities. Finally, the undo command challenges saving. To "undo" means to (1) cancel, omit, obliterate, erase something, or (2) eliminate, drop, leave out. In other words, undo is the opposite of saving.

The copying command challenges the concept of the original and special quality of architectural artifacts. What Benjamin advanced so long ago has gone to its ultimate result: the original and the copy are identical, hence it is meaningless to talk about identity. The copying command destroys the effort associated with physical construction. In physical reality, copying is a painful process even when highly industrialized and informed systems are employed. The most interesting issue that an architecture of digital copying brings about is not the art of skillful reproduction but instead the concept of the hybrid and the eclectic. By the selective copying/cutting and pasting of parts from a (original or other) source, architecture becomes the ultimate collage.

The potential of the command copy is due to the representational character of the cyber. Every digital event and being is representational and subject to the laws of representation, that is, to the whims of the designer, the software logic, and the power of the electronic engine that generates and supports the digital becoming. Electronic media may be the most delusive of all media. The rules of the cyber may purposely distort, bend, subvert to make appear that which cannot be, or is not in classical reality.

The traveling commands such as — find —, — go to — and —search — define the spatial infrastructure of the digital as they connect and communicate areas comprising electronic reality.

The resulting spatial structure is difficult to conceive both ontologically and structurally. In contrast to the real world, digital environments tend to be discontinuous, non-linear and hyper-dimensional. For instance, entities and users may not only be present in two places at once but also occupy the same space at the same time. Digital environments can also reverse interior-ity-exteriority, destroy the concept of materiality and stability, allow for infinite regressive or progressive scale and dimensional changes, and jump from digital site to digital site almost instantaneously. Cyberspace is closer to a quantum than to a Newtonian conception of space.

Part II : The experiental laws of potential

Grasping the laws of potential also means to study the laws of the digital at an experiential level, represented by ordinary

events of entry (orientation), circulation (access), and shelter (assessment). We will look at these events and how the present day vernacular of the digital coupled with kinetic changes necessitate architectural form in virtual environments.

The first experiential law of potential involves the event of entry into an environment. One must construct the context of the new environment in order to fulfill the purpose of entry. This orientation traditionally develops from our empirical knowledge of the place we are entering, as well as from the physical act of entry as procession. We conceptualize organization and purpose of a place based on our understanding of area site development, cultural traditions, regional geography and climatic conditions. We also visualize the order of space during approach. The passage of time and traveling of distance allows for acclimation. In traditional environments, our entry into a new place is prefaced within the context of similarity. We move through space that is adjacent to the one we are about to enter and therefore they share some environmental conditions.

In a virtual environment, entry consists of turning on, plugging in, double clicking, — jacking in,— lowering the HMD, etc. The plane of passage now becomes a switch or an icon or an opening of the eyes through new lenses. We no longer have, or have to have the opportunity for acclimation to the preluding contextual shift through voyage.

However, we still have the need for orientation to our environment. Our abrupt and non-contiguous entry into virtual worlds must be balanced by a quick location assurance. Here we can take advantage of the physiological shift and provide unique means of movement and sight that seek to orient the inhabitant. A global vantage point similar to an aerial view of a three-dimensional place can yield two-dimensional pattern recognition. One can learn much about the planning of Paris from the top of the Eiffel Tower. From the exaggerated Y dimension, the space flattens into two-dimensional patterns. But this is only one level of understanding. One must also walk the streets of Paris, listen to the traffic and conversation, smell the breeze and feel the sun to understand ones location within the city.

Multiple and instantaneous global vantage points could yield three-dimensional patterns and orders. Skeletal overlays (wire frame mode) against volumes (solid), an —x-ray vision,— could provide an understanding of the intended qualities of spaces. Mapping places through languages of text, color or symbols could also aid in orientation. Surfaces could become animate with sketches, advertising spaces within; the envelope as billboard. An augmented help overlay could exist for inhabitants with hotspots that roll-over information when activated.

Another experiential law of potential involves circulation. Circulation as an event is understood as accessing information within an environment. This is accomplished by movement or change of position (eye point or view point) in space. Tradi-

tionally, we circulate around and through structures to gather information. We change our position in space (eye point) to change our focus of study (view point). This circulation is based upon our physical scale and bodily needs. There is a ground plane that accommodates the size of our feet (or the treads of our tires, etc.). The ground plane is mainly horizontal to accommodate our mainly two-dimensional means of movement. The plane is of a certain texture and material to both comfort and support our passage.

In virtual environments, the change of position can be accomplished by flying, walking, skipping, flapping, singing, pointing, clicking, clucking, nose-twitching, or any other desirable action. This shift in kinesiology, no longer using our limbs to move through space, informs a new architecture of circulation. Surfaces for travel are no longer necessary, we can move freely, suspended in all dimensions. Spatial voids for passage are no longer necessary, we can move through planes and volumes.

We have always understood circulation as moving in time through continuous spaces. Hyper portals collapse the factor of time and the need for continuity. Circulation through spaces can now be a matter of activating the portal. No approach, no need for a path, only instantaneous entry.

However, surfaces for travel and spatial voids, these passages and entries imply movement and inform direction. Virtual architecture still needs to infer where and how we can access information. Digital vernacular may suggest the traveling commands (find, go to, search) as a method for access. Also, changes in appearance (typically of interface tools) imply movement or action such as the hour glass and blinking cursor.

This is lending towards dynamic architectures that are capable of transformation depending on the information they contain and the needs of the inhabitant. The change of position does not have to instigate with the inhabitant, the environment can actively circulate.— Here the eye point remains stable and the view point is dynamic. The circulation is now based upon the goals of the environment, or the goals of those accessing the information. The kinetic shift reverses the notion of formal circulation and stable information. The architecture is animate. Its form and animation are derived from the information it contains or is queried for.

Rather than serve as backdrop for activity, planes come into the foreground, animated with information. Smart agents or search mechanisms form space, visioning the desired information. The environment filters out all space not corresponding to the formal inquiry. The resulting spaces relate to the level of detail in the quest.

Shelter as an experiential law of potential depicts critical assessment of information within an environment. Tradition-

ally, walls, floors, and roofs combine to provide an envelope of shelter, an environmental, sensorial and physical protection. Overhead planes restrict environmental factors, underfoot planes provide ground that supports all activity. Vertical planes restrict and moderate environmental factors, and serve to restrict and direct inhabitant access.

Environmental factors, which we may know as snow, bugs, cold, etc., are not an assumed part of a virtual environment. Inclusion of sensorial factors, sight, hearing, smell, touch, taste, in virtual environments are dependent on the sophistication of the human-computer interface. Inhabitants physicality create the need to provide barriers from physical entry and, depending on object detection, may or may not be a part of the virtual environment.

An architecture that allows for assessment is still one of filters, but now what we are filtering has changed. Environmental factors may exist but they are more akin to Neal Stephenson's — Snow Crash — where what we need protection from are viruses. Environmental factors can also be thought of as an influx of information. Now that we have accessed the information, we need to critically assess it, meaning we need to isolate it from other information.

Typically, what we do now for shelter in these terms is capture the information (copy, save, download, or print to our own computer) and assess it at a later time. In a MUD, this shelter is accomplished by going to another room— or inside an object. In a 3-D virtual environment, it can be accomplished by providing assessment harbors, perhaps personal architectures that each inhabitant carries with them and expands or changes physicality in order to enter. These personal building blocks define architecture as a dynamic tool for shaping and creating environments.

"Assessment Harbors" will need to change the way we filter and restrict access. Assuming a visual human-computer interface, it will still be necessary to restrict vision of those outside and focus vision of those inside. Due to multi-dimensional travel, it will be necessary to provide multi-dimensional filters. A simple change from two-dimensional filters to three-dimensional will aid in assessment.

Traditionally we could get by with location as a filter, sheltering through distance, changes in vertical level, difficult egress, etc., but potentially instantaneous travel makes this obsolete. Instead, we may infer traditionally non-architectural filters to restrict access. Keys that could be codes, identities, or forms would allow access. Entry to these shelters is a command prompt, an intelligent mirror, or a keyhole. Once in, we are enveloped with the architecture.

We also have a potential shift in what we are sheltering or assessing. Virtual environments may need not shelter physical-ity but intangible information. Physical presence is replaced by mental or other sensual presence.

Conclusion

The fuzzy ontological states described in the first part were literally unimaginable before the arrival of electronic realities. From gaseous architectures to the concepts of unconstruction, the hyper and the eclectic-hybrid, these defy all our age old conceptualization of architecture. They create the potential of a new architecture.

The digital medium makes it possible to imagine and realize emerging architectures of common experience described in the second part. The process of entry, circulation and shelter are exposed to kinesthetic shifts and boundless laws that make animate architecture whose structure is information rather than structuring space to contain information.

Hence, we can conclude that the only constant in cyberspace is the constancy of potential. Everything, except the common sense imported from classical reality, is possible. Jacking into the digital means to switch our ontological/architectural paradigms from the concept of object permanency to the concept of permanency of potential.

CENTRE FOR IMAGE AND SOUND RESEARCH

By Justine Bizzocchi

justine@cisr.bc.ca

Ehe mission of the Centre for Image and Sound Research is to support applied research in the technological and artistic aspects of image and sound, contributing to product development and to the evolution of Canadian art and culture.

CI•SR was originally conceived at the School for Contemporary Arts, Simon Fraser University, and developed through the efforts of a founding group of individuals which included Tom Sherman (former head of the Media Arts Section of the Canada Council), Joy Leach (then with SFU's Development Office), Dr. Tom Calvert (then VP-Research at SFU), Grant Strate and Martin Gotfrit (Professors in Contemporary Arts, SFU).

CI•SR is now an independent, non-profit organization.

With original funding from Rogers Cablesystems, Inc., the Federal Department of Communications and the BC Ministry of Regional and Economic Development, and then a multi-year commitment from Industry Canada (through the Centre for Information Technology Innovation), CI•SR was able to establish a research laboratory equipped with computer workstations as well as audio and video processing facilities. In addition the lab has been tied to a presentation area with high-resolution display and multichannel sound.

The organization initiated a Research Program to support a variety of initiatives from industry, universities, and artists. Among current and recent projects are the following:

Archive Interface Design Project

Many performing arts organizations maintain historical records in multimedia archives. Imagine that this material could be digitized and made available through an interactive computer system, but instead of a simple cataloguing and searching device you are invited to explore the material in multiple modes using a graphical user interface that is an artform in itself. This is the ambition of Artistic Director Thecla Schiphorst who has created an interactive prototype which utilizes content elements provided by Cunningham Dance Foundation in New York. Choreographer *Merce Cunningham's* body of work now spans over fifty years, and the impressive collection of multimedia material which comprises the Cunningham Dance Foundation Archive provided initial inspiration for the interactive system design.

Digital Optical Printer

The motion picture entertainment industry is increasingly relying on digital image processing to create the special effects audiences now expect in all major films. Pthalo Systems, Inc., has developed a high speed, high resolution technique for transferring images between motion picture film and digital post production systems. Key features of the system include film quality resolution (up to 200 lines per millimeter) and frame rates of 5 seconds per frame. The Digital Optical Printer performs operations previously done by optical printers and provides both scanning and recording in a single machine.

iCube

A small but growing number of performing and visual artists have been exploring the use of computer technology to enhance their multimedia works. iCube is a tool which has been developed by Axel Mulder specifically to address the needs of artists working with sensors as devices to drive the computer-based media in their work. The device will translate the sensor data to midi signals in a manner which can be programmed through a user-friendly software interface. The goal is to create a product which is both affordable and usable by non-technical artists.

Yuan Ming Garden

The building of this fabulous Chinese Imperial Garden began in 1709 and continued under six generations of Emperors until it was destroyed by the Western Army in 1860. Xing Xing Computer Consultants has undertaken the ambitious goal of reconstructing the garden - not in plant and stone, but with the latest in 3-D modelling and animation techniques. The significance of the garden for Chinese history, culture, literature and art make this project ideal as the basis for development of educational and cultural interactive products.

Cutbacks in the Federal budget of February 1995 resulted in the cancellation of CI•SR's multi-year contract with CITI and necessitated a suspension of new research initiatives by the organization. Efforts are currently under way to identify new sources of support to allow continuation of the Research Program.

'KRACHTGEVER'
(1993/94)
&
ELECTRIC SWAYING ORCHESTRA'
(1991/92)
MACHINES WITH CERTAIN CREATIVE POWERS

By Peter Bosch & Simone Simons

E specially over the last five years, our main interest has been shifting more and more from a wide range of activities to the development of "music machines" with certain creative powers.

This is realized by the introduction of unpredictable factors, which play a central role in the concept. These unpredictable phenomena can be created either in the real world (e.g. the parametrically forced pendulums of the 'Electric Swaying Orchestra'), or in software (e.g. the use of "cellular automata" as decision-makers in 'Was der Wind zum Klingen bringt', 1989/90). This paper deals primarily with two of our machines:

> The 'Electric Swaying Orchestra' (1991/92) and the 'Krachtgever' (Eng: "Invigorator", 1993/94).

Two themes that are of extreme importance to both projects are "resonance" and "order and chaos".

In 1896, Nikola Tesla, one of the great geniuses of the electrical age, demonstrated the power of resonance, by strapping a small oscillating motor to the central beam in his Manhattan laboratory. He built up a powerful physical resonance that conducted through the building and into the earth to cause an earthquake in which buildings shook, panes of glass broke and steam pipes ruptured over a twelve block area. He was forced to stop the motor with a blow from a sledge hammer [1]. These 'resonances, stimulated by mechanical vibrations', play a central role in our work the 'Krachtgever'. However our main interest is not to amplify just one existing frequency, but to create a complex system in which various frequencies influence each other. As in the 'Electric Swaying Orchestra' forced and natural frequencies of objects, then pendulums now sprung constructions, are so attuned to each other that the movements and sounds created by the installations can change almost imperceptibily from order into chaos and vice versa. In both projects the role of the computer is paradoxical: although it has power over the mechanics (electro-motors), it can foresee only partly the physical outcome of its decisions. Alongside unstable balances and order and chaos, another element is sound. The pure power of sound and the subtlety of timbres remains an integral part of all our installations.
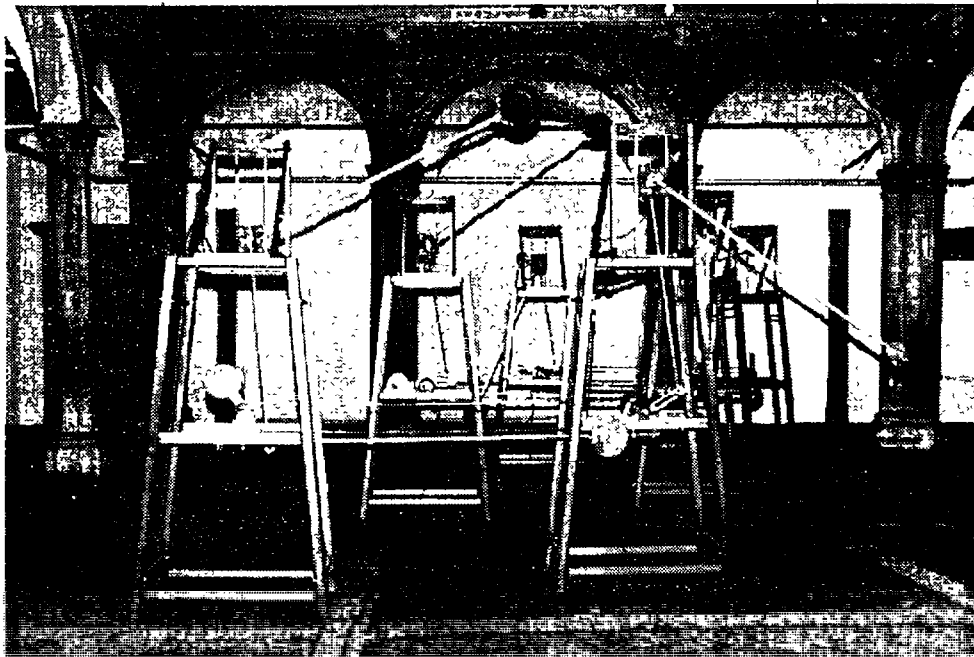
the 'Electric Swaying Orchestra' (1991/92)

Historically, the pendulum was used to create order; in the Electric Swaying Orchestra they bring chaos. This is realized by the use of parametrically forced pendulums, a well-known subject that has thoroughly been researched and documented by physicists within the cadre of order and chaos theories [2]. Parametrically forced pendulums are activated by the up and down movement of their hanging mounts. Since the behaviour of these pendulums depends on the oscillating frequency of these mounts, the use of a vari-speed electro-motor is essential. As a consequence the pendulums command an exceptionally wide range of movement; what can start off as a traditional to and fro swing can become an unpredictable and irregular motion leading to a startlingly vigorous full circumrotation.

The 'Electric Swaying Orchestra consists of six parametrically forced pendulums, with a length of 1.50 meters. A microphone or loudspeaker is attached to the end of each pendulum. From the loudspeakers can be heard electronic music (sampled brass instruments). A computer controls the electro-motors and the musical process. However it has no exact control over the consequences of its decisions. Although the movements of the pendulums are related to the oscillating frequency of their hanging mounts, there comes a point that the exact behaviour of the pendulums becomes unpredictable and therefore also the musical outcome. The computer interprets the sounds received from the three swaying microphones and responds by playing new notes over the three swaying speakers. It is a process which repeats itself endlessly. The computer is in fact listening constantly to itself. The main determining factors for this live improvised music are the unpredictable movement of the pendulums and listen and composition rules executed by the computer. The complexity and unpredictability of the system ensures that each performance is unique in both movement and sound.

About the electronics and software involved:
An Atari 1040 ST computer controls motor-frequencies and the musical process. For all communication between devices midi code is used. Midi-numbers are translated into CVs for the electro-motors by a Doepfer MCV-8. The elapse in time of the motor-frequencies is always the same. All motors start at the same speed, imperceptibily slow down during three minutes and stop. After a short break they continue at the final speed of part one and slow down further for another three minutes. During this process the behaviour of the pendulums changes from periodical to quasi-periodical and chaotic. Audio-information that is coming in through the three swaying microphones is translated into midi-code by an Ibanez MC1 audio-to-midi converter. Part of the musical outcome is determined by specific properties of the used audio-to-midi converter. The software transforms only pitch and velocity numbers. After these two transformations on the incoming numbers, received from the Ibanez MC1, it sends the new numbers at once to a sampler. It does no transformations within the time domain. The software is written by Peter Bosch in Forth, using a midi-handler, developed at STEIM, Amsterdam.

31
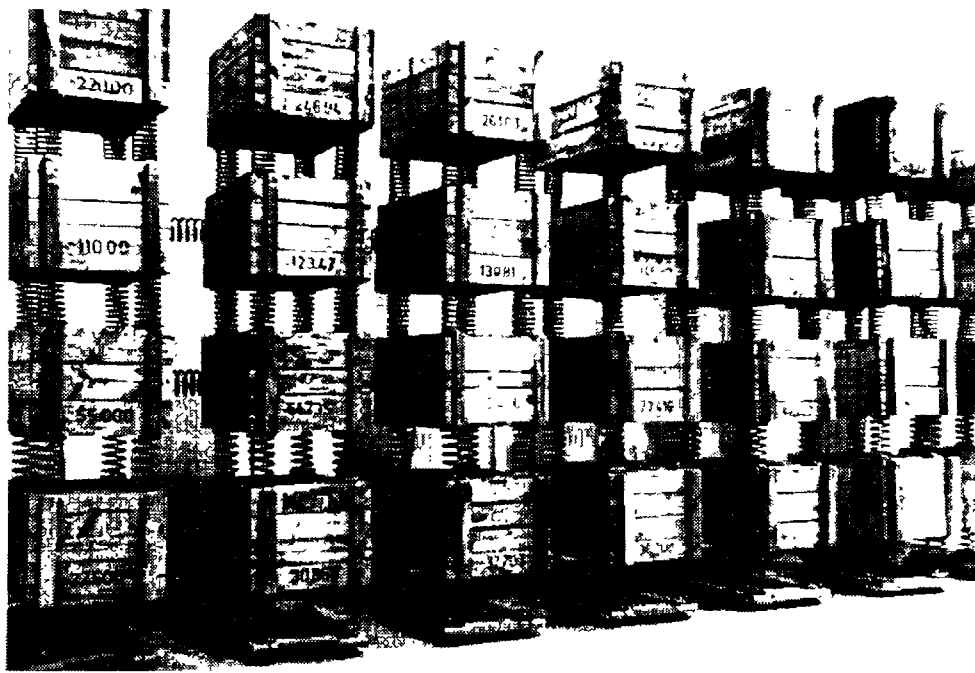
3. The 'Krachtgever' (1993/94)

The first version of the Krachtgever' ('Invigorator') was developed within the framework of the Technique and Art Festival '93 (TARt'93) in co-operation with students from the faculty of mechanical engineering of the University of Twente in Enschede, Holland. Three seven feet high towers of three steel boxes each are joined together vertically with metal springs. An oscillating motor is attached to each middle box of each tower. These motors are driven by a computer that by varying the speed at which the motors rotate causes interesting interferences between the stimulated vibratory and resonant frequencies of the towers. Depending on the chosen frequency each box can be vibrated independently, while also one complete tower can be brought into one periodical movement. Even a combination of vibrations can be generated to occur simultaneously at different levels of each tower. Our co-operation with the students was aimed at the development of a computer model, able of reliable predictions concerning the movements of the boxes. This way we could examine different combinations of springs, simply by changing the stiffness coefficients in the computer model, without actually buying and trying all these springs. The computer model was indeed reliable concerning rough predictions, but could not predict the details of the behaviour of the "real" Krachtgever, partly due to slight differences in dimensions and masses of the boxes and to small variations in the stiffness coefficients of the real springs. However most important deficiency of the model was the absence of the objects ("rattles"0), that move around in the boxes, not only the sound sources of the work, but also affecting the movements of the boxes. At its first presentation, November 1993, we showed the Krachtgever together with a computer animation of a vibrating virtual tower.

The complexity of the behaviour of the system depends on the number of inter-sprung boxes, the greater the number of boxes, the greater the complexity. This brought us in 1994 to the development of the version as shown at ISEA95 Montréal, consisting of seven 2.50 meters high stacks of four wooden boxes each. The boxes are joined together with metal springs, both horizontally and vertically. The total number of boxes can be extended up to 56. An oscillating motor is attached to each second box from below of each stack. The computer cannot only control motor- frequencies, but can also choose different combinations of motors. Each box or complete stacks can be vibrated independently, as was the case in the first Krachtgever. Totally new are the numerous combinations of vibrations that can be generated to occur simultaneously at different positions within the system. Each box contains different materials. These "rattles", varying in volume, weight and sound possess there own resonating characteristics. When stimulated by an oscillating motor the combined vibrations from all the elements - the springs, the boxes, the various rattles in the boxes, etc. - produces an extraordinary complex whole. In spite of this complexity, the relationship between all visual and auditive elements of the installation is unambigious. The sounds are pure, unamplified and rich in detail - in the tradition of our installation 'Was der Wind zum klingen bringt' (1989/90). The concept of 'live' musical outcome influenced by movement, can also be found in the 'Electric Swaying Orchestra'. There, however, all sounds are generated by a computer and a sampler. This digitalization permits melodic structures to play a large role in its music. The repertoire of the 'Krachtgever' by contrast can be best described as stacks of sound varying in strength, timbre and rhythm from the subtle to the powerful, from the ordered to the chaotic.

About the electronics and software involved:

An Atari 1040 ST computer controls the frequencies of the oscillating motors by sending midi-notes and pitch-bend information to a Doepfer MCV-8, which translates these data into CVs. The computer program is structured as phrases. A phrase simply consists of three variables:

1. Which of the seven motors take part in the phrase?

2. Start and end frequencies for each motor used in the phrase.

3. Total time used while going gradually from start to end frequencies.

Combinations of motors are fixed in some phrases, in others the computer chooses motors at random. The elapse in time of the motor-frequencies can be synchronous or a-synchronous, also depending of the chosen phrase: There are a kind of preset-phrases, where almost everything is fixed, while others are defined rather freely. The phrases are divided into three categories: Quiet, medium and rough (loud) behaviours. The program only remembers to which category belonged the last chosen phrase. After finishing this phrase only phrases from the other two categories can be chosen. The software is written in Forth by Peter Bosch.

The Electric Swaying Orchestra and the Krachtgever were developed in co-operation with the University of Twente, Enschede, Holland. Additional support in the form of a grant was made available by the Fonds voor Beeldende Kunsten, Vormgeving en Bouwkunst, Amsterdam.

Notes

[1] from: 'The sound of one line scanning' by Bill Viola in 'Sound by Artists', Dan Lander and Micah Lexier (eds.). Art Metropole, Toronto and Walter Phillips Gallery, Banff, Canada 1990 , p.43.
origin: 'Prodigal genius: The life of Nikola Tesla' by John J. O'Neill. New York: Ives Washburn Inc. 1944, pp. 159-62.

[2] e.g.: 'Nonlinear oscillations', by Ali H.Nayfeh and Dean T.Mook. New York: John Wiley & Sons 1979, pp. 258-261.

Nouvelles perspectives pour l'image de synthèse

Véronique Bourgoin   Marc Roelens

Ecole Nationale Supérieure des Mines de Saint-Étienne
158 Cours Fauriel
F42023 Saint-Etienne CEDEX 2
Tél : (33) 77 42 01 73
E-mail : {roelens|bourgoin}@emse.fr

Résumé

Le réalisme occidental utilise le point de vue unique et fixe qui ne semble répondre qu'à une convention culturelle mise en place au XVeme siècle, après plusieurs siècles de perspective antique. Le Cubisme utilise une autre notion du réalisme, en reprenant l'idée du regard balayant la scène avec deux yeux.

L'image de synthèse ne pose pas la question du réalisme expérimental humain : elle se réfère au réalisme photographique. Nous avons introduit dans la synthèse d'image ces concepts de réalisme plastique, en définissant de nouveaux modèles de projection, que l'on peut classer en trois familles : les projections à oeil mobile (perspective antique), les projections à grand angle et les projections convergentes (Cubisme).

Ces projections ont été utilisées dans un environnement de synthèse d'images comportant une modélisation par arbre de construction et une visualisation par lancer de rayons.

1 Introduction

1.1 Exposé de la problématique

De nombreuses perspectives ont été et sont utilisées dans le monde de la représentation. Choisir l'une d'elles reflète une certaine façon de percevoir le monde. Dans l'abstraction représentationnelle occidentale, le spectateur, en tant que corps, est réduit à un œil, lui-même compressé en un point.

Le questionnement sur le réalisme de l'image s'impose. L'image dite réaliste renvoie-t-elle à une réalité en tant que telle, existant dans le monde de façon absolue et directement accessible à l'exclusion de tout code transcriptif, ou à un concept culturellement acquis comme réaliste et qui ne renvoie qu'à lui-même [Bou94]?

Cette recherche ne s'inscrit pas dans le cadre d'une recherche scientifique dont l'objectif serait de construire des modèles dont les règles de fonctionnement correspondrait à des lois absolues de la nature. Nous nous trouvons en présence de modèles issus des seules sciences humaines et d'interprétations sensorielles. L'objectif de ce travail se résume donc à extraire les *concepts* qui régissent chaque style de représentation. En essayant de rester fidèle à ces concepts de base, nous définissons des fonctions de projection, et dans le cadre de nos résultats, nous ne conservons que les images dont l'esthétique nous semble radicalement nouvelle. L'enjeu n'est donc pas de faire de la *perspectiva naturalis* de façon radicale et ressemblante, ni de systématiser les principes du Cubisme pour réaliser un modeleur cubiste, mais à partir de différentes idées sur le « réalisme », de créer de nouvelles images propres à surprendre dans leur organisation formelle.

1.2 Approche informatique

Le problème de la perspective (ou de la projection) est le suivant : comment passer d'une représentation du monde qui est tridimensionnelle à une représentation de l'image qui n'est que bidimensionnelle?
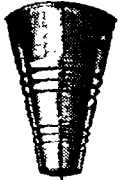
Il est très traditionnel d'utiliser en synthèse d'images une perspective classique conique. Nous avons essayé des perspectives qui nous ont semblé intéressantes soit par leur aspect historique, soit par leurs propriétés géométriques.

Des travaux ont déjà été menés en utilisant ces principes. A partir d'un modèle à base de systèmes de particules, une visualisation est possible en modifiant légèrement l'algorithme du z-buffer [BB92]. Cependant, ces techniques ne permettent que difficilement de rendre compte du volume des objets. Aussi nous sommes nous tournés vers une modélisation volumique de type arbre de construction avec visualisation par algorithme de tracé de rayons [Roe93].

2   Perspective classique

2.1   Un peu d'histoire

Rappelons tout d'abord les origines de la perspective que nous nommons *classique*, à savoir la perspective conique. Son objectif est le *réalisme*, c'est-à-dire la volonté de restituer des images planes aussi fidèles que possible à la réalité physique.

Cette technique n'a rien de neuf puisqu'elle provient de la technique dite *camera obscura* (la chambre noire). Une pièce sombre possède l'un de ses murs percé d'un trou permettant le passage de la lumière. Alors, sur le mur opposé au perçage se forme une image (inversée) de ce qui est visible par le perçage.

On obtient une perspective comparable en utilisant un miroir et en tournant le dos à la direction dans laquelle se trouve la scène à visualiser : il se forme sur le miroir une image plane par réflexion de la scène. Dans ce cas, la scène subit une inversion de sens gauche-droite.

Au $XV^{\text{ème}}$ siècle, Brunelleschi utilisa la technique du miroir, tandis qu'Alberti [Alb35] se servit de la *camera obscura* pour formaliser la trajectoire de la lumière et la formation de l'image. On peut d'ailleurs considérer que cette formalisation est la première description de l'algorithme du tracé de rayons[1].

A la fin du $XVI^{\text{ème}}$ siècle, Giambattista della Porta améliore la technique en installant des lentilles dans le perçage. L'utilisation de ces lentilles s'améliorera au fil des siècles. Ensuite, au $XVIII^{\text{ème}}$ siècle, la camera obscura va devenir portable et donc permettre la saisie de plus nombreuses scènes. Puis, en 1822, Nicéphore Niepce introduira une plaque sensible, inventant la photographie. Enfin, la synthèse d'images actuelle perpétue cette notion de réalisme photographique.

2.2   Principe de projection

Ceci nécessite la définition d'un certain nombre de paramètres qui sont par exemple :

– la position de l'oeil
– la position d'un point visé
– la direction du haut de l'image
– le demi-angle d'ouverture en largeur α
– le demi-angle d'ouverture en hauteur β

Les deux angles doivent être positifs et strictement inférieurs à $\frac{\pi}{2}$.

La figure 1 indique comment sont utilisés ces paramètres. L'écran est dans un plan orthogonal à la direction de visée (joignant l'oeil et le point visé), la direction du haut de l'image indique la rotation à effectuer autour de cet axe et les deux angles limitent ce plan à une portion rectangulaire. Afin d'éviter des artefacts (sphères apparaissant comme des ellipsoïdes), la résolution de l'image doit respecter les proportions des angles d'ouverture.

2.3   Lignes de fuite

Cette notion est importante dans l'analyse des peintures. Elle traduit une technique de construction picturale de la perspective.

Dans la réalisation d'un dessin en perspective, on commence par tracer une ligne d'horizon. Sur cette ligne d'horizon va se positionner ce que l'on nomme un point de fuite, vers lequel vont

---

1. Certains historiens de l'art estiment que la camera obscura fut déjà utilisée dans l'Antiquité
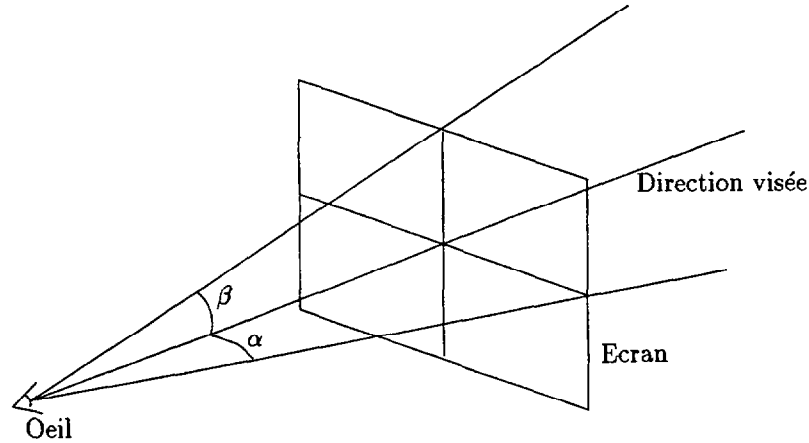
FIG. 1 - *Perspective classique*

converger toutes les lignes orthogonales au plan de projection. Ce sont ces lignes qui constituent les lignes de fuite.

3   Perspectives à oeil mobile

3.1   Analyse picturale

Ce type de perspective découle de l'analyse de la perspective en arête de poisson, perspective antique appelée *perspectiva naturalis*. Cette analyse a été faite à partir de peintures où l'espace se découpe de façon mesurable et régulière, par des poutres ou des carrelages orthogonaux au plan de projection.

Sur certaines de ces peintures, les lignes de fuite ne convergent pas vers un point de fuite unique mais vers un axe de fuite vertical occupant le centre de l'image. Selon les peintures, elles sont organisées sur cet axe de fuite de façon régulière ou irrégulière. On voit néanmoins toujours apparaître l'épine dorsale de l'arête de poisson [Pan87].

Nous avons retenu comme principe la mobilité verticale de l'oeil pour voir se dessiner cette épine dorsale. Ce déplacement de l'oeil est fonction de la position latérale du point de projection (tous les points de l'image situés sur une même colonne utilisent la même position de l'oeil).

3.2   Perspective en arête de poisson

Le déplacement vertical de l'oeil est ici proportionnel à l'écartement du point de l'image par rapport à l'axe central de fuite.

On constate que dans ce type de projection, une ligne horizontale est projetée sous forme d'un chevron, soit deux segments de droite symétriques par rapport à l'axe médian de l'écran.

La constante de proportionalité peut être choisie arbitrairement ; dans la plupart des cas, nous avons choisi une constante telle qu'une ligne occupant en perspective classique le milieu de l'écran (dans le sens horizontal) soit projetée en un chevron passant par les deux coins inférieurs de l'image.

Un autre type de perspective appelée perspective à faisceaux croisés utilise un principe similaire, à la différence près que les points se projetant en un point de l'écran constituent deux droites, symétriques par rapport au plan médian horizontal de l'écran : nous n'avons pas implanté cette perspective pour le moment.

3.3   Perspective hyperbolique

Dans ce cas, le déplacement est proportionnel à l'inverse de l'écartement par rapport à l'axe central de fuite.

Dans ce type de projection, une ligne horizontale se trouve projetée sous forme de deux branches d'hyperbole symétriques par rapport à l'axe central de l'image.

Afin d'éviter les dépassements de capacité informatiques, nous utilisons en fait la technique suivante : dans une zone voisine de l'axe central, les branches d'hyperbole sont jointes par un morceau de parabole. Ce raccordement est fait de façon continûment dérivable pour éviter les artefacts.

4   Perspectives à grand angle

Ainsi que ceci a été noté pour la perspective classique (et il en est de même pour les perspectives à oeil mobile), on ne peut utiliser une ouverture horizontale ou verticale supérieure à $\frac{\pi}{2}$, ce qui veut dire que le champ de vision est limité à un demi-espace.

Encore convient-il de noter que pour des valeurs d'angles importantes, on obtient des distorsions visuelles importantes. En particulier, les objets placés vers les bords de la pyramide de vision se trouvent artificiellement grandis.

Il nous est alors apparu intéressant de rechercher des modèles de projection qui permettent de représenter sur une vue plane une portion importante (voir totale) de l'espace.

4.1   Perspective stéréographique

La projection stéréographique permet de projeter une sphère privée de l'un de ses points sur un plan diamétral orthogonal à la droite joignant le point au centre de la sphère. Par analogie avec la sphère terrestre, on appelle *pôle nord* le point choisi et *plan équatorial* le plan de projection. Le principe est alors le suivant : soit S la sphère, N le pôle et P_E le plan équatorial, alors à tout point P de $S\backslash\{N\}$ est associé le point de P_E qui est l'intersection de la droite NP et du plan P_E (voir figure 2). Ainsi, dans une telle perspective, le pôle opposé (ou *pôle sud*)
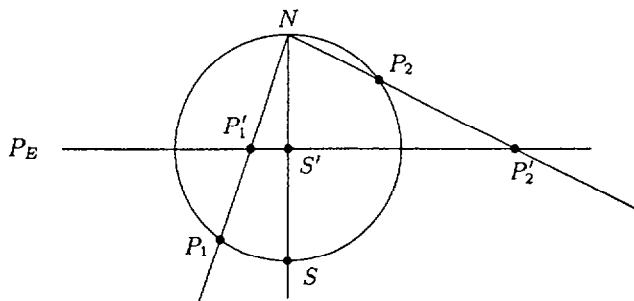
FIG. 2 - *Projection stéréographique*

se projette à l'origine du plan équatorial, les points de l'équateur sont invariants, les points de l'hémisphère nord (P_2 par exemple) se projettent à l'extérieur du cercle équatorial (en P_2'), les points de l'hémisphère sud se projettent à l'intérieur de ce cercle (voir P_1 et P_1'). D'autre part, les parallèles de la sphère se projettent sur des cercles, les méridiens se projettent sur des droites passant par l'origine du plan.

Une autre propriété intéressante de cette perspective est la conservation des angles : deux courbes tracées sur la sphère et s'intersectant en faisant un angle α sont projetées en deux courbes sur le plan s'intersectant avec le même angle α. Ceci se retrouve en particulier sur les parallèles et méridiens qui s'intersectent orthogonalement.

Le principe de la perspective stéréographique est alors le suivant : l'oeil se trouve au centre d'une sphère unitaire et la direction de visée détermine la position du pôle sud. Ainsi, le pôle nord se trouve "derrière" l'oeil. Tout rayon issu de l'oeil intersecte la sphère en un point I, et on projette ce point I stéréographiquement sur le plan équatorial en I'.

Ainsi, l'espace visible est l'espace entier privé de la direction du pôle nord. Dans la pratique, on interdit les directions dont l'angle avec la direction du pôle nord est supérieur à une valeur limite δ_{max}.

L'image obtenue par cette perspective est alors un disque, le centre de ce disque étant ce que l'on voit dans la direction principale de visée, et le cercle limite étant ce que l'on voit dans les directions limites. Comme nous calculons des images rectangulaires, nous avons pris la convention de centrer le disque représentant l'image dans ce rectangle, et de l'y rendre tangent. Les pixels se trouvant dans le rectangle en dehors du disque prennent par convention la couleur noire.

4.2 Perspective sphérique

La perspective stéréographique décrite au paragraphe précédent, ne permet pas la vue de l'espace entier. De plus, lorsque l'on prend des valeurs faibles de l'angle limite, le disque projeté prend des valeurs importantes de rayon, et les changements d'échelle nécessaires pour intégrer cette projection dans une image rectangulaire "compriment" les directions proches de la direction principale.

Nous avons donc essayé de remédier à ce phénomène en introduisant une perspective, dite *sphérique*, qui permet de projeter tout l'espace en limitant les compressions. Cette technique est d'ailleurs utilisée dans le domaine de l'architecture [Bon85], ainsi que par les Esquimaus pour effectuer la décoration intérieure des igloos. Le procédé OMNIMAX utilise une technique similaire pour effectuer des projections cinématographiques sur un écran hémisphérique (comme à la *Géode* de Paris) [Max83]. Ce principe est également connu dans le domaine de la photographie, puisque les objectifs de type *fish-eye* réalisent optiquement cette perspective sphérique (avec perception d'un demi-espace).

Le principe en est le suivant : l'oeil est encore situé au centre de la sphère S, et le plan de projection est tangent à cette sphère, orthogonal à la direction principale de visée. Le point de tangence est A, le point visé. Par tout point P de la sphère, on peut faire passer un plan Π contenant également le centre de la sphère (l'oeil) et le point A. Ce plan Π intersecte la sphère selon un arc de cercle C et le plan de projection selon une droite Δ (en fait, on ne retient que la demi-droite située du même côté que le point P). Alors, tous les points de la demi-droite $[S, P)$ se projettent au point p de Δ dont la distance à A est égale à la longueur de l'arc de cercle C. Le
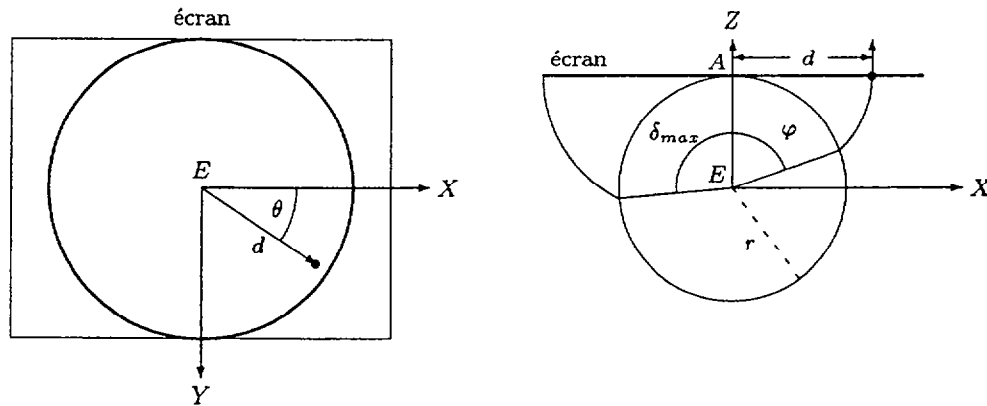
FIG. 3 - *Perspective sphérique*

principe ci-dessus est applicable pour un écran infini, mais dans la pratique, nous utilisons un écran fini. En fait, on utilise un angle d'ouverture δ_{max}, tel que le diamètre de l'écran soit égal à $\delta_{max}r$. Notons d'ailleurs que rien n'interdit d'avoir un angle d'ouverture supérieur à π. Dans ce cas, on trouve sur l'image une série de cercles centrés sur le centre de l'écran correspondant à ce qui est vu dans la direction opposée à la direction de visée (la distance au centre de l'écran

est alors un multiple impair de πr), et éventuellement une série de cercles correspondant à ce qui est vu dans la direction de visée (la distance est alors un multiple pair de πr).

5 Perspectives convergentes

5.1 Approche cubiste

Le Cubisme fut l'une des grandes ruptures de l'histoire de l'art dans les modèles de représentation depuis le Quattrocento. Braque et Picasso ont introduit dans le tableau l'équation espace-temps, attribuant à l'image le statut de surface démonstratrice de l'espace et du volume.

La réalité expérimentale du volume, perceptible uniquement par le mouvement, est traduite par le regroupement sur une même image d'une somme de points de vue différents. Le peintre tourne autour de son modèle et rend sur la toile la somme de ses impressions [Pau90].

Il est important de noter que Braque et Picasso refusaient de signer leurs toiles dans l'idée d'automatiser ce concept de représentation de l'espace. La vision cubiste devait accéder à une autonomie propre comme le modèle brunelleschien s'est affranchi de Brunelleschi et d'Alberti pour devenir une évidence en soi.

Du cubisme, nous avons retenu les principes suivant :

 - l'oeil tourne autour de l'objet,

 - l'image rendue regroupe la somme des points de vue.

Notons enfin que les perspectives dites "à oeil mobile" citées précédemment (perspective en arête de poisson et perspective hyperbolique) ne sont pas considérées comme appartenant à cette famille car il n'y a pas convergence des rayons en un point visé unique.

5.2 Perspective boulique

Dans ce type de perspective, c'est maintenant le point visé A qui se situe au centre d'une sphère S, et l'écran de projection est développé sur cette sphère.

On utilise un système de projection en latitude et longitude. Plus précisément, on associe à tout point de l'image une latitude et une longitude. Par convention, le centre de l'écran a une latitude et une longitude nulle, le bord droit de l'écran correspond à une longitude maximale, le bord gauche à l'opposé de cette longitude maximale, le bord supérieur à une latitude maximale et le bord inférieur à l'opposé de cette latitude maximale. Les angles de latitude et de longitude limites sont des paramètres de la projection.

Ensuite, pour un point de l'écran de projection, on calcule sa longitude et sa latitude par simple interpolation linéaire entre les longitudes et latitudes limites définies sur les bords de l'écran. L'oeil est alors placé sur la sphère au point défini par ces longitude et latitude. Les lignes horizontales de l'écran correspondent alors aux parallèles, les lignes verticales correspondant quant à elles aux méridiens.

On peut ainsi noter que ce type de perspective permet de voir un objet sous toutes ces faces sur une seule vue. Dans le cas où la latitude limite est supérieure à 90 degrés, on obtient des lignes horizontales de couleur uniforme, correspondant à la couleur vue en regardant d'un des pôles : en effet, pour une latitude multiple de 90 degrés, l'oeil est placé au pôle quelle que soit la longitude (la longitude n'est pas définie aux pôles).

Notons enfin un phénomène curieux avec cette perspective : si un objet est situé derrière le point visé (le centre de la sphère), il est vu à l'envers sur l'image. De même, si un objet est présent exactement au centre de la sphère, il est potentiellement visible sur tous les pixels de l'image (si aucun autre objet ne vient le masquer).

5.3 Perspective circulaire

Dans ce cas, l'oeil est mobile sur un arc de cercle et l'écran est développé sur une portion de cylindre coaxiale de cet arc. Deux angles servent à déterminer complétement cette perspective, un angle d'ouverture en largeur α (similaire à celui utilisé en perspective classique ou hyperbolique), et un angle d'enroulement δ_{enr}.
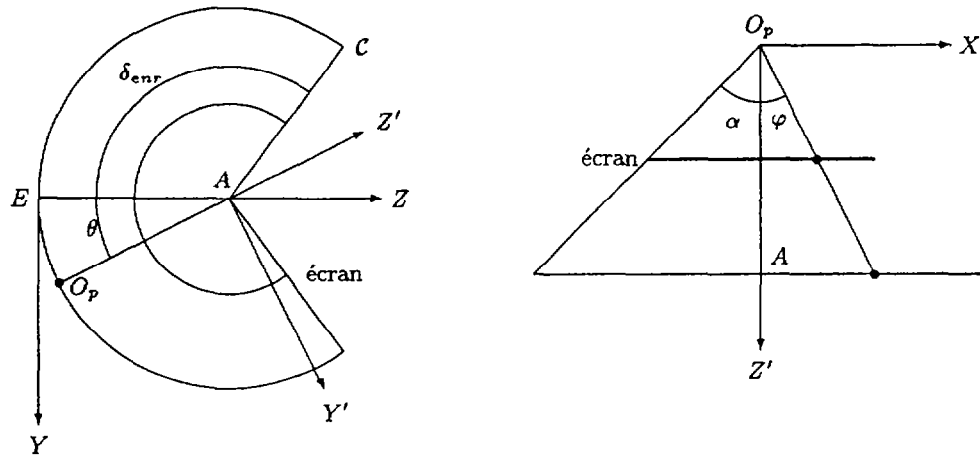
FIG. 4 - *Perspective circulaire*

Notons que pour des valeurs d'angle d'enroulement supérieures à 180 degrés, on observe une périodicité entre les lignes de l'image. D'autre part, de la même façon que pour la perspective boulique, un objet situé derrière le point visé apparaît inversé.

6   Implantation

D'un point de vue informatique, les diverses perspectives décrites précédemment sont implantées dans le logiciel de tracé de rayons yart développé à l'Ecole Nationale Supérieure des Mines de Saint-Etienne.

Ce logiciel, développé sur stations de travail UNIX, fait partie de l'environnement de synthèse d'image *Illumines* [BP89]. La base de cet environnement est un modeleur de type arbre de construction. On peut ainsi définir des primitives, des opérations booléennes entre objets (réunion, intersection ou différence) ainsi que des transformations affines appliquées sur les objets.

Ce logiciel est paramétrable de multiples façons. En particulier, il est possible d'utiliser n'importe lequel des principes de projection définis précédemment. Notons que le modeleur permet également de réaliser des interpolations entre les diverses perspectives, ceci permettant des effets d'animation.

Notons enfin que le logiciel de tracé de rayons ne doit utiliser aucune technique d'accélération basée sur la projection sur le plan de l'écran. En effet, les perspectives que nous utilisons rendent très difficile (voire impossible) la définition de projections de formes complexes sur l'écran. Notre logiciel utilise donc une technique basée sur la notion d'englobants, qui est plus générale.

Ces effets (perspectives multiples et interpolations) ont été utilisés pour la réalisation du film d'animation en images de synthèse "Castorexion". Pour illuster ces perspectives, nous avons calculé des images en utilisant la même scène, visualisée par tracé de rayons avec les perspectives décrites dans ce papier. La scène est composée de tores reconstituant les parallèles et méridiens terrestres. Dans le cas des perspectives à grand angle, l'oeil est placé au centre de la sphère. Pour les perspectives convergentes, c'est le point visé qui est au centre de la sphère.

Les photographies 1 et 2 montrent ces différentes images :

- photographie n° 1

    - en haut, à gauche : perspective classique
    - en haut, à droite : perspective en arête de poisson
    - en bas, à gauche : perspective hyperbolique

- en bas, à droite : perspective spherique
- photographie n° 2
  - en haut, à gauche : perspective stereographique (direction de visée selon l'axe polaire)
  - en haut, à droite : perspective stereographique (direction de visée selon un axe équatorial)
  - en bas, à gauche : perspective circulaire
  - en bas, à droite : perspective boulique

Références

[Alb35] Alberti (Leone Battista). – *De pictura*, 1435. Manuscrit en latin, traduction de Jean-Louis Schefer, 1992, Ed. Macula Dedale.

[BB92] Beigbeder (Michel) et Bourgoin (Véronique). – New perspectives for image synthesis. *In : COMPUGRAPHIC'S 92: Proceedings of the Second International Conference on Computational Graphics and Visualization Techniques*, pp. 44–52. – Lisbonne, Portugal, Décembre 1992.

[Bon85] Bonbon (Bernard). – *La géométrie sphérique tridimensionnelle.* – Paris, Eyrolles, 1985.

[Bou94] Bourgoin (Véronique). – *Synthèse en trois dimensions. Analyse et recherche de modèles de projection inspirés de concepts développés au cours de l'histoire de l'art.* – Thèse de PhD, Université Paris VIII/ATI, Décembre 1994.

[BP89] Beigbeder (Michel) et Péroche (Bernard). – Un système de synthèse d'images 3d : Illumines. *In : Journées UNIX Internationales de Grenoble*, pp. 265–276.

[Max83] Max (Nelson L.). – Computer graphics distortion for IMAX and OMNIMAX projection. *In : Nicograph '83 Proceedings*, pp. 137–159.

[Pan87] Panovski (Erwin). – *La perspective comme forme symbolique.* – Paris, Editions de Minuit, 1987.

[Pau90] Paulhan (Jean). – *La peinture cubiste.* – Paris, Folio Essai, 1990.

[Roe93] Roelens (Marc). – *Un environnement pour le tracé de rayons utilisant une modélisation par arbre de construction.* – Thèse de PhD, Ecole Nationale Supérieure des Mines de Saint-Etienne, Avril 1993.
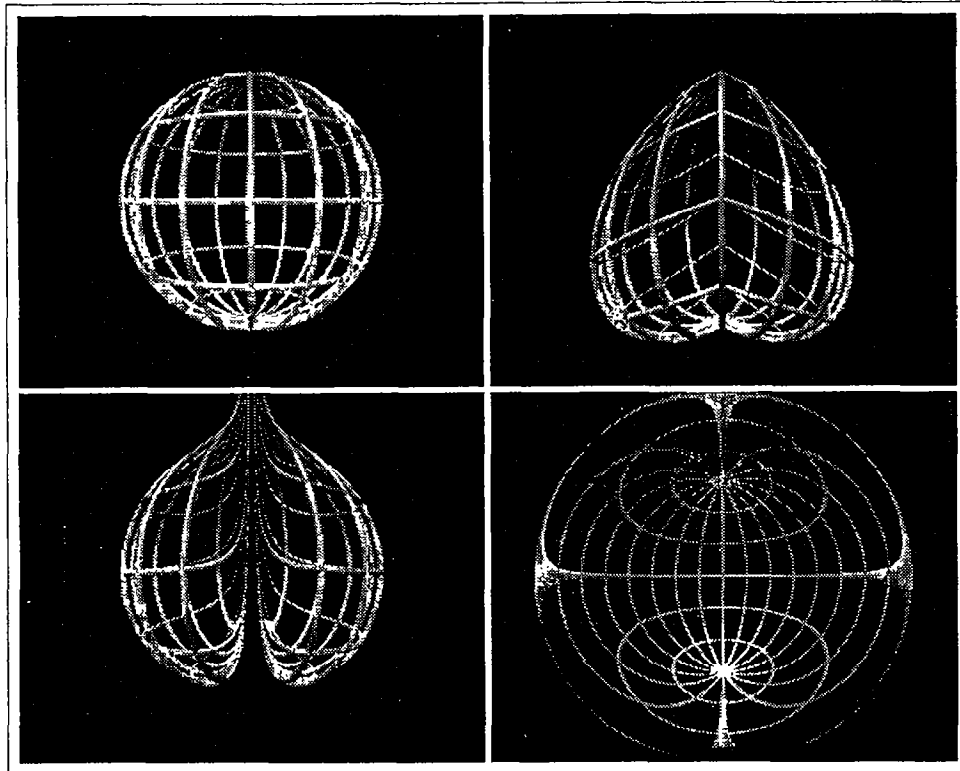
Fig. 5 - *Photographie n° 1*
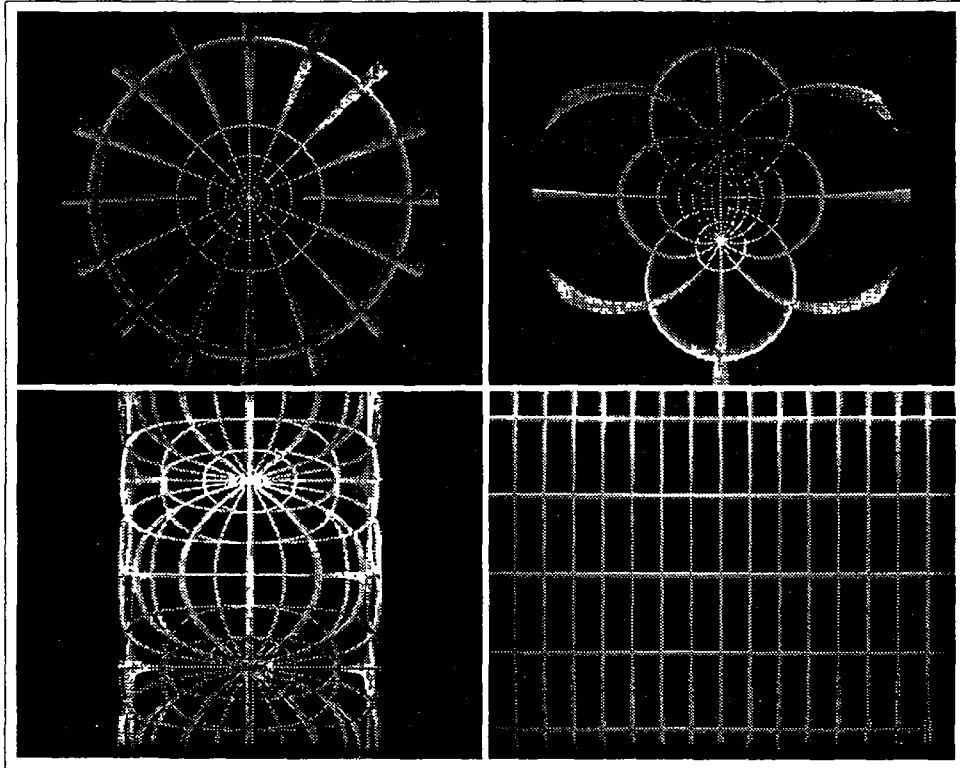
Fig. 6 - *Photographie n° 2*

THE FUTURE OF ART ON THE INTERNET

USING A GENETIC METAPHOR

By Anita Cheng

acheng@alize.msh-paris.fr

T he challenge of the unready and the unforeseen. The omnipresence of technology dares artists to find their voices using new media.

While there is plenty of discussion about ease of artwork distribution, the reproduction of existent art in 256 colors and the economic implications of digital copyright, the crucial question remains the nature of art.

As a practicing artist and interested spectator of biology, I've found the metaphor of artistic development as a genetic development intriguing and practical. Often, a change in the our angle of thought allows us to capitalize on the unexpected.

Art, like all other human activities will develop by trial, error, and inexorable serendipity independent of analysis. Yet reflection in situ offers an orienting chronicle of our hopes and fears. The questions raised by this paper are equivalent to the inscriptions of ancient cartographers who wrote, "Here be monsters" on the seductive blank spaces bordering their known world.

Facing a new technology can be disorienting for artists who have the habit of entrenching themselves in a medium to perfect it. Role models for approaching new technology include Marcel Duchamp and Andy Warhol. Along with the Bauhaus movement aligned towards the machine, Duchamp appropriated the ready-made and Warhol, the commercialized mass production of objects. They responded to the technology of production by kidnapping it and calling it art. Following their appropriating precedent, artists can sleep well, to paraphrase Duchamp: as artists, we define art.

Nam June Paik has also pioneered efforts to synthesize artistic and technological creativity. By presuming an interaction between viewer and work, he has highlighted the importance of interactively for the artist and audience alike. His optimistic view of technology tames the specter of machines to a friendly means of expression for everyone. New media requires a unique process of constant learning the latest developments and forgetting the obsolete. Everyday, artists exploring with technology glean anew what is useful to their work from past, present and future alike.

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

44
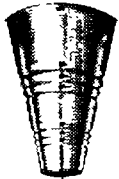
The metaphor of biological development for artistic development interests us on two levels: the first, recontextualizing the history of art, and the second, a different level, extrapolating the Internet as an organism. In conclusion we use this metaphor as a method to help us understand the topography of the present.

I. A Biological Metaphor for Art History

The activity of the world's artists can be compared with the activity of human genes. The development of aesthetics (ideals of beauty and interest) can be understood as localized specialization. Creative ideas can be thought of as mutations: constant, random, and essential for survival. Even genetic algorithms can be employed to analyze artistic processes.

" Localized specialization", as explained by Stephen Jay Gould in his book Ever Since Darwin, is the original term Darwin used to describe his theory of "descent with modification" (meaning progeny with adaptations). Darwin never accepted the theory of Social Darwinism (which coined the popular term and understanding of "evolution"), and insisted upon his theory of "descent with modification", which implies not an ascent from cellular simplicity towards a complex, super-organism, but an across-the-board genetic jerry-rigging for tactical survival, (jerry-rigging is a familiar concept for artists of new media).

As suggested by Darwin's genetic theory, localization is key to the development of dominance. An example is the unique, high incidence of porphyria in South Africa. This disease is thought to have driven King George III of England to madness and is possibly the root of the werewolf legend. According to Steve Jones in The Language of the Genes, "Porphyria is rare in Europe, but thirty thousand Afrikaners carry it. In Johannesburg, there are more carriers than in the whole of Holland. All descend from a single member of the small founding population which grew in numbers to produce today's Afrikaners."(2) Another illustration is Queen Victoria's descendants afflicted with hemophilia, which was inbred into European royalty. These are results of limiting the chromosomal variability in a population.

Such genetic localization is analogous to art on a local level. For all the diversity within a community, there usually emerges a gradual dominance of an artistic consensus defining a distinct style. Examples are: Florence in the 15th century Renaissance, Paris during the Impressionist movement, Vienna at the turn of the century, Berlin in the 1920's, and New York Abstract Expressionists from the 1940's to the 50's. An urban phenomenon, a concentration of working artists, a dominant aesthetic emerges.

Art historians spend a lot of time tracing these influences of individual artists and communities of artists as well as the impact of entire meetings of cultures. With this scholarship, an artistic family tree can look surprisingly similar to a tree traced by biological anthropologists who study both genetic and cultural influences. Artistic influences, so multiple and fragmen-

tary, mirror the complexity of chromosomal possibilities with an initial isolation necessary to develop uniqueness and the inexorable scattering revealing and creating diversity.

II. The Organism Internet

Employing the metaphor on another level, we assay the idea of the Internet as a biological organism. For its users, the development of Internet accelerates the redefinition of "local". Historically, aesthetic has been a local phenomenon-a cultural consensus and specialization of individuals-an extract of artistic agreement. With the Internet, the sheer speed of dissemination will affect how aesthetic consensus is reached. While many art historians remain interested in the connoisseurship of the individual hand of an artist (the "signature brush stroke" of Raphael for example), now more and more delve into cultural signifiers-art iconography-that is imbedded in the work of art or vice versa, i.e. the social context of an artist's work. Is a particular work of art a comment on a particular time or just a vehicle for that time? On the Internet, the artist's social context is redefined to include whomever he/she collaborates with, irrespective of geographic location.

The major danger associated with globalized, standardized systems is over-homogenization. A good example is found in the history of agricultural genetic engineering. Sophisticated breeding and cloning of grains and vegetables optimizing for marketable traits has developed into a loss of genetic diversity. Many farms and even entire countries use genetic clones for maximizing agricultural production. As described by Jones(3), a crisis for American grain farmers in the 1970's occurred when a sixth of the grain crop was destroyed by a virulent fungus. Because all the grain was of a single type, they shared a singular lack of resistance. After a frantic search, the farmers found a more ancient species of grain to breed a more resistant plant. As a result, there are now seed banks around the world to protect agricultural genetic diversity.

Being wary of homogenization, artists need to differentiate between the preservation of a unity of artistic ideals and the conservation of the environment of diversity. In the present day, artistic ideas are moving in synchronism with the rest of the world, changing so quickly that no aesthetic can dominate for very long. Instead of a traditional model in which an artistic movement grows out of a local community and reaches ascendancy by which others are judged, the acceleration of information transfer offered by the Internet can lead to a weakening diffusion and confusion of taste. The result could be a homogenous blandness, (American television, dubbed into many languages, is an example of global homogeneity in a creative form).

The solution is to recognize the necessity of diversity for ensuring artistic well-being. Comparing off-line and on-line art will reveal much about the personal meaning, apart from the media hype, that people find in this media. What will artists on the Internet look for: communicating without meeting people?

anonymous art? game art? Their mutual influence is already felt in many multi-media exhibits. In any form, once an artist presents his/her work to the public (fairly easy on the Internet), it is placed in context, judged by what had been created before, and influences the criteria for what comes after.

The Internet also offers a re-evaluation of the place of the individual. Biologists have argued that genes are purely interested in perpetuating more genes, thus the entire theory of survival of the fittest, genetic success, etc.. From this viewpoint, the organism itself is nearly inconsequential except as a risky chromosomal repository. Yet genes survive for individuals success (i.e. living long enough to reproduce), and cannot look into the future to predict and adjust to environments that do not yet exist. All evolution, genetic and artistic, is fortuitous, without master plan. Artists working though the Internet have a chance to work and create on a communal level, much as ants in a hive or bees in a colony. One example is JOE BLOW, whose "World's Longest Sentence" invited anyone on the Internet to contribute (as long as they didn't place a period) to the piece exhibited in a Soho gallery. The "World's Longest Sentence" introduces a new form of art, on a new scale of diffusion of creation, that sublimates the individual contributions to a collective work.

Another crucial way to preserve heterogeneity besides diversification is mutation. The key to artistic as well as genetic success lies in such accidents. For laymen, the word mutation conjures visions of arthritic, oversized lizards eating Tokyo. But this is really an artistic rather than scientific view. Genetically speaking, mutations are minute, constant, potentially lethal and yet essential for survival. The majority of mutations have no discernible effect whatsoever, occurring as natural errors in DNA replication. Some of these copying mistakes have a great impact on the success (i.e. local environmental adaptability) of the organism. Artistically speaking, creativity is mutation, modifying old ideas, objects, techniques and forms. To continue the analogy: development is random, improvement is relative, and success is based on the environment. Major concepts inherent in mutation theory are the primacy of chance and the expediency of existence-ideas also important to struggling artists everywhere.

Thus, considering so many variables when we discuss the future of art on the Internet, we can only consider the structure of digital transfer, not the variability and potential in individual artists. The potential remains in the individual. We won't want to follow the precedent of poor Dr. Frankenstein who is now confused with his creation.

III. Using the Metaphor
Advances in technology have exploded the number of our indirect experiences. After the evening news we say that we "saw" the event, but in our living rooms we are far too detached to claim actual experience. We communicate through telephone, fax, Internet. All is by proxy. We more and more rarely communicate directly and internally, with the multiplicity and chance of the shared moment.

Ironically, virtual reality has fully arrived for the individual, not for the environment, in that it has become easier than ever to fabricate our own persona in relationships, personal and professional. In relationships by E-mail we are never betrayed by the subtleties of tone of voice, expression, gesture, timing, appearance, touch or smell. We always get to finish what we say, and every interaction is self-edited. Yet these can be poisoned gifts. The reality is that we are increasingly alone in front of our terminals. We experience disengaged from the sources, which connotes a dependence and trust on people several informational generations removed from us: the few people actually experiencing, the translators into disseminating media and the digital catalogers and structuralists. The facility of these types of relationships will also affect artists.

A promise inherent in the Internet is the potential that art will be perceived more and more as its own medium, complete in development of process and interaction rather than as an elaborate obsession of objects. While modern art has been freed from representation of the physical world, it has curiously remained tied to physical existence. Acorporeality offers an alternative from the dogma of art for museums and the concept of the history of art and the lives of artists existing merely to produce objects with market value. Art has been chained for too long to the idea of production.

But like currency, which has become a phantom idea long untethered from any basis in reality (i.e. the gold standard), and yet remains an obsession in our society, now, art has its chance to flourish as the conjectural.

Art is most interesting when it has a profound connection between its medium and its content. It is a better idea to explore time-based art (consuming, using, and conscious of time), rather than painting clocks. In that sense, what kind of art will be comfortable on the net? Probably one that capitalizes on the nature of the net. The scale between individual and forum will change. No longer limited to the number of visitors to a museum, or other traditional temporal and geographical constraints (the criteria will be the ownership of computers and modems), the impact of individual contribution will be recalibrated in direct proportion to the number of people contributing. Conceivably, more contributions, less individual impact.

By viewing art on the Internet as a gigantic network, as wondrous, varied and uncontrollable as genetic activity, it can be seen as a global cadavre exquis (invented by the Surrealists, one artist would begin drawing a fantastical animal and fold over the paper, hiding all but the incomplete lines for the next artist, who would continue drawing the animal without seeing what was drawn before, etc.. The animal finally revealed from

head to foot was surely surreal). Digital art on the worldwide scale can also be seen as a conglomerate of minute individual contributions, too numerous for any individual to know all (The connecting lines will be software constraints and the strength of precedent).

Professor David E. Goldberg, Director at the Illinois Genetic Algorithms Laboratory (IlliGAL) unwittingly provides an idea for artists on their home web page by describing genetic algorithms as using equations and programmed procedures to mimic environ mental selection on variables generated by computer from artistic ideas. Thus the artist retains specificity of process while inviting chance operations done by the computer to guide the results.

The accessibility of the Internet will allow artists to select and recombine ideas in this way from many diverse sources. It will also advance non-linear learning and expression, advancing a democracy of collage, possibly redefining the hunting and gathering of information from a process to the goal. This non-liner pattern (explained as the concept of chance by John Cage and Merce Cunningham), represents our true daily experience of visual and sound "bytes". The popular use of "byte" taken from computer terminology, now applied to the torrent of information we marinate in, highlights a change in our way of seeing equal to the revolution of photography's arrest of the instant. As we channel surf in homes or surf on the Internet (switching rapidly from place to place, we prove that we are all experts in non-linear systems. We are connoisseurs of chaos.

With this new medium, I imagine art as global as weather patterns. A cadavre exquis beyond belief. Aesthetics will be as untraceable and unenforceable as the source of thunderstorms. A visual map of global artistic activity will resemble satellite footage of the world's meteorological activity. Art critics will function as weathermen. The content of art will be its medium (a fascinating paradox). Weather art.

References

(1) Gould, Stephen Jay. *Ever Since Darwin.* Norton Paperback. 1977. p. 34-45
(2) Jones, Steve. *The Language of the Genes.* Harpers Collins Publishers 1993. p. 150
(3) Ibid. p. 267

AN EMBODIED BODY OF WORK

By Christopher Csikszentmihályi

ccsiksze@ucsd.edu
http://jupiter.ucsd.edu/~csiklet/

A bstract

As technology and science continue to break down phenomena previously held to be whole, artists are presented with new methods and concepts with which to work. Life and intelligence, two areas currently under the scientific gaze, are of particular interest to the author. After giving a survey of his work, the author responds to criticism of the attempt to create intelligent entities.

Creating Entities

For the last four years I have been creating works of art which are aesthetic experiments in autonomy. These experiments investigate, or attempt to redefine, boundaries of humanity, nature, and technology.

The actual things I build, which I call either autonomous entities or familiars, generally have some sort of behavior within a particular context. It is in this relationship of behavior to context where I situate my art. In order to work in the medium of autonomous entities, I've been following and applying current research in such areas as artificial life, genetic algorithms, and neural networks.

I'm learning and using these tools not because I'm fascinated with these topics and the debates around them — though in fact I admit that I'm far more interested in these debates than, say, most literary or psychoanalytic theory. I'm not creating pieces using these tools because of the tolls' implications for our species, although they will have serious implications. I'm doing it because I think people and animals, autonomous entities I have contact with, are by far the most interesting things in the world. Far more interesting than Venice in three point perspective, than sculpted bodies without *animus*, than the interplay of abstract ideas within culture. As I see it, animals are the most interesting things in the universe, and I'll be lucky if I can create something with the complexity of an animal.

Of course, that's impossible now. I've been gambling, so far, five years of my life that certain developments in scientific research will eventually allow me to build truly complex entities, or, rather, to allow them to emerge from components which I build. Central to this notion are the strategies of Brooks (Steels & Brooks, 1995) and his ideas of emergent behavior and behavior-based robotics.

ISEA95 montréal

isea95@er.uqam.ca T : (514) 990-0229
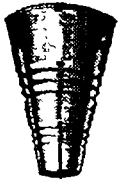
Embodied Works

I have created four autonomous entities to date. The first, I'll just describe quickly. It was initially intended to be a hollow vessel for various tasks, for behaviors. It certainly succeed in the hollow part. I thought that if I built a general manipulator, I could test many behaviors and metaphorical acts with it. It had many degrees of freedom, half a dozen sensors, half a dozen actuators, and lots, lots lots of inertia.

This robot became so complex, mechanically and in software, that I never really got a chance to give it behaviors; it just posed a lot. I also agree with Simon Penny that this approach, form first and behavior second, is wrong. After I realized that form should follow behavior, I titled the piece after a Kipling verse: **From coupler-flange to spindle guide I see thy hand o god, predestination in the stroke of yon connectin' rod... John Calvin might ha' forged the same.** I can personally attest to the fact that a long name can spice up boring material.

Moving on, I've built three pieces that deal with the issue of technology and social control. They form a series called "Products for a Dystopian Future." I'm using these imaginary devices in the same way that Ridley Scott used *Blade Runner* or George Orwell used *1984*; as editorial extensions of current cultural trends.

The first in this series, **hunter hunter**, explores an issue of consciousness and morality. In moral systems where even thinking about a sin is actually sinful (as in many religions), true virtue lies in orthopraxy: Consideration and thought are really potentials for evil. **hunter hunter**, a virtuous autonomous entity, has a simple binary moral code which punishes aggression with aggression. Using a sensor-servo loop, it can triangulate precisely on the location of a loud noise, process that noise through a simple Adeline neural-network to discern if the noise is a gun shot, and if so, fire a bullet (9mm is the inner-city option), back that exact direction.

Scopes Beacon is a site specific installation for placement under the Clarence Darrow memorial bridge on Chicago's South Side. It's a technology for a future where evolution is no longer allowed to be taught. It contains genetic entities, strings of ASCII data, which are competing for survival in an environment that selects these text bits for their similarity to successive lines from Genesis. So, of forty or so initially random strings, the environment selected two strings with the letters closest to "In the beginning the world was without form and ...." These two strings were genetically spliced, randomly, along their length, with a tiny bit of random change of characters, to create forty new text strings. Of these forty offspring, the two which were closest to the target sentence were selected, bred, etc. The sentence would be spelled within about sixty generations, typically. Then the environment would change to demand "and god did move...." The results of each generation were "printed" to an FM digital radio and an LCD screen, disseminating a proof of the existence of evolution.

The final piece is a work in progress, in an early stage of development. It is a product for an earth with drastically less biodiversity. As species lose both their source of food and their natural predators, unpredictable, complex changes occur within their gene pool and population levels, usually leading to further changes in the environment and even to extinction. What better solution (ahem) than a technology which assures both natural predation and a constant supply of food?

This piece that I'm starting works with a specific ant species living in a barren artificial environment. It alternates between both feeding and nurturing the ants at a rate similar to what would occur in their natural environment, and killing them at the rate their predators would in a natural environment.

It should be clear from these works that it is not the mechanism, the movement, or the pure physical form of these pieces which is important.

What *is* important to these pieces is their situation in a part of culture, their transformation of that part of culture, and the behaviors by which they make that transformation.

Why bother?

We are autonomous entities. The idea of creating new autonomous entities has been floating around for millennia. The first self-regulating (cybernetic) systems on record, variations on the flush toilet, were created in ancient Greece. The complex automata of the 18th and 19th centuries (simulated ducks, chess playing Turks) expressed a desire to mimic living beings in four dimensions. Observers of these did not doubt that technology could, eventually, simulate living beings; many philosophers viewed (and still do) animals as relatively simple machines. Paralleling these technological investigations were moral ones: The golem and Frankenstein's monster are two popular examples of moral lessons which use artificial entities.

Critics of the notion of creating artificial entities fall into two camps. There are those that doubt it can be done on a practical level, and those that object to the idea of even trying it. The former have their points, and I personally hope they are wrong. The latter are often trying to preserve an organic or an essentialist view of life; again, time will tell.

One novel argument against even trying to create artificial entities comes from Jean Baudrillard, presented in his treatise "Xerox and Infinity" from "The Transparency of Evil." Baudrillard's overall body of work is important enough that it's worth investigating this argument.

Baudrillard attempts to contextualize efforts at creating artificial intelligence. He doesn't pull his punches; the first sentence of "Xerox and Infinity" reads:

"If men create intelligent machines, or fantasize about them, it is either because they secretly despair of their own

49

intelligence or because they are in danger of succumbing to the
weight of a monstrous and useless intelligence which they seek
to exorcise by transferring it to machines,
where they can play with it and make fun of it."
Later:
"If men dream of machines that are unique, that are
endowed with genius, it is because they despair of their own
uniqueness, or because they prefer to do without it — to enjoy it
by proxy, so to speak, thanks to machines."

It is tempting to initially dismiss these arguments; we are, most of us at ISEA, already converted. And, in fact, Baudrillard works off of many false assumptions: He talks repeatedly about "the great progress that his been made in artificial intelligence." I, for one, would like to know what he's referring to — perhaps he's been reading Minsky. He ignores aspects of emergent behavior or emergent computation when he says that "Even the most intelligent machines can never be more than they are..." But his thesis does raise a new and important question: Are we sure that we are not attempting to create artificial intelligence so as to, in some way, yield the responsibility for our own?

Luckily, we don't have to look far to find good reasons for creating intelligent entities that are not human. Baudrillard tacitly assumes that such an intelligence would be human-like. If, on the other hand, intelligences that were different from human intelligence were invented, we would have the potential to learn from them. In fact, we already do — deceptive dolphins and warring gorillas are two species we've already learned a lot from. There are thousands more on this planet, and potentially a lot more to come.

There's another example of intelligent, autonomous entities which serve humans rather than dehumanize them; monsters, as heard in myth, seen in painting, and sensed under the bed. As has often been said, monsters are cultural tools for mapping the boundary between what a culture thinks is human and what is not. Monsters de-monstrate. Ambroise Paré built a taxonomy roughly divided between monsters and prodigies. Isidore of Seville defined monsters in two categories, monere and monare, monstrations or warnings of divine will. It was not until the modern era that historians of religion were able to ask the more semantically fundamental questions "Of what were monsters monstrations? and whom were they intended to warn?" (White, 1991)

A culture's monsters are a test of what that culture hopes to differentiate itself from. As Donna Haraway points out, "The Centaurs and Amazons of ancient Greece established the limits of the centered polis of the Greek male by their disruption of marriage and boundary pollutions of the warrior with animality and woman." (Haraway, 1991) I doubt that angels, God, centaurs, rakshasas, and bodhisattvas dehumanize us; In fact, it is within the cracks of all these artificial, if fictional, intelligent entities that many definitions of our species may be found.

Baudrillard, who perceives AI research as an abdication of personal responsibility to one's own intelligence, ignores the many useful and poetic functions artificial intelligences might fulfill. The questions of language and meaning semioticians wrestle with may be impossible to solve because we have only one data set, one history. Artificial life, too, can be used to illuminate some of the central questions of the human experience. Questions from biology like the origins of life, or the mechanism of autopoiesis, may well be impossible to piece together from the fossil record. Surely a definition of life, language, or intelligence can be more easily generalized from multiple examples?

Baudrillard says that "All kinds of spare parts are available to help humans achieve gratification, but none has yet been devised that could take pleasure in their stead." Why would an autonomous intelligence take pleasure in our stead? Is this like immigrants taking jobs? Does he think there is a limited amount of pleasure in the universe? Is he somehow jealous of the possibility that something else could achieve pleasure?

In fact, Baudrillard's argument, when zoomed out a little, is swept away by what Daniel Dennet calls Darwin's "universal acid". To imagine that humans are the end of evolution is just plain uninformed. It is likely that within a century or two, intelligences will be created by human endeavor. I, for both moral and aesthetic reasons, want to ensure that these intelligences are not in the nose cone of a smart missile, or used to maximize profit for a few corporations. Baudrillard thinks it's silly to attempt to add to the net amount of intelligence on the planet. I think that intelligence, diverse intelligence, is something we could all use more of.

References

Baudrillard, Jean (1993). *The Transparency of Evil: Essays on Extreme Phenomena.* New York, NY: Verso.

Brooks, R. (1995). *The Artificial Life Route to Artificial Intelligence: Building Embodied, Situated Agents.* Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Haraway, Donna (1991). *Simians, Cyborgs, and Women: The Reinvention of Nature .* London, UK: Free Association.

White, David Gordon (1991). *Myths of the Dog-Man.* Chicago: University of Chicago Press.
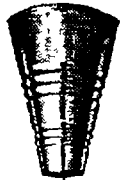
OSMOSE

NOTES ON BEING IN IMMERSIVE VIRTUAL SPACE

By Char Davies

charlotte_davies@softimage.com

*.,.through their "immensity" these two kinds of space
- the space of intimacy and world space-blend.
When human solitude deepens, then the two immensities
touch and become identical.*

*,..by changing space, by leaving the space
of one's usual sensibilities,
one enters into communication with a space
that is psychically innovating...
For we do not change place,
we change our nature.*

Gaston Bachelard, *The Poetics of Space*, 1964

T hese notes have been developed during the process of conceptualizing and realizing the immersive virtual space, OSMOSE. As theory and practice, OSMOSE addresses a number of aspects related to the medium of "virtual reality" that are often overlooked: these involve the very essence of the medium, in terms of immersive spatiality and the role of the body within its domain. In OSMOSE, I have set out to create a work which expresses an emotional and visionary content particular to my own practice as an artist, and in so doing demonstrate the medium's potential to enable us to experience our place in the world afresh, or to paraphrase Bachelard, *to change space in order to change our nature*. Now that OSMOSE is out in the world, I have been able to incorporate into these notes certain insights gained from public response to the work.

OSMOSE / as technology and installation

OSMOSE is an interactive immersive virtual environment, utilizing 3D computer graphics and spatialized sound. The core experience is that of the "immersant", accessed via a stereoscopic head mounted display and a motion capture vest with breathing and balance sensors. A secondary aspect of OSMOSE is the audience's vicarious witnessing of each immersant's journey in real-time, via stereoscopic video projection and headphones. The installation at the Musée d'art contemporain (Aug. 19 - Oct. 1, 1995) consists of a dark quiet space and two large-scale openings of light facing each other, one horizontal, the other vertical, one the stereoscopic video projection, the other a shadow-silhouette of the immersant. This silhouette serves to poeticize the immersant's body gestures (along with head mount, cables etc), allowing privacy while drawing the audience's attention to the role of the immersant's body as a medium for communicating experience. OSMOSE was created with

Softimage 3D and custom VR software and runs on a Silicon Graphics parallel processing Onyx computer. Information on the creative process and team members is included further along in this text.

OSMOSE / as content

Simply stated, OSMOSE is about "being-in-the-world" in its most profound sense, i.e. our subjective experience as sentient, embodied, incarnate, living beings embedded in a spatially-enveloping living flowing world. Osmosis: a biological process involving passage from one side of a membrane to another. *Osmosis as metaphor: transcendence of difference through mutual absorption, dissolution of boundaries between inner and outer, intermingling of self and world, longing for the Other.* OSMOSE as an artwork is motivated by the desire to heal the Cartesian split between mind and body, subject and object, which has shaped our cultural values and contributed to our dominating and alienated stance towards life. In this context, OSMOSE seeks to re-sensitize, reconnecting mind, body and world.

There are a dozen virtual world-spaces within OSMOSE. Most of these, with the exception of an introductory Cartesian Grid, are based on archetypal elements of Nature: they include a Forest, Leaf, Clearing, Pond, Abyss, Subterranean Earth, and Cloud. Two other worlds, Code (containing 40,000 lines of custom software used to create the work) and Text (my own writings and excerpts of relevant philosophical and poetic texts on nature and technology) function as a substratum and superstratum parenthesizing the work. All of these worlds connect to one another in various ways. There is also a Lifeworld, symbolizing life/Earth itself, which appears when it is time to bring the immersive session gently to a close.

A simplified schematic of OSMOSE:

Text
*
*
Cloud
*
Cartesian Grid
>>> * Forest * Clearing * Tree * Leaf * >>>
Lifeworld
* *
Subterranean Earth Pond
* *
*
Abyss
*
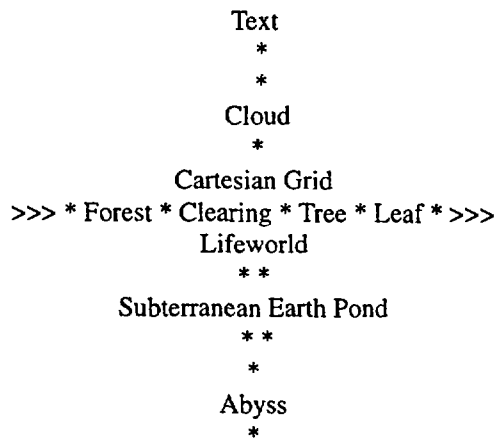
OSMOSE / as a visual and aural aesthetic

The visual aesthetic of OSMOSE is soft, semi-transparent and ambiguous, consisting of luminous particles and translucent textures. I have developed this aesthetic over years of my own art practice, first through painting and then through making still images with Softimage 3D software. Most of the various world-spaces of OSMOSE are represented poetically, in terms of their implicit, interior qualities rather than phenomenal outward appearances. Representation fluctuates between figuration and abstraction, and figure/ground relationships are ambiguous to allow for open-ended emotionally-associative interpretations, rather than superficial illustration. Temporal transitions between world-spaces are long-lasting and subtle, creating fluid, spatially-complex, non-Cartesian relationships between worlds. All of these elements work together to loosen the mind's rational hold, dissolving the subject/object dichotomy, and in a dream-like way shifting the immersant's mode of experience from the everyday bias of eyesight to one that resonates deeper within the body.

The sound in OSMOSE is spatialized and interactive in real-time, responding to changes in the immersant's location, direction and speed. In a lay person's terms (not being a musician) my goal was to have sound that was neither literal nor illustrational, musical nor sound effect-like, but which was, in equivalence to the visual aesthetic, aurally ambiguous. I also wanted the sound to be hauntingly emotional rather than abstract or chaotic, which provided a challenge to the composer and designer working with me who were faced with the challenge of spatially and temporally shaping a composition that would change in real-time according to the immersant's interaction. All the sounds in OSMOSE are derived from samplings of a single male and female voice, a compositional decision which subliminally re-affirms the presence of the human body within the work. The significance of sound in the design and experience of virtual spaces is often underestimated: in OSMOSE, sound and imagery have become one, amplifying each other.

OSMOSE / as an interactive aesthetic

The interactive aesthetic or user interface of OSMOSE is body-centered. It is based on the intuitive, instinctual, visceral processes of breathing and balance. Through breath, the immersant is able to rise and fall in space with subtlety and precision. By altering the centre of balance, the immersant is able to change direction. The use of these methods, inspired by my own experiences of scuba diving, has many implications for the work as a whole, both on an instrumental level and in terms of metaphor. They are intended to re-affirm the role of the living physical body in immersive virtual space, as subjective experiential ground. They are also intended to act as channels of communion rather than tools of control. As in meditation, the practice of following one's breath and being centered in balance opens up a profound way of relating to the world (Drew Leder, *The Absent Body):*

Breath is a potent tool of overcoming dualism. Physiologically, respiration stands at the very threshold of

the ecstatic and visceral, the voluntary and the involuntary... inside and outside, self and Other are relativized, porous, each time one takes a breath. The air is constantly transgressing boundaries, sustaining life through inter-connection. One may have spent years studying the mystics on the unreality of dualism and this remain an abstract idea. But in following breath, one begins to embody this truth. p178

Balance is a question of centering. When we are properly centered, our experience of Being is in equilibrium. Being well-centered, we can encounter other beings in a more open, receptive way. Finding our center is a necessary step in the development of our ontological capacity to open ourselves to the larger measure of being and to encounter other beings with a presence that is deeply responsive. Coming home to our true center of being, we can begin to relax our egological defences, and begin to experience things outside the subject/object polarization. Being well-centered in Being is therefore at the very root of Gelassenheil, that "way of being" in virtue of which according to Heidegger, we are going to be most favoured with a deeper experience of beings, and the presencing of Being as such. p274

OSMOSE / as a medium of expression

The desire to express a particular content preceded all else in OSMOSE. The themes in OSMOSE, related to archetypal aspects of nature and the body and enveloping luminous space, have been the focus of my artistic practice - through painting and 3D software - for more than fifteen years. My background as painter, i.e. thinking in terms of simultaneous relationships rather than linear narrative, of ambiguous semi-transparent figure/ground gestalts rather than literal illustration has profoundly influenced OSMOSE's visual aesthetic. In the mid-80's I abandoned painting when the two-dimensional picture plane became a limitation for expressing my ideas, and became involved with 3D computer graphics because of its potential for creation in virtual three-dimensional space. Between 1990 and 1993, I produced a series of still images with Softimage 3D software, titled *The Interior Body* series, comprised of images called *Leaf, Root, Seed, Bloom, Stream*, etc, all metaphorical themes which reoccur in OSMOSE. Although these images were created in 3D space they were output as flat 2D stills. It was therefore a natural progression for me to move into VR or what I prefer to call "immersive virtual space" (since the term VR is so overused it doesn't mean anything anymore) because of its spatially-enveloping quality. The museum installation includes a painting from 1985 which was an attempt to represent luminous enveloping space. In OSMOSE, a decade later, I have found the medium capable of expressing my artistic vision.

OSMOSE / as space

The medium of OSMOSE is immersive virtual space. This is not merely a conceptual space but space in the sense of being extended, three-dimensional, and enveloping. At present, full access to this space is possible only via a stereoscopic head-mounted display. Although such encumberment is disparaged by many, as a diver who dons a tank of air, mask, fins, weights and buoyancy-control vest to access oceanic space, the wearing of a Head Mount is to me a minor inconvenience because it offers access to another kind of space. Immersive virtual space is a new space to which we now have bodily access. I think of it as a spatial-temporal arena, where mental models or constructs of the world can be given virtual form and then kinaesthetically, synaesthetically explored through full-body immersion and interaction. No other space allows this, no other medium of human expression. As humans, we have access to very few kinds of physical space. I can think of only terrestrial space and oceanic space. (Outer space isn't accessible to most of us, and cyberspace isn't relevant to this discussion because it is not bodily-accessible unless it takes on the qualities of immersive virtual space.)

At present, most people rely on their everyday experience of terrestrial space when it comes to designing virtual environments. As a result, virtual worlds are filled with hard-edged-solid-objects-in-empty-space, horizontal floors and walls, etc. Similarly, interface/navigational methods are based on walking, bicycling, driving with joysticks etc. Not only does this approach to the medium severely limit its potential, but it tends to uphold the status quo, conveying dominant Western cultural values.

OSMOSE has been influenced by my experience as a diver of deep oceanic space. Oceanic space, in comparison to terrestrial, is not empty but enveloping and sensuous, not horizontal but vertical, often beyond measuring. At depths of 100-200 ft of water over a 6000 ft abyss, the ocean takes on the quality of pure limitless space, fluid, enveloping, interior, embryonic. Distinctions between near/far and inside/out become blurred: a luminous speck can be a distant pelagic or rod misfiring in the retina of one's own eye. Divers do not walk or drive or manipulate joysticks, but float, free from gravity, using subtleties of breath and balance to ascend and descend. Buoyancy control is an essential skill that enables divers to move subtlely and sensitively. When this skill is mastered and the diver is able to hover motionlessly, suspended, it is an extraordinarily mind-altering experience. Two years ago I was diving above a blue hole in the Bahamas, floating between layers of lacy white cobweb-like algae and warm ochre gas-clouds: I lost all sense of where I was, whether I was inside a dream, or was having a drug-induced hallucination, or whether I had become a bird flying through heaven. Diving offers a means of changing space.

There is another physical space, not exterior but interior, which bears resemblance and relevance to immersive virtual space. This is the subjectively-felt space of the self, i.e. the interior space into which our minds and visceral organs project the

immaterial imagery of dreams. All human imagery arises from a single psycho-physiological source, namely the human imagination grounded in the material body (see Campbell). Although our culture has drastically separated exterior from interior, and valued the objective over the subjective, poets such as Rainer Maria Rilke and the philosopher Gaston Bachelard spent their lives re-affirming the inter-relationship, the interplay between exterior physical world-space and the interior spiritual space of self. The Buddhist and Neo-Confucian traditions of "forming one body with all things" otherwise known as expansive awareness also explore this relationship. (see Leder, and Callicott) My own desire to heal the schism between outer and inner is probably based on an experience I had twenty years ago, in a field at dusk, when for an instant the boundaries of my mind expanded to merge with the horizon, creating of sense of union between self and world that I have been seeking ever since. Both of these spaces, inner and outer, merge osmotically through the body.

OSMOSE / as body

It is impossible to speak of immersive virtual space or of enveloping physical space without speaking of the body, for the very experience of being spatially-enveloped depends on having a centre-of-being. And for us, as incarnate beings, this centre is the body. It is only through the living organic body that we can access the world. It is only through the body that we can transcend the body. My concerns with the body in immersive virtual space are not with its objective representation, i.e. how it is perceived by others, but rather how the immersant's body is subjectively-felt, how the immersant senses his or her own interior body as a centre-of-being within immersive space. By its very nature, immersive virtual space invites full-body kinaesthetic exploration, leading to deeper engagement than that involving just the mind. Immersion in OSMOSE is deliberately solitary for the goal is not to connect the immersant to other people but to the depths of his or her own self.

The paradox of experiencing immersive virtual space is that it feels both embodied and disembodied at the same time. In OSMOSE, for a variety of reasons, this paradox is amplified. After a certain period of immersion (usually about ten minutes), various conditions related to imagery, luminosity, semi-transparency, spatial ambiguity, slow subtle transitions between worlds, evocative resonant sounds, along with solitude, deep breathing and maintaining a centre of balance within the space all combine to create a suspended dreamlike state in the immersant's mind, which is experienced as a distinct shift of awareness as he or she lets go and boundaries between inner, outer, mind, body, space and time are dissolved.

I believe that it is only through the body, through body-centered interfaces, that we can truly access this space and explore its potential. I am also aware that recognition of the body's role in immersive virtual space may be inherently female. The whole notion of space as enveloping and womblike around a body at its centre is probably feminine rather than masculine, as is the desire to use this technology to re-sensitize rather than de-sensitize, to re-affirm life itself.

OSMOSE / as immateriality and temporality

Another key aspect of immersive virtual space is its immateriality. By this, I mean its capacity to contain immaterial forms, i.e. within this space it is possible to create three-dimensionally embodied forms which cannot exist physically in the real world. This obviously differs from two-dimensional media such as painting and photography, but also significantly from sculpture in that these forms, even when extending through virtual three-dimensional space, have no solidity, no materiality and it is possible to float right through them. In OSMOSE, this immaterial quality is pushed even further through its visual aesthetic which relies on semi-transparency to create spatial ambiguity. In addition, emphasis has been placed on representing aspects of Nature which we cannot normally see instead of mimetically reproducing surface appearances of solid objects already existing in the real world.

OSMOSE also encompasses a temporal dimension. By this I do not mean the obvious aspects of real-time interaction or movement within the space by the immersant or other entities but transformation. OSMOSE is concerned with the transformative aspect of life or Nature, i.e. life as an irrepressible current, flowing through various phases of life and death, and the transformation of light to darkness through cycles of dawn, day dusk and night. This notion of fluidity is essential not only to our subjective experience of being, but to life itself.

In OSMOSE, the effect of these qualities on the immersant is strangely euphoric, and increases the paradoxical sense of embodiment/disembodiment. For me, the categories of immaterial and material, mind and matter, body and spirit are all osmotically interlinked: immersive virtual space seems to be the most effective medium for exploring their connections.

OSMOSE / as nature

It is important to address here the relationship in OSMOSE between Nature and technology. In this context, by Nature I mean that which is not-man-made, i.e. the living flowing world around us, not the cement and pavement and plastic and steel that surround us in cities but earth and rivers and forests and fields. These have a deeply life-affirming power, because they are not-us and are the source from which we came and to which (cyborgs excepted) we will return. As technology, OSMOSE does not seek to replace Nature. Immersion in OSMOSE is not a replacement for walking in the woods. What OSMOSE can do however, like all art, is filter human experience of Nature through an artist's vision, distilling or amplifying certain aspects, so that people who experience OSMOSE can see freshly, can become re-sensitized so the next time they walk in the woods, they may experience it more fully, more openly. In reminding people of the extraordinariness of simply being alive, OSMOSE may inspire people to protect those woods as well. OSMOSE is not a replacement for Nature, but a spatial-temporal arena we can perhaps re-learn how to be.

OSMOSE / as creative process

The making of OSMOSE has been a team effort. It could not have been created by one person working alone. Although its themes and aesthetic have evolved over more than a decade of solitary painting and making images with Softimage software, I actually began writing about OSMOSE two years ago, working out the concept, the various worlds, the interactive approach etc, before getting a team involved. Georges Mauro who is responsible for the graphics in OSMOSE, is a classically trained animator who has worked with me and on Softimage for many years and who has come to understand my aesthetic and painterly approach to creation. John Harrison, who wrote all the custom virtual-reality software for OSMOSE, joined the Visual Research team a year and a half ago and brought considerable expertise as well as a sincere desire to work towards an artist's vision. Ground work and testing of various techniques took place over a year, while actual world-building and immersion in the HMD began only six months ago. In May, Dorota Blaszczak came from Poland to design and program the sound. She was joined soon after by Rick Bidlack from Seattle who composed and programmed all the music. They worked closely together, with little time, lots of pressure and off-the-shelf equipment, to translate my vision into sound.

Once we were able to become immersed in the worlds, my attempts at pre-scripting interactive possibilities were superseded by responding in situ to the work as it progressed. In this way, the creative process itself became very much like painting, a combination of planning and serendipity, where a single change affects everything else, and all world-spaces had to be constantly reworked in relation to each other, so that the entire work evolved as a whole. I consider OSMOSE as a work-in-progress and we have many uncharted areas to explore.

OSMOSE / in context

The context in which OSMOSE is situated is of prime importance. Our culture's privileging of mind over matter has contributed to devaluation of the body, as well as women and various "others". Historically, this world-view has contributed to the plundering of non-human beings and their habitats as objects for human use: the negative implications of this stance are becoming ever more apparent as evidence of world-wide environmental degradation increases. As "unspoiled" unmediated Nature recedes from our lives through urbanization of human populations and habitat destruction, there are signs that while the biological consequences for many species (including ourselves) are devastating the effects may be psychologically damaging as well. This premise known as the Biophilia Hypothesis (developed by the Harvard biologist Edward O Wilson) suggests that the increasing loss of access to Nature - as a source of human spirituality - may prove to be at the root of our collective psyche's deepest wounds.

As a culture, we are on the cusp of a new technological paradigm: the emergence of cyberspace as a means of global communication will alter our world significantly. We must however be wary: as a realm ruled by mind, cyberspace is the epitome of Cartesian desire, in that it enables us to create worlds where we have total control, where the presence of aging mortal flesh and animal-others is denied, and where there is, to paraphrase Laurie Anderson, no "dirt". Popular and media-hyped expectations of "virtual reality" reflect a longing to transcend the limitations of our physical surroundings. The long-term effect may be to seduce us to turn away en masse from our bodies and Nature, enchanted and distracted while we continue wasting the resources that sustain us and erasing the futures of countless other-beings on the Earth. This desire to escape the body may be symptomatic of pathological denial of our materiality and mortality. For me, it is tempting to suggest that belief in artificial intelligence and silicon as a means of delivery into immortal omni-potence on some other Eden is a but testosterone-induced dream...

Many forms of digital media offer evidence of these dominant cultural values. In its most prevalent form, virtual reality can be considered to be "a literal re-enactment of Cartesian ontology" (see Coyne, Gigliotti) representing the human subject as an omnipotent and isolated view-point, "an island of consciousness in a sea of insensate matter" (see Leder) maneuvering in empty space and probing objects with an acquisitive hand (see Tikka). Most 3D graphic techniques are laden with conventions such as Cartesian space which have been inherited from the Western scientific and military paradigm. The conventional 3D computer graphic aesthetic relies on polygonal textured-mapped models - "hard-edged solid objects in empty space" - a combination of low-level mimetic realism with emphasis on surface appearance, Cartesian space and Renaissance perspective, all of which reinforce a dualist way of seeing the world in terms of mastery and control (see Jones, Wright). Commercial computer games approach interactivity as a means of empowering the human subject, most often male (see Cornwall). These approaches to digital media reflect our culture's Cartesian worldview, with its tendency to reduce the world and its myriad of inhabitants to "standing-reserve" for human consumption (see Heidegger). In this context, conventional use and consumption of the technology is increasing our estrangement from Nature, and the de-sacralization of our world. OSMOSE approaches these issues by using immersive virtual space as a means of *resisting* the trajectory described above, as a way of acting against the increasing biological, ecological, and spiritual impoverishment of our age.

OSMOSE / in summary

The desire to re-affirm our essential physical and spiritual inter-connectedness, to *heal* the estrangement between ourselves and Nature is the germinal force behind OSMOSE. If those who enter OSMOSE can experience, however fleetingly or ephemerally, a deep embodied sense of self, of being alive in-fluid-relationship with an enveloping world, returning to the real world with greater serenity and sensitivity, then OSMOSE will have achieved its most fundamental goal. Instrumentally, this goal has involved developing the visual, aural and interactive aesthetic capable of expressing these ideas, and in so doing, dem-

onstrate the potential of immersive virtual space as a medium for kinaesthetic exploration of ideas and feelings about our place as embodied sentient beings in a living flowing world. Speaking now from experience of other people's responses to the work, it seems that in certain ways OSMOSE is succeeding: immersion within it is experienced as liberating and exhilarating, and for some, even spiritual.

References

Bachelard, Gaston, *The Poetics of Space*, Beacon Press 1969.
Bishop, Peter, *Greening of Psychology: Vegetable World in Myth, Dream and Healing, Spring* 1990.
Callicott, J.. Baird and Ames, Roger T., editors, *Nature in Asian Traditions of Thought*, SUNY Press 1989
Campbell, Joseph, *The Inner Reaches of Outer Space: Metaphor as Myth and as Religion*, Harper & Row 1986.
Conley, Verona, editor, *Re-Thinking Technologies*, U. of Minnesota 1993.
Cornwall, Regina, "From the Analytical Engine to Lady Ada's Art" *Iterations: The New Image*, edited by T. Druckrey, MIT Press 1993;
Coyne, Richard, "Heidegger & Virtual Reality", *Leonardo*, Volume 27, #1, MIT Press, 1994.
Evernden, Neil, *The Natural Alien: Humankind and Environment*, U. of Toronto 1985.
Gaudin, Colette, *On Poetic Imagination and Reverie: Selections from Gaston Bachelard*, Spring 1987.
Gigliotti, Carol, *Aesthetics of a Virtual World: Ethical Issues in Interactive Technological Design*, (doctoral dissertation),
Ohio State University 1993;
Harrison, Robert Pogue, *Forests: The Shadow of Civilization*, U. of Chicago 1992.
Heidegger, Martin, *The Question Concerning Technology*, Harper 1977,
Heidegger, Martin, "What are Poets For?", *Poetry Language and Thought*, Harper & Row 1971
Huxley, Aldous, *Doors of Perception*, Harper & Row 1954
Izutzu, Toshihiko, *The Interior and the Exterior in Zen Buddhism*, Spring Publications 1975.
Jones, Beverley, "Computer Imagery: Imitation & Representation of Realities", *Siggraph'89 Art Show Proceedings*, ACM Siggraph 1989;
Leder, Drew, *The Absent Body*, U. of Chicago 1990.
Plumwood, Val, *Feminism and the Mastery of Nature*, Routledge 1993.
Rilke, Rainer Maria, *The Duino Elegies*, Norton 1992
Tikka, Heidi, "Vision & Dominance: A Critical Look at Interactive Systems", *ISEA'94 Proceedings* 1994.
Wilson, Edward O. and Kellert, S., editors, *The Biophilia Hypothesis*, Island Press 1993.
Wright, Richard, "The Image in Art & Computer Art", *Siggraph'89 Art Show Proceedings*, 1989.

EAUX D'IMAGES

Par Dominique de Bardonnèche-Berglund

Quand l'image « *se met au parfum...*»

D ans le travail sur ordinateur, l'image, dématérialisée, est le résultat d'un travail distancié, d'une activité où le corps disparaît. Sur une palette qui est restituée, c'est un regard d'aveugle que je pose. Comment, dans cette dépossession par rapport à la tradition, l'artiste peut-il retrouver une émotion?

Ce regard à perte de vue va mobiliser d'autres sensations, faire appel à d'autres sens, à une autre sensualité, apportant une dimension qui n'est pas la celle de la machine. Sans ce glissement des sens, l'image est oeuvre machinale.

De la palette faite d'échantillons de couleurs, au matériau composé d'extraits d'images, mes possibilités sont celles d'un parfumeur: je teste et compare, je choisis, je combine et synthétise... Travail abstrait, d'une mise en rapport d'éléments disparates, d'une alchimie, où la matière sublimée de l'image, donne peut-être plus à sentir qu'à voir.

«Il y a une évidence du parfum qui est plus convaincante que les mots et que l'apparence visuelle...»

Patrick Süskind: « *le Parfum. Histoire d'un meurtrier*»

«Johnny got his gun»[1]

Créer par l'intermédiaire d'une machine, et qui n'est pas n'importe quelle machine, mais outil de calcul et de mémoire, une techno-logie, n'est pas sans faire rupture avec le travail sur la matière. Ici, il y a interprétation par les mathématiques, par le chiffre, ce nouvel alter ego de l'image.

Une création distanciée, qui implique de nouveaux rapports avec le corps: plus d'impact avec la toile dans un espace défini, plus de contact avec la matière, plus de pinceau pour prolonger la main, mais deux cerveaux qui fusionnent pour se compléter. Dans un espace qui dissocie l'oeil de la main, l'artiste déjà rendu muet par une machine qui lui prête son langage, ne peut agir directement et se trouve en quelque sorte privé de son corps.

Au mutisme, s'ajoute donc la privation du geste. Plus de geste, mais une transmission par l'intermédiaire de ce qui pourrait être une machine à coudre des morceaux d'images, ou du moins, un geste réduit au geste du conte de fées: frotter la lampe, désigner de sa baguette magique, ordonner par quelque «Sésame ouvre toi», faire un voeux et attendre le résultat, c'est à dire un geste en forme de vouloir, une volonté sans action réelle qui se réalise par l'intermédiaire d'une machinerie, d'un pseudo-cerveau.

En bonne lampe merveilleuse, l'ordinateur permet ce fantasme d'une vie magique. L'artiste réalise son vieux rêve

humain de paresse et la liaison traditionnelle de l'art et de l'effort semble s'estomper dans la séduction de la facilité. Mais cette paresse est peut-être une paresse essentielle, cette privation du corps mobilise peut-être autre chose, une énergie ailleurs, comme dans le corps mutilé de Johnny où les sens se sont réfugiés plus loin en lui-même...

Que devient cependant l'image dans cette amputation, dans cette dépossession de l'artiste par rapport à la tradition? Comment, dans cette transfusion de pensée, du cerveau de l'artiste au cerveau électronique, dans ce qui pourrait être pris pour une magie, pour une opération intellectuelle, où semble s'abolir la frontière entre idée pure et idée incarnée, l'image peut-elle exister, autrement que comme vision d'anachorète, c'est à dire comme faire? Que reste-t-il de la sensibilité dans cette activité artistique où le corps disparaît?

L'œil en deuil
Le cerveau, pallie au geste amputé et charge l'œil de la tactilité perdue de la main. Ainsi les manchots gardent souvent conscience de leur bras. L'œil contient la main et accorde une valeur tactile aux couleurs comme aux formes, velouté, douceur, rugosité... Mais il ne s'agit là pourtant que d'une restitution de sensations, un monde récupéré au travers de la machine, celui de l'aveugle qui recrée mentalement son environnement.

L'artiste est malvoyant, aveuglé par la machine parce qu'elle même ne voit rien, et ne fait que transformer des informations, m'obligeant à une oeuvre «à tâtons». L'œil perd, ici, sa relation à une réalité que lui dissimule l'écran et ce manque de réalité, prive de la sensation visuelle.

À l'univers labyrinthique de l'image, correspond une construction qui n'est plus la projection d'un système de vision sur la toile (perspective par exemple), mais un parcours d'aveugle dans des systèmes constitués. L'autre côté de l'image est une construction mentale qui relève davantage d'une organisation des données que de celle d'un espace visuel.

L'œil joue un rôle instrumental, il enregistre, transmet, mais perd son pouvoir d'organiser l'espace, qui n'est plus l'espace vide de la toile, donné dans son entier, mais un espace qui déborde sans cesse l'écran, indéfini, complexe et chiffré, sans totalité.

Est-il encore possible, alors, de retrouver une émotion dans cet univers abstrait, cet univers restitué? Ce regard à perte de vue peut-il faire appel à d'autres sensations?

Le chant des machines
L'espace de l'image est un espace multiplié par les possibilités. Il a la dimension du temps. L'image renonce à son statut spatial antérieur comme à sa forme définitive, pour devenir projet presque musical. Il n'y a pas accumulation dans la même image (comme dans une peinture de Jérôme Bosch, par exemple) mais déploiement des formes dans le temps des changements. Sortie d'une sorte d'orgue de Barbarie à images, comme le chant d'une machine.

Comme la musique qui n'a pas de relation avec des sons de nature, l'image informatique possède son propre monde dans lequel elle nous transporte et son propre principe d'organisation qui est essentiellement numérique.

Ses conditions de création sont proches de la composition musicale: l'usage d'un instrument, et même d'un clavier, le droit à l'erreur (que n'a jamais eu vraiment le plasticien), la matière illusoire, la convention du langage, une «partition» soumise, en quelque sorte, à des règles harmoniques», car en effet le côté préconstitué du logiciel, étroitement défini et non modifiable, pour qui ne sait pas programmer, soumet l'image à des critères artistiques précis, provocant un heurt perpétuel entre technique et imaginaire. Et encore le jeu sur la variation d'une «phrase mélodique», d'un thème, l'abstraction du collage, le côté rapsodique, cousus ensemble d'une image faite de lambeaux, ouvre à l'artiste un monde de sensations, celui d'une «polyphonie visuelle».

Il semblerait donc que cette création, proche de la composition, appelle la confusion des sens au niveau du travail. L'image continue à faire appel à l'œil, au sens esthétique de la peinture, mais aussi à une activité qui relève du sens intellectuel du musicien, et pourquoi pas à d'autres encore. En effleurant tous les sens et sans faire appel à aucun réellement, ce travail semble mobiliser plutôt un complexe de sensations, que des sens d'ailleurs artificiellement dissociés.

«Un orgue à parfums»?
En fait, la création d'images est ici un louvoiement entre les différentes activités artistiques et qui accorde la sensibilité du peintre avec celle du sculpteur ou du musicien.

Pour retrouver une émotion sur la palette restituée, il faut la regarder en aveugle, la réimaginer, faire ainsi appel à d'autres sens, donner une nouvelle sensualité, une dimension qui n'est pas la celle de la machine. Sans ce glissement, cette «délocalisation» des sens, l'image est oeuvre machinale.

Dans une épargne du travail manuel, le broyage des couleurs est remplacé par un nuancier déjà prêt. Gamme visuelle, mais distanciée, ne demandant pas de trouver la nuance par mélange progressif, mais de choisir dans les 16 millions de possibilités.

La palette est celle du parfumeur, faite d'échantillons, aussi bien catalogue de couleurs, figures de notes, que répertoire d'arômes, mettant en évidence une correspondance des arts. Échantillons de couleurs réduites à leur lumière, mais essentielles, essences de couleurs, dont je peux prendre avec une pipette virtuelle une nuance comme une goutte.

Le matériau est fait d'extraits d'images. Réalité déjà passée par la photo, aseptisée par numérisation. De l'herbier de la photo, je rassemble en pots-pourris aux senteurs imprévisibles les pétales macérés dans l'encre d'imprimerie. Le jardin des arts, me fournit les huiles essentielles pour de nouvelles créations. Aura d'oeuvres, fine fleur d'images, digitales, exprimées, épuisées dans l'alcool du chiffre pour de nouveaux bouquets.

Les touches successives apposées sur la toile font place ainsi à un travail d'extraction, d'émulsion, de fusion des essences d'images, des échantillons stérilisés par le scanner-alambic, versés dans le tube à essai de l'écran, et que je compose, combine et synthétise.

Car il n'y a pas simple collage, non plus qu'articulation autour d'une touche, d'une tache, d'une trace comme la peinture s'organise autour du premier jet de forme, de la première tache de couleur, ou comme le musicien fait un travail symphonique autour de quelques notes, mais progression par une succession d'essais et d'erreurs: ajouter, retirer, comparer, intégrer, combiner, «une goutte de çi, une goutte de ça».

Par le traitement des éléments, la façon de les tester, de les mettre en rapport, de les mélanger, le travail est plus proche de celui du parfumeur, qui ne se fait pas en fonction de l'environnement, que de celui du peintre qui organise un espace où se rencontrent la toile, l'huile et le pinceau. Il y a recherche d'une harmonie, dans une volonté de faire vivre ensemble, hors lieu, des éléments disparates, d'origines diverses, jusqu'à leur totale capture par l'image. Un travail abstrait en somme, celui d'une alchimie, où la matière sublimée de l'image donne plus à sentir qu'à voir. C'est dans un respect embaumeur des oeuvres du passé, un «enfleurage d'images», que je fais oeuvre de Parfumeur.

Le parfum oublie la fleur, les prés et les bois. Il ne reste rien des épaisseurs tactiles, des densités, des dimensions, des délicates matières. De même les images, déminéralisées par numérisation, sont des extraits, des décoctions d'images, des essences, dont il est difficile de détecter l'origine, de dissocier les différents apports, aussi bien que de les dénombrer, de les cataloguer, et qui sont finalement tellement mêlées dans leur effluve continu, qu'un certain côté «déjà vu» ne peut faire qu'appel à de lointaines et inidentifiables exhalaisons. Capsules, fioles et flacons d'images aux précieuses fragances qui sollicitent notre plus profonde mémoire celle qui est faite d'oubli.

Explication de la métaphore

«Mais qu'elle est, dira-t-on, la signification de cette métaphore?»[2]

De quelle façon, le sens olfactif pourrait-il intervenir dans cette création? L'odorat est le plus diffus de nos sens, le plus ancien sans doute, le plus subjectif, le plus primitif, celui larvaire du bébé, et malgré les possibilités de mesures et d'amplifications des autres sens, celui-ci ne se prolonge pas et échappe encore aux prothèses. Il est basé sur la mémoire. Le parfum suggère, son message est ailleurs dans une relation avec nous même. La mémoire est essentielle dans le travail sur le parfum.

Or l'ordinateur n'est-il pas un voyageur sans bagages, par sa mémoire figée qui stocke et qui calcule, le contraire de la mémoire vivante? Que faire de cette amnésie informatique, de cette mémoire foudroyée, sinon essayer de lui donner un sens?

Cette métaphore, qui pose l'ordinateur comme «orgue à parfum» peut donc se faire au niveau de l'activité, de cette activité de chimiste, de ce travail de synthèse dont procède l'image informatique, mais la comparaison pourrait se soutenir encore au niveau du produit et même du récepteur.

Dans la création d'un parfum, le produit n'a pas un maximum de matérialité et on peut s'interroger sur sa réalité. Quelle est la réalité, le «poids» d'un parfum, sinon la concentration d'informations? L'odeur informe. L'évanescence d'un parfum, dans sa dispersion provisoire, garde assez de densité pour nous convaincre. L'image née de l'ordinateur, de même, est une accumulation d'informations. Elle relève d'un art du melting-pot, d'une activité qui fait usage d'un mixeur, remplit d'informations qui y sont brassées, malaxées. Mais la plupart des «ingrédients» qui entrent dans la composition de l'image ne sont pas n'importe quelles données. Ils ont déjà été sélectionnées dans le but de l'image finale, comme sont sélectionnées les bases d'un parfum, et ont déjà une connotation esthétique.

«Cuisine» qui rend difficile l'accès à des mondes vraiment neufs, et donne la tentation d'un travail préparé, comme soufflé par quelque Cyrano de Bergerac, révélant ce qui, peut-être, serait resté dans l'ombre sans cette médiation...

Un travail, en tous cas, qui passe par la précision d'une formulation, d'une «recette» possible et qui en permet le clonage. Le parfum pas plus que l'image informatique ne possède d'original, non plus que de matrice. Ils ont pour base une incorruptible formule garante de leur absence. L'un comme l'autre sont mis en flacon, pliés et invariables dans leur vie protégée par le verre, se déployant à volonté et reproductibles à l'infini.

Pour le spectateur, il s'agit alors d'accepter ces images comme un nouvel art, de les évaluer à partir d'elles-mêmes pour éviter la frustration des comparaisons. Le spectateur se doit à une activité composite pour ne pas regarder comme on regarde des peintures et mettre en évidence ce que ces images ont perdu, ce qui serait les ravaler au rang d'huiles de machines, mais essayer de voir ce qu'elles apportent de nouveau, par l'usage des technologies, dans un sens positif. Si tant est que l'image soit chargée encore de significations, de qualités évocatrices, et en souhaitant qu'elle puisse éveiller d'autres sens que la vue, ou, du moins, amener le spectateur à une interactivité nouvelle, comme on s'active à partager un secret dans l'expérience d'un parfum. L'image est une image dans laquelle on peut pénétrer et sa nouvelle dimension est celle du mélange. Elle appelle l'oeil multiple et combiné d'un nouveau spectateur.

© Dominique de Bardonnèche-Berglund 1995

Notes

[1] Dans ce film de Dalton Trumbo (1971), Johnny, de retour du vietnam, est gravement blessé. Il a perdu bras, jambes et une partie du visage. Mais malgré un coma apparent, il continue à penser. Réduit à son esprit en quelque sorte, il trouve un moyen de communiquer avec son infirmière.
[2] Raymond Queneau: «Si tu t'imagines»

59

RÉ-ÉMERGENCE DES SENS

DANS LES ARTS DES RÉSEAUX

By Derrick de Kerckhove

derrick@epas.utoronto.ca

Knowledge Adventure Worlds

Knowledge Adventure Worlds est un site de réalité virtuelle sur le World Wide Web qui vous permet d'occuper un même espace virtuel commun, en temps réel avec plusieurs dizaines de participants situés partout dans le monde, et d'y converser avec ces personnes dont on peut voir les représentations évoluer sur l'écran. Pour entrer dans le jeu, il faut d'abord se choisir un costume virtuel parmi ceux qui sont exposés dans une garde-robe virtuelle et le placer quelque part dans le décor commun. On peut faire jouer ce personnage sur cette scène, à la rencontre d'autres figures qui représentent les personnes avec qui on est en train de correspondre à ce moment précis. L'effet est hallucinant.

Un imaginaire collectif

On a véritablement affaire à un imaginaire partagé collectivement. Saisissons bien l'ensemble proposé par une *vingtaine de personnes disséminées sur de grandes aires de la* Terre, penchées sur des écrans où elles apparaissent simultanément dans le même décor pour tout le monde, chacune à une place qu'elle contrôle en temps réel et dans lequel, à partir du point de vue qu'elles choisissent, elles peuvent y voir évoluer les homoncules qui, comme dans notre propre imaginaire privé, les représentent. Cet imaginaire est collectif, mais il n'apparaît nulle part ailleurs que sur les écrans des participants (et ceux-ci comprennent au même titre les "voyeurs" qui ont choisi à ce moment-là de regarder seulement, sans se mettre sur scène). Cet imaginaire est un objet de pensée, sans aucun doute, mais c'est aussi en soi une "pensée collective-assistée-par-ordinateur". Ce que le décor virtuel y ajoute, c'est une nouvelle intériorité d'un type comparable, sinon égal, à notre sentiment d'intériorité individuelle, mais étendu à la communauté des participants en-ligne. Le regard - et la pensée - de chaque participant occupe le même lieu d'élaboration des significations, mais sans y perdre son identité. Une nouvelle identité collective se constitue. L'étape esthétique sera de lui donner un corps commun, un décor commun, une intériorité collective.

Le corps paradoxal

Sans être spécifiquement sur réseau, Telematic Dreaming, de Paul Sermon, pose une question complémentaire: que devient notre expérience sensorielle dans la téléprésence ? Telematic Dreaming permet à deux personnes éloignées de plus de mille kilomètres, de se retrouver en temps réel "dans" le même écran,
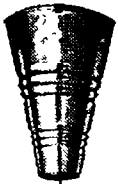
avec un décor commun et de se prendre dans les bras. Ce n'est pas une oeuvre sur réseau, mais rien n'empêche de l'y réaliser. Son intérêt ici, c'est qu'elle propose l'inverse complémentaire de Knowledge Adventure Worlds. Le lieu, mi-réel, mi-virtuel est commun. Le figures ne sont pas des costumes, mais des présences réelles sous leur apparence analogique, et, à cause de cela, se donnent et offrent le spectacle d'une sensorialité paradoxale. Les participants ne se touchent pas, mais ils peuvent voir parfaitement bien qu'ils -ou plutôt leurs images - se tiennent dans les bras. Imaginons deux amants à qui ce choix serait offert. Peut-on dire qu'ils ne ressentiraient pas une expérience de nature - même paradoxalement tactile ?

L'émergence des sens assistés par ordinateur, dans l'interactivité (le tact), le multimédia (vision, ouïe), le virtuel (synesthésie) et la téléprésence prend une ampleur particulière et cherche une nouvelle définition dans les arts des réseaux. C'est à l'art, en effet, que revient à nouveau la tâche qui est la sienne depuis l'origine - d'élucider, d'expliciter et de communiquer une nouvelle sensorialité encore à l'état embryonnaire, mais capable de s'imposer très rapidement. C'est d'ailleurs à partir d'une réflexion sur les réseaux plutôt que sur la réalité virtuelle ou l'interactivité telle quelle qu'il est possible de resituer le procès de l'art dans la culture. La nouvelle direction de la recherche artistique va se jouer dans les réseaux parce que c'est dans les réseaux que se joue la nouvelle mutation du langage.

Une question de sens

Toute la question, en effet, revient au langage, non pas parce que les arts ont ou se comportent comme des langages, mais parce que c'est dans le langage que se jouent les rapports entre les sens (esthésis) et le sens (sémiosis). Les arts sont les fragments sensoriels du langage désarticulé par l'écriture. Parce que l'étape actuelle de l'évolution du langage continue l'histoire de l'écriture en la plaçant sur réseau, on peut prévoir une reconfiguration de ce rapport des sens au sens.

L'invention de la notion d'art est une des conséquences directes du rapport de l'homme à l'écriture. Lors de l'apparition de l'écriture occidentale, le rapport entre les sens et le sens a été profondément modifié, pour ne pas dire bouleversé. Du langage, en effet, l'écriture ne garde que le sens, mais elle élimine les sens. L'écriture pousse le sens dans le silence de la pensée. Par l'écriture, le langage devient pensée. Entre l'invention de l'alphabet et celle de l'imprimerie et après, le traitement de l'information n'a pas cessé de se déplacer par l'écriture de l'espace externe des corps (échange oral) à l'espace interne de chaque corps (réflexion, pensée). Le texte, porteur de sens (sémiosis), mais pas de sens (esthésis), s'est rapidement hissé au sommet de la hiérarchie des stratégies de traitement d'information. Il s'est donné en échange des sens (esthésis) .

L'écriture, par voie de conséquence, a entraîné une redéfinition partielle du rapport de tout lecteur au corps social et au corps propre. Du corps social, la lecture - comme le théâtre - détachait le corps de l'individu. Pour lire, il faut se retirer du groupe. Les liens sensoriels serrés qui naguère tressaient la participation du sujet au groupe (tribal) se sont partiellement défaits. Un rapport nouveau d'objectivité s'est établi entre l'observation et le sujet observant. Le sujet allait se ressaisir comme individu autonome et son rapport au corps propre serait désormais médiatisé par une "image du corps". Les gens allaient commencer à s'imaginer, à se représenter à eux-mêmes comme des images , plutôt que de se ressentir comme situés au sein d'un milieu multisensoriel. Ce nouveau regard intérieur allait détrôner sinon remplacer la proprioception comme mode premier d'auto-perception. Le sujet occidental se possède encore aujourd'hui comme une figure visuelle dans un univers soumis au regard. Dans la source de Narcisse, ce qui s'échange, ce sont les sens pour le sens, le corps pour l'image, la participation océanique pour l'autonomisation de l'identité.

C'est à ce moment critique de la naissance d'une nouvelle identité humaine, point de clivage entre l'Occident et l'Orient, que l'art s'est inventé pour récupérer et spécialiser les sens désormais évacués du langage, du procès et du traitement de l'information. Les différentes catégories de l'art, celles, par exemple, des neuf muses, se sont regroupées en fonction de leur spécialisation sensorielle, musique, danse, théâtre, poésie, architecture, peinture, sculpture, plus les arts mineurs du jardin, des parfums, de la restauration et autres genres isolés les uns des autres et soudain érigés soit en milieux professionnels, soit, plus tard, en industries. Le groupe social, défait partiellement de ses liens sensoriels interpersonnels, va subir une crise de puritanisme plus ou moins grave selon les ethnies et ira récupérer une sensorialité réprimée et contrôlée sous forme de spectacle.

Aujourd'hui cependant, nous sommes contemporains d'un nouveau clivage épistémologique. La mutation de l'écriture, annoncée depuis plus de vingt ans sur les écrans de nos ordinateurs, se diffuse désormais sur les réseaux.

L'hypertexte, nouvelle mutation du langage

A cause de leur terme commun, on a tendance à rapprocher les notions de texte et d'hypertexte, alors que l'hypertexte est une forme absolument nouvelle du langage, située entre l'oralité et l'écriture, au confluent de la pensée et du geste. Nous avons affaire, dans l'hypertexte en réseau, à une véritable mutation de l'écriture en pensée multisensorielle collective, ce qui est la nature profonde et le message des réseaux. L'hypertexte se présente avec le caractère immédiat de l'oral, l'immédiat de la pensée. Cette écriture est en suspens, toujours présente dans sa virtualité, comme la pensée. Comme la pensée, elle est créée sur le champs par une volonté et un calcul. Elle est distribuée selon une règle absolue de pertinence parce qu'elle est appelée par d'autres textes et se joint à eux dans une synergie d'écritures suspendues, occupées au travail du sens.

Le logiciel d'Hypermail, par exemple, réunit les propriétés du courrier électronique ordinaire et celles de l'interconnectivité de la distribution des contenus sur réseaux. Pour adresser - afficher - un message sur Hypermail, on procède de la même façon que pour envoyer un message ordinaire "en-ligne". La différence, le surplus "hyper", c'est qu'il est possible de signaler ou de marquer certains mots pour les rendre automatiquement et instantanément "connectifs" avec d'autres mots, phrases ou paragraphes soumis par d'autres personnes engagées dans la même conversation en ligne. L'avantage immédiat, c'est que n'importe qui peut entrer dans la conversation en passant au travers de tous les propos échangés à partir de l'une ou l'autre expression pré-connectée, sans devoir remonter, de façon linéaire tout le cours des échanges précédents. L'avantage plus profond, révolutionnaire sur le plan des échanges collectifs humains, c'est que Hypermail fonctionne comme un index permanent où les termes connectés donnent un accès immédiat et auto-classifié à l'état présent de la pensée collective sur le sujet. C'est comme si, d'un coup, n'importe qui, en entrant dans la conversation, pouvait se situer, comme au sein de sa propre pensée, à un point précis de la réflexion, toutefois, non plus seulement sur un plan strictement personnel, mais comme au sein d'une pensée collective en plein travail, en plein mouvement.

De cette façon, Hypermail reprend et isole une des caractéristiques principales du World Wide Web qui tire ses propriétés de l'interconnection des liens textuels, iconiques, et numériques. C'est cette interconnectivité qui permet de traiter tout corpus sémiotique comme matière vive, faite d'intelligence et non plus seulement de mémoire. Il s'agit là d'une forme d'intelligence collective qui fonctionne précisément en réseau d'associations pertinentes, mais automatisées. Entreposée en suites binaires sur réseau, cette nouvelle écriture est sans autre support, sans existence autre qu'au moment où elle est évoquée. L'intérêt de sa nouvelle souplesse, de sa connectivité, ne réside pas dans une sorte de dispositif de mentation individuelle accélérée, mais dans le fait que l'hypertexte est adaptable instantanément aux intentions et aux expressions simultanées de plusieurs personnes en même temps, en temps réel.

L'hypertexte, donc, n'est pas tout bonnement destiné à rendre l'écriture interactive, mobile, réticulaire, mais plutôt à lui permettre de devenir un moyen d'élaboration mentale collective en temps réel. Le corpus hypertextuel, toujours en mouvement, s'adaptant de soi-même en temps réel à toutes les entrées de tous les participants, se constitue comme un milieu de permanence, comme une forme psychique en suspens.

En ligne, la nature même de l'écriture change. De technique de mémoire dans l'écriture manuscrite ou imprimée, elle devient technique d'intelligence sur réseau. Elle se pare de tous les paradoxes. De purement écrite, elle passe à un statut quasi oral; d'individuelle et exclusive, elle devient collective et inclusive; en devenant hypertexte, le texte pénètre plus avant que

jamais dans le domaine de la pensée. Mais c'est une pensée collective, en temps réel, accessible instantanément à tous et à chacun des participants. Nous n'avons jamais vu ça dans l'histoire du monde .

Vers une esthétique de l'intelligence

Aux arts traditionnels de la mémoire, d'origine grecque, "les enfants de Mnemosyne", succède l'ère des arts de l'intelligence. L'accent n'est plus mis sur l'objet, mais sur son traitement. L'idée n'est plus de représenter le "déjà pensé", le "déjà imaginé", mais de promouvoir et de favoriser le travail même de la pensée, la croissance même de l'imagination en mouvement. Le travail esthétique porte sur la création de logiciels qui peuvent gérer la synergie d'intelligences individuelles.

Un modèle d'intelligence collective est celui qui met en série ou en parallèles les intelligences individuelles des participants. Dans ce type de fonctionnement c'est la subtilité du logiciel de gestion qui assure la qualité des effets. Idea Futures vous permet d'afficher une idée, un projet, une hypothèse sur écran et d'y investir (d'entrée de jeu) jusqu'à concurrence de $50 "numériques", c'est-à-dire de l'argent purement symbolique (comme tout argent d'ailleurs). Le lendemain, ou plus tard, si votre idée est bonne, intéressante, vous découvrez que d'autres personnes l'ont lue et y ont elles aussi investi de l'argent symbolique au gré de leur intérêt, de leurs ressources et du désir de poursuivre le travail de recherche. Car il est possible, en effet, en plus d'investir en argent, même symbolique, d'ajouter des raffinements à l'idée, la travailler, chacun, à son tour, pour l'améliorer. Au bout de quelques jours, sinon quelques semaines, si l'idée tient toujours, elle aura attiré l'attention et les précisions de plusieurs centaines de personnes, et elle aura acquis non seulement une valeur marchande, du fait de l'accumulation d'investissements dûment catalogués, mais aussi un degré de raffinement et de précision capable, dans certaines applications de devenir un véritable projet réalisable. A ce moment, on pourra vouloir "essayer" l'idée, ou, au contraire la placer dans un contexte de valeurs comparables, de même qu'on investit dans le marché des bourses sur des estimations de croissance potentielle de la valeur d'une action ou d'une devise étrangère. Un placement dans Idea Futures, même s'il ne rapporte rien d'autre que de l'argent symbolique, est un investissement dans l'intelligence collective en plein travail. Voilà donc un hypertexte destiné à la production collective d'idées, et à l'élaboration d'une idée collective par la collectivité du réseau.

Une papille gustative collective

Dans la foulée des progrès des sciences de l'échantillonnage et des statistiques, il est possible d'entrevoir des systèmes de sondages collectifs instantanés, à partir du moment où on dispose d'un réseau d'interconnections étendu. Le "Web" fait déjà des essais - encore primitifs - de sensorialité collective. HOMR est un site qui vous aide à découvrir et recommande des oeuvres musicales susceptibles de vous plaire grâce à un procédé

ingénieux. Sur l'écran apparaissent vingt titres de pièces musicales courantes. Il vous suffit, après vous être enregistré vous-même sur le site, de graduer votre appréciation selon un barème de sept variables. Quand vous aurez fini, vous aurez droit à une seconde liste d'une vingtaine de morceaux choisis en fonction de vos choix précédents. Si vous désirez savoir combien de personnes, parmi les autres membres du site, ont un goût musical rapproché du vôtre, vous pouvez interroger le site et recevoir sur le champ une liste détaillée accompagné d'un graphique descriptif de votre milieu d'écoute privilégié.

A première vue ce système n'est qu'une version accélérée du genre d'information que l'on peut obtenir d'une étude de marché. Mais, c'est justement l'accès instantané, la mise-à-jour immédiate, la compréhensivité des données recueillies, et l'interactivité libre de la consultation qui donnent à penser à un organe perceptuel collectif à l'état primitif, qui permettent d'imaginer une sorte de "papille gustative collective".

Un bouillon de cultures virales

Ce qu'on appelle les "agents numériques" sont des progiciels autonomes de gestion de données qui fournissent un travail automatique et permanent de filtrage, de classement et de recombinaison. L'exemple le plus simple d'un agent numérique est un logiciel de filtrage de nouvelles pour votre courrier électronique ou pour le recensement des nouvelles dans les milliers de journaux en-ligne. L'agent peut vous aider à vous débarrasser automatiquement de courrier sans intérêt ou aller repêcher précisément le type d'information dont vous avez besoin, saisie exclusivement dans les contextes qui sont pertinents pour vous. Ce genre d'opération contribue d'abord au perfectionnement de la recherche individuelle, mais, suivant les types d'utilisation, il peut contribuer à l'élaboration et à la consolidation d'un travail de pensée collective. De même que nos cerveaux ont besoin de certaines routines, de certaines pratiques d'auto-organisation pour la mise en lumière de nos idées, les protocoles d'échanges et les agents numériques servent à élaguer et à mettre en forme les pensées collectives - toujours en temps réel.

Le modèle d'intelligence collective correspondant consistera, par exemple, à mettre en jeu différents agents numériques doués de propriétés très simples capables de fonctionner en synergie et de contribuer, chacun selon ses propriétés distinctives à la survie de l'ensemble, un peu à la manière dont E.O Wilson décrit l'intelligence collective des sociétés d'insectes. Jusqu'à présent, la recherche artistique a porté surtout sur des logiciels plus ou moins interactifs de vie artificielle. Ceux-ci ont donné lieu à d'étonnantes réalisations par Michael Tolson, Christa Sommerer et Laurent Mignonneau, Richard Bates, Stephen Lankton, parmi d'autres. Sur le plan esthétique, le plus réussi de ces essais est Las Meninas de Tolson qui a créé une vingtaine d'environnements occupés par des petites unités animées qui "vivent" en communauté, naissent, se reproduisent et meurent selon les déplacements d'un faisceau lumineux, actionné par l'interacteur.

Dans cette expérimentation comme dans d'autres, il est possible de varier les critères d'adaptation des unités ou des groupes de créatures virtuelles, de leur donner plus ou moins d'intelligence et de ressources, et même, comme le fait Richard Bates, de doter ces créatures d'émotions. L'étude des émotions virtuelles, par ailleurs, n'est pas un projet de simulation futile, dans la mesure où, comme le pense Patti Maes, c'est en dotant les agents numériques d'émotions simples comme le désir de survie ou de simples critères d'attraction ou de répulsion qu'on pourra, à l'avenir, s'assurer de leur collaboration efficace sur réseau. Comme on pouvait s'y attendre, certains artistes et chercheurs en vie artificielle commencent à porter leur attention aux possibilités des réseaux, notamment avec Biodiversity Reserve , de Tom Ray. Ce projet, primé avant même sa pleine réalisation, au Prix du Festival des Arts Interactifs 1995 à Los Angeles, permettra d'utiliser des cycles et des zones provisoirement "libres" des réseaux pour y faire naître, croître et évoluer, des créatures numériques.

Le langage à l'intersection de l'organique et du numérique

Désormais le langage, comme la vie, se partage entre le binaire et l'organique. Au plus profond de la mutation, il y a la réduction, la traduction de la matière même en pulsions binaires. La suite de pulsions binaires fait subir au corps, à tout corps, à toute matière, à tout texte le même processus d'atomisation et d'homogénéisation que l'alphabet phonétique a imposé à la parole orale. Mieux encore que le phonème alphabétique, le code binaire propose le plus petit dénominateur commun de tous les systèmes, de tous les langages, de toutes les textures, de toutes les formes, de toutes les composantes. Le code binaire donne même accès aux données infra ou ultrasensorielles, à la structure moléculaire et ses mouvements, à l'intériorité des objets les plus denses. Il enregistre et traduit "les sons, les parfums, les couleurs" des choses inaudibles ou invisibles. On peut désormais tout traduire en tout.

Un des points de rencontre les plus évidents du langage entre l'organique et le numérique est déjà la synthèse vocale . Le logiciel le plus élémentaire de synthèse vocale réalise la transmutation du langage écrit en langage oral. Ce début est encore timide. Les travaux de synthèse vocale s'attachent de préférence à la relation inverse, celle qui permet à l'ordinateur d'entendre et de "comprendre" la voix humaine. Ceci veut dire que l'intégration numérique des valeurs sensorielles dans le procès des significations peut simuler d'assez près l'intégration neurophysiologique des composantes sensorielles (ton, intonation, gestuelle) dans la parole vive. La différence, c'est que le numérique donne un contrôle absolu et permet d'innombrables combinaisons et permutations de valeurs sensorielles. On peut déjà s'attendre à ce qu'une direction artistique de l'avenir essaie d'intégrer des valeurs sensorielles aux effets de la dictée orale. Les expérimentations de Laurie Anderson et de Laetitia Sonami, qui impriment des distorsions à la voix en temps réel sur scène, font le tout premier pas dans ce sens. Sur réseau, à travers les

pages du Web, capable d'être illustrée comme jadis les enluminures illustraient les manuscrits, douée de toutes leurs ressources et séductions, la parole vive peut maintenant s'enrichir du retour des sens (esthésis) dans la gestion du sens.

Désormais, le langage sur réseau veut réunir et combiner les principaux attributs de l'écriture, de l'oralité, de la pensée, de l'individualité, du collectif, et y ajouter l'ubiquité et les extensions sensorielles. L'apparition et la prolifération fulgurante des valeurs sensorielles depuis l'invention du World Wide Web et du langage hypertextuel/multimédias invitent à considérer la nouvelle étape dans l'histoire des formes d'échange humain comme le moment d'une reconfiguration du langage même. C'est un langage qui prend et donne corps. Il est donc doué de sens (esthésis). Il annonce la réunion des sens et du sens, le retour du corps dans la création du sens, un renouveau de l'ancienne synergie collective et l'intégration des valeurs sensorielles dans le procès des significations. On peut donc parler d'une véritable ré-émergence des sens dans le langage d'où l'écriture les avait chassés.

EPILEPTOGRAPH
THE INTERNAL JOURNEY

By Isabelle Delmotte

p2081693@cumulus.csd.unsw.edu.au

E pilepsy is the most common chronic neurological disorder as there are around 40 different known kinds. All forms of Epilepsy are induced by a chemical imbalance, or a structural abnormality in the brain which could be genetic, or caused by physical damage at one stage of someone's life. These impairments can cause electrical malfunctions sparking off uncontrolled and excessive discharges that spread to other parts of the brain, leading to temporal lobe epilepsy seizures. When the whole brain or large parts of it become involved in a raging electrical storm of signals, the result is what is known as a tonic-clonic seizure. Both types of seizures trigger a range of symptoms, such as headaches, nausea, hallucinations, flashbacks, déjà vu, emotional outbursts, lack of awareness, limb jerking and so on. They can make a person hear or see imaginary things, have strange feelings and engage in involuntary actions which often resemble the symptoms of a psychiatric disease. Crude sensations of smell and taste, epigastric sensations, rapid mood swings, chewing movements, lip-smacking, spitting, and other forms of uncoordinated movements are not unusual. As well, tonic-clonic seizures also induce aimless physical wandering, followed by periods of total loss of consciousness, convulsions and amongst other consequences, more or less severe falls. A large number of people diagnosed as epileptics experience some kind of personalised warning sign previous to a seizure known as an "aura". Some don't.

The difference between a temporal lobe epilepsy seizure and the beginning of a tonic clonic one can sometimes be minimal and difficult to notice, even for the person experiencing the seizure. All the sensations experienced in the context of temporal lobe epilepsy seizures can constitute the aura of a tonic clonic seizure. Epileptic fits are not thought to typically leave brain damage but can definitely alter interrelating neuronal connections.

Epileptic activities have a definite physical, emotional and practical impact on the lives of people subject to epilepsy, as well on the lives of those surrounding them. Long term effects include loss of self confidence, loss of trust from other people, personality changes, multiple medication side effects, and so on. There are as many types of seizures as there are individuals living with epilepsy. For each person subject to some epileptic activity, no one seizure is the same as another: mental and physical environments always differ.

The brain as the site of construction and control of consciousness, is the ultimate site of subjectivity. Based on the vari-

isea95@er.uqam.ca   T : (514) 990-0229
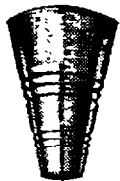
ISEA95 montréal

ous functions and so-called malfunctions of my brain, "Epileptograph: the internal journey" focuses on the unknown. Regaining consciousness after a tonic-clonic seizure is a visceral and frightening experience which leaves me only glimpses of memory. In the context of this project, the use of the word consciousness could seem a misnomer as this work focuses on the awareness process preceding linguistic ability. Despite feeling the process of life germinating in a chaotic way, the concept of being someone is non-existent. I associate the word consciousness with the ability to articulate emotions and sensations. In my case, having a tonic-clonic seizure means that all memory has been temporally wiped out. Language has to be re-learnt in order to communicate with the inner self, as well as the outside world. All sensations and resulting emotions revolve around the absence of language and a time frame. The loss of language implies a loss of time structure and affects all previous references in terms of knowledge. The inability to categorize events in time causes a nearly total loss of specific references. The awareness of the chaos inhabiting the brain triggers a tremendous feeling of fear, which is compounded by the instinctive awareness of a total lack of control. The powerless obedience to the body generates an elusive environment without any time structure. Without the capacity to express to oneself the reality of a situation, Self-awareness is a vacuum of loneliness.

To me this totally non-linguistic event is at once the richest and the most painful of experiences. It is extremely valuable to me as the emergence of all senses triggers the awareness of the unknown self. Beyond words and physical control, the doors of perceptions open to endless primary emotions that the intellect could tend to instinctively denigrate. The process of explaining such primary sensations using words seems impossible, so challenges one's value of language. The apparent limitation of each linguistic unit paradoxically offers infinite potential of understanding based on one's own previous references.

A complex scheme of sensations follows the black-out provoked by the seizure. It involves a slow and frightening reconstruction, done without any words, of any data internal or external to the body. This slow re-accumulating of the self is based on and activated by primal sensations, as there is at all times a physical link between the viscera and the brain activity. It is a process of awareness of procedures and sensations over which the intellect has no control. During this time, the visual and auditory patterns of this chaotic experience map parts of the body, including the brain, with different physical pains and result in a coding system. The body resonates and talks, becoming a very active mass of disconnected layers unable to communicate. Will-power is non-existent as the body has its own agenda. Fear of not reaching a coherent language is instinctive and extremely physical. The progressive recognition of some audio-visual patterns allows language to re-surface, although mental confusion can be present for hours, even for days.

On the consequences of the processes

The actual realisation of this project started in January '92, after 9 years of gestation. To start with, I wrote a text in English named "Epileptograph: the internal journey", aiming to depict my sensations, or absence thereof, during the regaining of consciousness. It is rather ironic that I had to write a text in order to describe this non linguistic episode but as I wanted to depict inexpressible audio-visual sensations, it seemed appropriate to be restrained by a very basic vocabulary. As soon as this process began, it became a constant interrogation of every aspect of language and its social implications. It seemed that every appropriation of a word in order to describe physical sensations could only be done by its juxtaposition to other words. Although this work does not interfere with any medical knowledge, its creation became a metaphor for its subject. While I wanted to describe a loss of language and the struggle to regain it, I was coming across institutional and medical jargons which required some kind of objectivity. The sensations and fears I am trying to describe are not acknowledged by the medical profession or any supportive organisations. According to institutional belief, when someone is lying on the ground during and after a tonic-clonic seizure, this person is not in pain. But emotions are only added to the internal turmoil affecting the physiological body, and are not immobilised. For a witness viewing a tonic-clonic seizure the activity of the 'physical envelop' of the body could be easily connected to an annihilation of the mind due to the brain's uncontrollable electrical activity. The appearance of physical chaos does not always lead to an emotional void. And the term black-out only increases the myth of the physical aspect of an epileptic seizure.

To unwillingly lose control over one's body can be traumatic especially when the point of origin of the loss is a taboo area such as the brain. The most highly valued human organ, the brain in a state of malfunction is feared and reviled. I have been aware of extraordinary mental activity without being able to channel it and articulate it at the time. I have been aware of sensations so intense that language could only translate them as "fears". These chaotic perceptions have made me extremely conscious of the inner turbulences of the body as well as its limits and potential. The brain is as vibrant as a muscle, can hurt as much as bones breaking, can pulse, breathe and pump like the lungs and heart. All physical pains start to emerge after a certain time laps in the process of regaining consciousness, as if a scale of sensations was made out of previous physical referential pain. I consider my brain as a part of my body and every component of my body as a tool of my conscious mind. But in an altered state, each one of these tools has a mind of its own. In an awareness mode, the individual lives and consciousness of these tools are a threat to the sanity of the recovering mind. The primal instinct in the reconstruction of the self is the awareness of the absolute lack of communication tools. The body had a mind and consciousness is a body of awareness ruled by an instinctive language.

Intuition as an experiencial method of inquiry

In order to create "Epileptograph: the internal journey", I had to lose control of my thoughts and physical abilities by triggering visual and sonic sensations with the technological tools I have access to. To do so, I relied entirely on my instincts with no idea of the consequences this process would have. Basically I asked my body to remember a state that I couldn't recall but that my body knew better than anyone.

Corporeal intuition, physical emotions and body memories form the core of this project. They are based on the numerous sensations encountered after the black-out provoked by a seizure. I didn't expect this process would provide me with an insight into what is happening during the actual seizure, but in fact it has. So far, my intuition has led me all the way, especially in the use of computer technology as these tools allow me greater flexibility than other methods. They provide me with the freedom of controlling the process only at specific times. Most important is the fact that machines have the power to surprise me, to take me further than physical reality, to provoke me emotionally, to reflect internal processes that I cannot articulate verbally.

It could seem paradoxical to use such a time based medium in order to realise a project which in essence describe the loss of a time reference. To create this loss of time, I wanted to depict the sensation of being in a enclosed space which had its own life and its own rules as this is what I experience on these occasions. The process involved in the creation of the soundtrack has been extremely visceral, therefore highly emotional. I construct sounds completely intuitively as the only criteria for their veracity is their ability to put me in a near epileptic state. As soon as my body is affected by the sounds I become subject to visceral fears, dizziness, sweat, deformed vision, altered sense of time, loss of balance, to name a few of the triggered symptoms. These sensations can be combined or perceived individually. At first I could not believe the impact of these sounds on my body as the resulting symptoms seemed so definite and clear, impossible to alter. It took me 2 years to complete the first 2 minutes of the audio part, the first reason being my inexperience with sounds and the time consuming technics that I developed. The second reason being that I was searching for memories that reside in my body but not in my consciousness. I do not have any recollection of a specific warning sign prior to a tonic-clonic seizure, or at least I do not remember it. But I think there must be one. When I tried to audio-visualise this almost imaginary time frame of a seizure, my body recognised the sounds so well that a near seizure state was a permanent companion in the sound studio. This was my measure of success, to undergo trauma, to retrieve the body memories. I am now able to listen to this part of the sound track with less anxiety, providing that I am in the right emotional state. The process of creating the visuals is similar in the sense that it is totally empirical and completely instinctive.

Two main events have occurred in the past 2 months. First, I was given access to a faster machine than the one I have been using to make the visuals. Consequently, I am not able at this stage to physically absorb the pace of the animated flip books I have been creating: their visual impact generates extreme fears and very painful epigastric sensations. Real time visualisation is too dangerous for the time being. But as the main outcome of this 4 year process has been a therapeutic effect, I should be able to cope with them over the next few years.

I do not know exactly if confronting these fears so graphically has changed my epileptic sensitivity threshold or if it is simply that the process has affected my general perception of my epileptic reality. A mixture of the two is possible as over the past years the number of seizures has decreased and the process of regaining consciousness seems a bit less frightening. Actually it is not less traumatic, but in some ways it seems more familiar. Before I wanted to escape from the experience, now I want to investigate it. Now, on most occasions, I regain linguistic faculties more quickly even if the resulting physical and mental exhaustion can still last for a day or two.

The other main event I would like to mention is a seizure which happened 3 weeks ago. For the first time ever, I was conscious during a 15 mns seizure. The sensations were frightening: life was escaping through my limbs; all sounds were decayed, distant. High pitches were cramping my viscera so painfully that I thought I was going to die. I was literally sucked into a tunnel whose axis was located in the center of these pains. I could not talk, move or breathe properly. I had a poor understanding of my surroundings. Although I was conscious, my mind could not control my body. The most amazing thing was that the visuals I have been creating over the past years were in front of me: I was inside them. The whole experience made me think that the loss of consciousness during all previous epileptic seizures was the natural reaction of my body to prevent this kind of pain. The body has the power to protect the sanity of the intellect by suppressing its connections with of all senses when necessary. The intellect has the power to forget and to anticipate, the body has the power to remember things which will stimulate the mind. Despite all physical pain encountered, this seizure was a major turning point and one of the most positive steps taken over the past 13 years. The feeling of having somehow looped the loop is providing me with a new base. A whole new world of internal questioning and possible understanding is there for me to explore.

Regarding sharing subjectivity, I thought for years that the aim of "Epileptograph: The Internal Journey" was for epileptics, and non-epileptics, to experience the different stages of recovering consciousness as undergone by one individual. Of course, no one will exactly be able to share what I experience, not even myself. What I experience is changing, evolving and my present knowledge of myself has nothing and everything to do with who I was when I started this project. My instincts are

the first public of this work, my body is its interactive viewer, my mind is its virtual space. The few people who have seen this work in progress have expressed physical sensations leading to very different emotions. All these emotions are theirs at the time given, as subjectivity is far from static. What is most essential to me is the process of this work and the resulting chain reaction which goes beyond any expectations. In the future, the product of the process might even become irrelevant for me as it will only reflect a precise time of a previous life. The process itself keeps taking me further internally; its external life only depends on other people's subjectivity. This project has fed me with a multitude of information concerning my own physiological identity and my mental and emotional functioning for the time being and for the time past. It has also given me a broader view of other peoples' internal processes.

The future implications in pursuing the process of "Epileptograph: the internal journey" are limitless as all areas of my life, without any exception, have already been shaken by this work. Being brought back to animal instinct and primary sensations has given me an insight on the physicality of linguistic tools and provided me with another language. The void that words can provoke as well as their power of evocation feed every individual according to their personal history and their sense of future. But having no words does not mean being mute.

68

ARTIFICIAL CHANGELINGS

A WORK OF RESPONSIVE CINEMA IN PROGRESS

By Toni Dove

tdove@aol.com

A rcheology of a Mother Tongue, a virtual reality instal- lation, was a collaboration with Michael Mackenzie and was sponsored by the Banff Centre for the Arts as part of their Art and Virtual Environments seminar. It is an immersive interactive narrative piece. It combines interactive computer graphics, laser disc video and slides with interactive sound. The work sample is a compilation of short excerpts from the instal- lation which takes approximately forty minutes to experience. As a viewer you navigate the piece with a small plastic camera that allows you to "look" around the spaces and a glove that allows you to start and stop and to touch objects. In the first segment, a dream sequence, touching an animated figure takes you through a path in the architecture which has a narrative segment attached to it. You are in the point of view of the Coro- ner, one of the two main characters. It is her dream - a memory (forgotten in waking life) of being adopted as a child from the city to which she is returning to investigate the murder of a child. There are three environments. The first (the dream) is based on a Piranesi prison drawing, the second is a human ribcage that functions as the transport plane which brings the Coroner to the city . In this second environment orienting your virtual body in the space causes you to collide with invisible planes. These become cloud banks that trigger sections of nar- rative and bleed through memories of a child, the violinist, who has been murdered. The third environment is a copper wire hand. The hand is a short term memory construct built by the Patholo- gist, the other main character, who is overwhelmed by memory and can't function in the present. The objects in the hand are memories - some are of forensic details of the autopsy of the child and tell the story of her life in the city. The skull, with its wireframe brain inside, is the Pathologist's long-term memory. When you touch these objects they grow large and you enter them, moving around while you hear accompanying sections of narrative.

The experience of working on Archeology of a Mother Tongue left me with the desire to further explore certain inter- active and immersive issues.

I was interested in working with a more transparent inter- face so that the viewer was free of the elaborate apparatus usu- ally identified with virtual reality. This apparatus creates a her- metic experience and isolates the viewer from the real space and from other people in the space. I wanted to see if I could keep the sense of space and communal audience experience without losing the viewers sense of immersion.

ISEA95 montréal isea95@er.uqam.ca T : (514) 990-0229

I was interested in working with a more accessible technology for purposes of distribution. The high end technologies used in the virtual reality installation made it very difficult to travel the piece or to exhibit it.

Finally, I wanted to use a different model for interactivity. The logic tree as a structure was labor intensive, rather like washing your kitchen floor with a q-tip, and created an illusion of choice that I felt was a dissimulation. Everything is pre-planned and pre-programmed. It gave a false sense of agency and empowerment to a viewer that was not a good model on which to base a developing syntax. I was interested in developing an environment with a responsive personality. If you pushed on it, it would push back. A narrative would be based on an accretion of character interactions. I wanted to experiment with ideas of body identification between the viewer and the characters in the piece and to experiment with, or use as a point of departure, ideas based on synesthesia.

This led to the piece I am currently working on: Artificial Changelings: the Boned Body, the Chaos of Flesh

"Chaque époque rêve la suivante"
- Michelet

An interactive laser disk and sound installation. The narrative develops along two parallel threads, one set in Paris at the turn of the century during the rise of the department store, and one set in a geographically undefined future. The character in the 19th century, Arathusa, is a kleptomaniac given to delicate self-cutting, dreams and flights of ecstasy. Her attempts at ecstatic transcendence are juxtaposed against the restrictions her body endures in the form of corsets, stays, and the extremes of tight-lacing. These physical restrictions become metaphors for the strategies of social control which were part of the tactic for the containment of women in that era and by extension — our own.

Arathusa dreams of a young girl in the future who is an anarchist in search of an enemy. This woman, Zilith, has a problem - her inability to find a target, a center of power, or something or someone to blame. Power seems to disperse like a gas. Her research is conducted on a computer which she carries on her hips like 18th century panniers. The computer's screen is a "smoke screen" that projects information as well as providing a protective cloud for her - figuratively like the octopus's cloud of ink and literally as a shield to electronically block intrusive surveillance.

Each woman is involved in a romance. Arathusa, who is already having an affair with a department store, becomes entangled in a romance that evolves out of a battle of wits with a man who is a gambler and an entrepreneur in charge of display in the department store. She becomes his greatest display as a performer of human emotions and her struggle for autonomy

leads her to partial freedom from social convention. Zilith, a polymorphously perverse multiple personality, plays out her romance on a network of electronically linked entities. The romance is here defined not by deception, but by projection. She projects her desire onto the object of her desire and he projects onto her in a tango of misapprehension and misconception. The spheres of cultural influence have moved from strategies of discipline to those of a gaseous and mutable permeation. Her lover re-uses the technologies of image projection that construct the realities of their world like a contemporary DJ scratches on record albums. His performances reroute existing technology and lead to a collaboration that allows the two characters to physically connect. She then dreams the past, an 18th century theater scene. The lights are on and verbal interactions with performers and audience become a reference or template for the audience behavior of the interactive installation itself.

Woven through the piece are references to audience behavior and public life at different moments in the development of spectacle - the 18th century theater scene; the 19th century audience, in the dark, passive; a 21st century audience watching a skilled "image-scratcher"/interactor as a performer in a VR piece and a live video feed of the audience for the installation. I would like to look at recipes of reception, to make them self-conscious and perhaps disrupt them or open some territories for approaching the social space of the installation with a fresh eye.

The intrusion of capital into the sphere of relationships, how this perverts human connections and how they survive in the margins of economic transaction in spite of this, becomes a central theme of the piece. It traces the changes in human interaction and the concomitant alterations in the construction of spectacle, audience behavior and public space from the industrial revolution to the technological revolution. The past becomes a model, an armature, a ruin and a continuum from which the future is imagined and the present critiqued.

Relationship of Content and Technology

I have always thought of narrative as a wandering accretion in a three-dimensional cube. I have in the past used the development of fictional metaphors for theoretical ideas as a story base that is driven by an escalation of emotional engagement. I am now, in addition, interested in exploring an engine that uses certain technical devices, such as virtual illusion based on action and response, to create an emotional metaphor that is played out in the body's memory - a type of synesthesia. The viewer will receive different reactions from the piece based on body movements and spatial positioning. As the author of the narrative and characters I am creating video androids that gradually reveal themselves to a user through somatic interaction, memories and speech. I am attempting to create a cinematic environment with a personality or personalities that accrete over time using a story engine or program based on the three act screenplay. This allows a development through time and the

creation of certain plot points and crises that surround somatic interaction with a narrative frame that fleshes out the experience with a richer content - a proliferation of detail that charges the physical experience. I am not interested in the metaphor of choice - the viewer does not choose who gets the girl. I am interested in an immersive somatic experience that triggers certain feelings of engagement that can be used to intensify narrative and critique. I am interested in attempting to "cube" the narrative for an interactive viewer and in surrounding the installation with a social space for audience participation and reflection. The piece can be presented as a feature-length performance event or in three segments as a serial.

The installation consists of a curved rear projection screen suspended in a room with some chairs in a semi-circle for an audience. It should be possible to walk around or circulate freely in the room. Interspersed with several non-interactive narrative sequences that frame the experience are segments that offer the audience an opportunity to have a responsive experience with the characters and environment. A projected map appears on the floor in front of the screen; the outline of a phrenology scull for the 19th century that dissolves to an MRI brain map for the 21st century. When an audience member steps into a character's head there are labeled territories - memory, speech, body and trance/dream that produce different images or sounds based on movement. A video motion sensing system translates location, speed and amount of movement into programmed behaviors that produce sound and image on the screen. Movement close to the screen will produce intimate revelations - close-up images and whispered sounds, movement away from the screen will create memories clouded by layers of time - transparent images and washes of sound. The characters become like marionettes with unpredictable reactions based on the movement of the viewer on the map. In the body section, for instance, if the viewer moves their body left and right it will move the character's body. If the viewer speeds up movement the video speeds up - if they slow down the character moves in slow motion.

There is the possibility of moving back and forth between the centuries as if they were parallel realities suspended in a universe where time has no linear direction - the trance/dream space takes you through a time tunnel to the memory section of the character in the alternate century. The viewer does not change the narrative events, but develops a more immersive relationship with the characters and environment based on physical behavior. Different viewer responses will produce different aspects of content, emotional tone and information.

I think there are within some of the current developing technologies trajectories that have possibly frightening yet fascinating ramifications. What does it mean when a machine responds to you as a human being does, or seems to? What does it mean when a machine produces a sensual engagement usually reserved for a relationship with another person? I'm interested in the idea of a somatically engaged connection with a responsive machine that has been programmed by a person. There is an interesting dislocation in this relationship, mediated by technology, that echoes the themes of the narrative of this piece: the perversion of human connections and their reformations in a continually changing context.

THE SURVEILLANCE SERIES

By Wayne Draznin

ai182@po.cwru.edu

D ata acquisition, fear, personal life, files, privacy, security, safety, freedom...a maze of contradictory needs and desires. We know the world better than we ever have before; our fear and unease grow steadily.

As we enter the Information Age, we find that much of the data being gathered and tabulated is about us. Faster computers and cheaper storage make it possible to hold our lives in greater and greater detail. Personal history becomes a primary commodity, completely alienated from its creator.

The omnipresent security camera has become a key sign of this knowledge and fear. From the parking lot, to the entranceway and through the corridors of public and private buildings; on the street corner; in our schools and museums. It represents a fundamental trade: The surrendering of individual space for protective environment. Information provides us with both reality and illusion of safety.

Information even begins to take the place of the physical maintenance of law. In an experimental program under way in the United Kingdom, the cop on the beat, that most venerable symbol of order, is being replaced by sophisticated centrally operated street cameras, capable of isolating and tracking individuals a half-mile distant.

This maze of contradictions, quietly bubbling beneath the surface of the information grid, became a focus for my work. My attempt has been to make visible that which is rendered transparent by its very ubiquity. Through investigation of the surveillance system as signifier, I sought to develop greater understanding of that which it signified.

The weight

The first piece in this "Surveillance Series" was an outdoor sculptural installation, *The Weight*, built in July 1993. It took the form of a massive "surveillance camera" mounted on a 16' tower. At twilight, and through the night, the image of a large eye was projected from the "camera" onto an adjacent wall.

The Weight was installed in an empty lot behind a sculpture gallery in a working class Cleveland neighborhood. It could easily be seen from the adjacent street. The sculpture was a humorous caricature, while the projected image was quite ominous. Through its extreme visibility, it shed light on its less-noticeable, more use-oriented, brethren.

ISEA95 montréal

isea95@er.uqam.ca T : (514) 990-0229
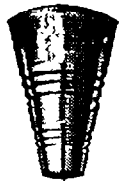
Surveillance installations

In November 1993, I presented *Surveillance Installation: East Side Component* and *Surveillance Installation: West Side Component* concurrently at two Cleveland galleries.

Surveillance Installation: East Side Component was sited in a mainstream commercial gallery on the East Side of town, in a popular gallery/restaurant district. A window-mounted security camera's outdoor observations were fed into a computer. Viewers in the gallery were brought into the process via their manipulation and saving of the resulting images. The viewers thus built a "data base." The "observed," outside the gallery, could watch these imaging processes in a monitor, which peered out of the window from the pupil of a large eye.

As the "data base" grew, I photographed the images, along with those generated on the West Side, and rear-projected them in an adjacent front window.

Surveillance Installation: West Side Component was sited in an alternative gallery (and law office) on the West Side, in a lower-working class district that has also become a gentrifying art "hot spot". A large gray "security booth" partially obstructed the gallery entrance. On the booth, a monitor displayed the image of those entering, as captured by a security camera mounted in the pupil of a large eye in the entranceway window.

The images generated also became part of the "data base," which was rear-projected into a front window at this space as well. Several of the images were mounted in small television-like light boxes and displayed on the wall.

The *Surveillance Installations* spoke to the contradictions between these two sites, as well as to the broader issues of watching and being watched. At the more affluent East Side location, the viewers were brought into the process, highlighting its contradictory character. Images generated at this site were manipulated, and in color. At the West Side location, the viewers had no access to the process. The images from this site took the form of black and white video frames.

Stolen moments

These investigations were further developed in the installation *Stolen Moments*, created in collaboration with Cleveland artists Beth Wolfe and Michael Loderstedt. *Stolen Moments* was presented at the Cleveland State University Art Galley in May 1994.

For this piece, we reconfigured the gallery by enclosing a space, building a balcony, and otherwise immersing the viewer in the work. A feed from the university's security cameras was mixed with video of the viewers as they entered; upon entering, one was faced with a monumental projection of this video. Above, in a dark, industrial-like space, an array of monitors presented a montage of scenes edited out of "real life" cop and rescue television shows. Frozen images from these scenes were projected into a "window" below.

In our statement on this project, we cited television pioneer John Baird's report on an experiment he performed February 10, 1928: "The essential image for television passed through the eye within half an hour from the operation. On the following day, the sensitiveness of the eye's visual nerve was gone. The optic was dead. Nothing was gained from the experiment."

We continued:
The cameras peer into our lives, stealing our private moments. Our horrors, tragedies, humiliations become public spectacle; we become detached voyeurs.

Our longing for reason, justice, salvation is fulfilled by the sight of colored strobe lights, the sound of screaming sirens, racing to restore order. We scan a landscape of strangely familiar fragments: the poor are punished, the privileged rescued. The common-sense tragedies of things moving too fast, too high are halted and brought to earth. Violence and disaster are no longer so confusing, so uncontrollable.

"Our collective sense of environment shifts as these bloody sensibilities attempt to fulfill an overwhelming desire for social meaning. The images are burned into our consciousness, deadening the complexities of discourse. The optic nerves have been severed; mute eyes wander aimlessly and loudly."

Watching

In August 1994, *Watching* brought the "Surveillance Series" from the gallery to the street. It was installed unannounced in a storefront window on a well-traveled shopping street in downtown Cleveland. The street, popularly known, from its primary businesses, as "Wig Street," links the rundown, time-worn city center with the new splendor of Cleveland's sports arenas. *Watching* repeated the motif of large eyes observing the passerby. The massive "camera" from *The Weight*, reinstalled at window level, dominated the street.

"Elastic visions"

For the "Elastic Visions" exhibition (Zoller Gallery, Pennsylvania State University, October 1994; scheduled to travel through 1996), I provided a documentation/summation of the "Surveillance Series."

Images from the "data base" were built into a series of television-like light boxes. The final box holds a monitor, displaying a distorted image from a security camera which is aimed at the viewer.

The viewer becomes the viewed.

DANSE
ET
APESANTEUR

Par Kitsou Dubois

I l n'y a rien de plus immédiatement concret que le corps du danseur, et pourtant il ne sert à rien. Il n'a pas de fonction autre que le geste et la forme. Son apprentissage consiste à ce qu'il arrive à faire correspondre, grâce à une intégration de toutes les sensations internes (kinesthésiques et autres), les mouvements du corps à ses sensations pures. Il va donc réaliser une unité du corps dans laquelle le rôle de la conscience des mouvements collabore à un processus **d'abstraction.**

• Ce corps "abstrait" induit une approche de l'espace et du temps tout à fait particulière qui n'existe qu'en prenant en compte le mouvement.

• Ce mouvement qui s'insère dans le corps du danseur, qui a pris naissance avant lui et qui se continue après lui. Il est à la fois limité et illimité, fini et infini. Il n'est rien d'autre qu'un déséquilibre entretenu, ou un équilibre instable permanent, puisque son rapport au réel est un rapport de poids.

Le corps abstrait-espace-temps en danse développe la perception de soi et permet d'être présent au moment même de l'action. Il s'inscrit dans un environnement culturel, technologique et politique. Il contient la mémoire du corps passé et projette celle du corps à venir.

La prise de risque, que constitue le fait de se confronter à un nouvel environnement est le mécanisme de créativité qui est à la base même de ma recherche chorégraphique.C'est l'émergence d'une véritable **poésie de l'expérience** à partir de laquelle s'élaborent des espaces, des qualités de mouvements et une esthétique propre.Je partirais donc de cette expérience d'immersion dans cette nouvelle technologie qu'est l'apesanteur, pour tenter d'analyser la perception du mouvement en apesanteur.

Je vais d'abord décrire rapidement l'état d'apesanteur, tel que le vivent les astronautes, puis l'expérience de vol parabolique vécu en "état de danse", pour définir les relations entre l'espace du corps en apesanteur et l'espace du corps sur terre ainsi que le point de vue esthétique sur la qualité des mouvements et les images du mouvement.

État d'apesanteur

Dans les décennies à venir, on intégrera la présence de lieux habités sur des stations interplanétaires. Cette existence de lieux nouveaux va devenir une dimension nouvelle de notre conscience culturelle et de notre dimension philosophique. Le "rêve de vol qui nous donne notre première, notre seule expérience
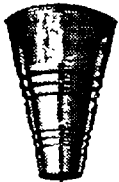
aérienne" selon G. Bachelard se réalise lors des vols spatiaux en apesanteur.

Mais paradoxalement la réalité de la vie en apesanteur pose des problèmes qui viennent troubler le plaisir de se libérer de la gravité. Effectivement par cet état d'apesanteur, les conditions dynamiques de certains mouvements se trouvent modifiées. Toute chose perd son poids et conserve sa masse. Les sources d'informations fournies par la force inertio-gravitationnelle disparaissent, mais les structures visuelles de l'environnement sont maintenues. Le schéma corporel en est certainement modifié.

C'est dans un univers sensori-moteur et perceptif différent de son milieu habituel de vie, et à travers leurs relations réciproques, que l'individu va devoir s'adapter à cette nouvelle condition .

L'astronaute s'adapte : il doit redéfinir son monde propre et constituer un ensemble de connaissances sur l'environnement et les procédures expérimentales destinées à l'exploiter. Il va donc être confronté à la nécessité d'exécuter une stratégie comportementale adéquate adaptée aux circonstances de l'instant (Tafforin, C.1993).

L'absence de gravité, est aussi vécue comme une agression d'origine sensorielle. L'astronaute est confronté à des messages sensoriels qui ont deux caractères particuliers fondamentaux : ils sont insolites et conflictuels. C'est ainsi qu'apparaît " le mal de l'espace", sorte de maladie de l'adaptation. Les manifestations de ce mal sont un sentiment d'inquiétude avec baisse de vigilance, sensation de fatigue et apathie que l'on rencontre au cours des cinétoses.

Les hypothèses quand à l'origine de ce mal sont :
• Les conflits sensoriels : conflits intra-vestibulaires, visuo-vestibulaires,
• réactualisation du schéma corporel .
• La modification de la répartition liquidienne.
• La digestion, à cause de la non stimulation des mécano-récepteurs de la paroi gastrique.
• Enfin, la fatigue et le stress psychologique peuvent jouer un rôle favorisant.

L'EXPÉRIENCE DU VOL

Paradoxalement ces difficultés m'ont révélé l'extraordinaire travail d'adaptation que représente notre travail de danseur.

Je travaille donc avec le CNES (Centre National d'Études Spatiales Français) depuis 1990 . C'est un monde technologique et scientifique et il m'a fallu m'adapter à ce langage pour faire comprendre la perception du corps du danseur. Je me suis donc appuyé sur l'observation des astronautes en vol et les informations fournies par la recherche scientifique en apesanteur .

J'ai élaboré un entraînement des astronautes à partir des techniques de danse. J'ai émis des hypothèses, mis en place un protocole expérimental et travaillé en collaboration avec le

laboratoire de neurophysiologie sensorielle de CNRS(Paris) spécialisé dans l'homme dans l'espace.(Dubois, K. 1994)

Grâce à cette relation d'échange entre l'art de la danse et les techniques spatiales, j'ai participé à plusieurs campagnes de vols paraboliques. La France possède une Caravelle spécialement affrétée pour décrire des paraboles à haute altitude. Sur terre la gravité est de 9,8 m/s2 soit 1g, pendant la chute libre de l'avion, on obtient à l'intérieur de la carlingue une microgravité égale à 0,009 m/s2. En apesanteur la gravité est égale à zéro.

Lors d'un vol, l'avion effectue 30 paraboles, soit 30 fois 25 secondes de microgravité. Une parabole se déroule de la façon suivante :

lorsque l'avion se cabre il y a 20 secondes de gravité 2 (2g), puis 25 secondes de microgravité, suivies de 20 secondes de gravité 2 lorsque l'avion se récupère.

Premières impressions

L'expérience du vol est à la fois une expérience merveilleuse et mélancolique C'est une expérience formidable sur la présence d'un état de danse parfait.

Les émotions :

Merveilleuse parce qu'on se trouve dans un état qui correspond à ces quelques moments magiques ou moments "justes" que chaque danseur a pu vivre dans son expérience mais après lequel il court toujours.

Mélancolique parce que le rêve de vol est atteint, il devient réalité et qu'il faut déplacer les objectifs, aller toujours plus loin.

L'Espace

Un travail de présence à ce nouvel espace est nécessaire: Il s'agit de se mettre en "état de danse"; c'est à dire se concentrer sur l'espace interne de son corps et l'interaction avec l'espace environnant, ainsi que sur l'imaginaire qui émerge directement de ce nouveau corps-espace-temps.

Au niveau interne, une impression de dilatation, nos organes s'organisent complètement différemment et brouillent les repères de notre propre espace interne.

Au niveau externe : Après un premier réflexe de nage dans le vide, Il faut aborder la 3ième dimension et la désorientation qui en découle comme autant de nouvelles possibilités d'être.

Le temps

Il y a modifications des rythmes internes et des conflits de temps à gérer dans l'instant :

Quand le corps est en "free floating" (c'est à dire qu'il n'y a aucun contact avec les parois de l'habitacle) la gestuelle est ralentie. Par contre, lorsqu'on se repousse, la poussée peut provoquer une vitesse très rapide et constante puisque la gravité n'est plus là pour la freiner. D'autre part, le temps d'apesanteur (25 secondes) est très court et le déplacement de l'avion est très rapide.

Ces conflits de temps interviennent dans la difficulté à établir une mémoire du mouvement une fois revenu sur terre.

Le mouvement

Chaque mouvement induit **un déplacement totalement inattendu.** C'est une gestuelle à réinventer. Les mouvements sont fluides et infinis. On est face à une page blanche, un vide ou toute création est possible. Quoi de plus merveilleux pour une chorégraphe que d'élaborer une gestuelle en apesanteur.

RELATIONS ENTRE L'ESPACE DU CORPS EN APESANTEUR ET SUR TERRE

Cette expérience en apesanteur m'a directement renvoyé à l'espace interne du danseur et m'a permis d'isoler certains éléments qui me paraissent essentiels autant pour s'adapter dans un milieu inconnu que pour réappréhender le mouvement sur terre.

Référenciel subjectif

Dans un univers à trois dimensions, sans poids, il faut se créer des références égocentrées subjectives puisqu'il n'y a plus de centre de gravité . On peut se représenter une verticale subjective ou un point situé sur cette verticale . Il n'y a plus de référent universel, tout est relatif et chaque personne a la liberté de construire ses propres structures sur l'axe subjectif de la verticalité. À partir de cette construction interne, on peut appréhender l'espace externe et réagir par rapport à lui.

Sur terre, chaque danseur peut aussi se créer ses propres références. La référence de base ne serait donc pas absolument de l'ordre d'une droite verticale mais plutôt d'un point ou le haut et le bas importe peu. L'important est de structurer son espace en fonction de ce référent subjectif.

La spirale

En danse, nous travaillons sur la spirale qui est la base de la recherche d'un mouvement fluide. Sur terre, ce mouvement interne de spirale a toujours une issue sur l'axe de la gravité .

En apesanteur, elle est totale et infinie. C'est à la fois le révélateur que tout est bien spirale dans le corps, c'est aussi la découverte de la fluidité extraordinaire des mouvements. C'est un mode de communication de l'espace interne vers l'espace externe et vice versa. En effet, en apesanteur, on constate l'efficacité de mouvement tels que des rotations et des torsions, pour retrouver son "centre subjectif de gravité" lorsqu'on est désorienté .

L'espace Entre

En apesanteur, cette confrontation directe entre le référenciel subjectif et la spirale crée une interaction entre l'espace interne du corps et l'espace externe.

Elle révèle "l'Espace Entre" : entre les corps, entre les objets, entre les articulations, qui est le lieu du vide et de la création, qui est révélé par la spirale et le référenciel subjectif.

Cet "Espace Entre" est la matière même de la danse que j'explore. C'est une vrai qualité d'adaptation, c'est un travail de présence dans un univers fluide qui puise ses racines dans la gravité et qui s'en échappe à la fois. C'est une ouverture du corps et de l'esprit.

Conclusion : Point du vue esthétique
Qualité de mouvement

La perception de cet "Espace Entre", si prégnante en apesanteur, induit un point de vue esthétique de qualité de mouvement qui n'est pas basé sur la force musculaire mais plutôt sur le jeu constant entre les forces contraires et les transferts de poids, de façon à libérer les "Espaces Entre" comme **véritables espaces virtuels** ou s'expriment la mémoire et le devenir d'un mouvement ainsi que l'imaginaire du danseur. C'est le lieu de la "présence" du danseur.

Images du mouvement

Les conflits de temps dont nous parlions précédemment, nécessitent un support d'images pour réactiver la mémoire du corps en apesanteur. La vue de l'image réactive instantanément, pour ceux qui ont vécu l'expérience, la mémoire perceptive du mouvement vécu, et pour les spectateurs, ces images libèrent un imaginaire qui est enfoui très profondément dans la mémoire du corps humain.

L'image n'illustre pas, elle est la mémoire vivante d'une expérience vécue. Elle doit donc s'intégrer dans un mode de représentation non plus comme une prolongation de la perception, mais comme le partenaire d'un mouvement à réinventer. C'est un véritable duo qui surgit entre la qualité du danseur et l'image du mouvement vécu en apesanteur.

Mon projet de recherche chorégraphique est donc d'évoquer ces Espaces Entre grâce :

- à une qualité de mouvement ou les danseurs sont toujours dans une situation d'expérimentation donc dans un état d'équilibre instable.

- à une interactivité ou plutôt un duo entre cette qualité de mouvement des danseurs sur terre et les images des corps en apesanteur.

- à une interactivité entre cette qualité de mouvement et des systèmes d'apparition scénographique qui brouillent les repères habituels sur l'axe de la gravité des spectateurs eux-mêmes, et crée un phénomène de résonance dans leurs propres corps

Références

BACHELARD,G. : *L'air et les songes* essai sur l'imagination du mouvement - édition José Corti -1943

DUBOIS - K., *Dance and Weightlessness: Dancer's Training and Adaptation Problems in Microgravity.*- LEONARDO, Vol.27, No.1, pp 57-64, Berkeley USA 1994.

TAFFORIN -C., *Ethological description of the Astronaut's motor adaptation from training to space flight - Applications to sport domain.* 5 th Journées Internationales d'automne de l'Association des Chercheurs en Activités physiques et sportives (ACAPS), Caen, France, 28.30 Octobre 1993.

INTERACTION ARISING FROM INSTALLATIONS

By Tessa Elliott

tessa1@mdx.ac.uk

T he 'i =' Series - Interaction as Improvisation not Imposition The 'i =' series of installations and performances were intended to explore the notion of 'interactivity' and what constitutes 'art' in the current technological age. Central to the work is a focus on human/human and human/computer communication by a subversion of surveillance and control.

At the outset of residency at the Camerawork Gallery - January 24th to February 22nd 1995 the work for (i = 0001; i <= 1001; i++); contained no images or sounds. It was constructed and conceived as a framework for interaction, an orchestration for collaboration, an exploration of representation within a computer mediated environment. The audio and visual forms that were developed and displayed over the period of the residency resulted from a series of 'interactions' with the participants, the public, the passers-by and the performers, all of whom were necessary for the realisation of the work. The title of the residency refers to the structure and process by which the work was created, declaring it's status as an algorithmic form, beginning with the creation of the work 0001 by the first group of participants and continuing until the ninth work, 1001 was complete. The series was extended further by performances of i=1010; at Sadler's Wells in June. Before this recent work is described in detail, it is necessary to outline several issues arising out of previous computer installations. In 1990 we began to research into the possibility of creating interactive environments which respond to movement. The ability to control the computer by gesturing with hands, arms and legs, dispensing with the need to touch a mouse or keyboard, was initially of paramount importance. We developed a program to utilise the signal from a video camera, so that, when people walked into view, their image would activate the projection of images and sounds. The first installation Social Hair (1990) was intended to be an interactive narrative, influenced by Mallarme's theories of guided chance. By moving in the installation space the viewers' silhouettes would activate brief, 1 second, animations. Therefore, by shifting their position, people could choose to re-sequence, omit or emphasise individual elements, thus creating multiple readings of the narrative.

Tract, created in 1991 continued this theme, however as its name suggests, the concept was one of navigation in an area of indefinite extent. A video journal, recorded on location in North Wales - at the site of a Lost Land legend - was condensed, and digitised into sixteen animations. The editing process purposefully departed from mimicry and simulation, focusing on the essence of movement through surroundings. The piece was initially

ISEA95 montréal
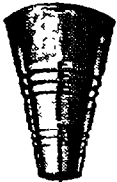
installed at the Sheffield Media Show, where people were invited to navigate the virtual landscape, constructing their own legend.

On reflection it became evident that both these installations 'reacted to' rather than 'interacted with' the people who moved in the space. The computer in these works was used merely as a storing device, an 'insertion box'. By performing certain movements in the view of the video camera people could select and control the output of their choice. Were these and other 'reactive' works merely indicative of art created for the consumer age, "I chose, therefore I am"?

What would happen in an interactive space where choice was denied? How could a space be constructed by utilising the algorithmic power of the computer so that the rules of production would change in response to movements?

It became necessary to explore in depth the notion of interactivity within computer mediated environments, to create an installation in which people and computer code would 'interact', that is, have a reciprocal effect on each other. It took a year devise the programs and plans for the installation Emergence which was premiered in Australia at the Third International Symposium of Electronic Arts'92, and in England at Digital Dreams'93.

In Emergence the viewers' interaction with the installation is mediated through a set of transformational rules, which not only act on the audio and graphical output but also continually change the installation's response to movement. The program was structured so that the drawings and sounds would cease to develop if movement in the space halted. People therefore, needed to collaborate to perpetuate the evolving forms and this they did with warmth and gusto. The installation encouraged sociability rather than individual isolation. The work denied choice and insisted on a dialogue, an 'interaction' between human and human, between human and machine (code). This line of enquiry was extended by Hetrophony a site specific commission for a Mediaeval Great Hall in Suffolk, England. The installation provided an immersion in a continually evolving planar space in which ripples track movement, radiating and gently perturbing the surface video image. The work echoed the duality of the politics and architecture of the age whilst challenging the English heritage visitor.

The residency at Camerawork provided the opportunity to enquire further into interaction and collaboration within a computer mediated environment by combining 'reactive' and 'interactive' elements of our previous work. In for (i = 0001; i <= 1001; i++); we utilised computer technology to enable diverse groups of participants, ranging from school children to architects, to input images, sounds and interactive structures into the installation. These sessions de-mystified the technology of production and questioned the distinction between art, education and audience. The animated works produced ranged from samples of 'skipping games and playground chants' to 'bodies making letter forms and their related phonetic sounds'. During the period of the residency, as these works

were produced, they could be activated in the day by movement in the gallery space. In the evening, they were projected onto the glass frontage of the gallery, making it a 'reactive' focal plane for passers-by, whose movement was monitored by a street surveillance camera.

Towards the end of the residency the works created by the participants were placed into the 'interactive' structure of the installation. To generate this space we encoded the compositional technique of the composer Andrew Deakin and developed a 'perspectival inversion' to translate the video detection of movement across a two dimensional plane into navigation within an immersive three dimensional sound space. This dynamic 'interactive' structure surrounding the static 'reactive' animations can be likened to a pool of water with stepping stones. A movement from one stepping stone (animation) carries with it trace elements of that particular form, which are mixed, altered, amplified and modulated by the water (code) that surrounds it. The dynamic nature of this complex structure, which conceptually permeated the gallery, ensured uncertainty and improvisation, as the installation was made to resound with visual and acoustic traces of physical presence. This was exemplified by Rebecca Skelton's performance in the space on February 19th, when the dichotomous dialogue of human and machine was explored by poignant movements of contorted control and surrender. The collaboration between Skelton, Deakin, Jones-Morris and myself was continued when we were commissioned for two performances of the 'i ='series at the Lillian Baylis Theatre, Saddler's Wells.

We selected several of the animations created during the residency, refined the sounds to create a spectral aural space and developed a simple neural network to enable the system to identify certain movement patterns so that it would respond with a degree of learnt behaviour. Personally, I was apprehensive about developing this work for a theatre setting, with the traditional trappings of audience and performer. I was concerned about the relevance of an interactive installation on stage and with the engagement and immersion of an audience that could only observe. As it happens the audience become 'active observers rather than remote participants' - a phrase I gleaned from Michael Hill's talk ISEA'95. Sat in their chairs, comfortable, freed from the imposition of being a performer, of making the 'thing' work or not, they could focus, focus an a person who was skilled, who after years of training, and months of rehearsals could move with a degree of control not available to anyone else. The tension created by the improvisation between the performer and the system, the human and the machine was gripingly intense, and beyond all expectations. For us, as artists, computer interactive installation, will continue to be an art not concerned with a framework which allows choice, but rather the choice/construction of a framework which allows interaction.

STATE-OF-THE-ART RUSTICITY

By Agustin Fernandez

agustin@dcolarts.demon.co.uk

I n one respect you will probably find this paper rather unlike other papers being read at ISEA95: I shall not be speaking about recent technological developments. I would like to outline an aesthetical phenomenon arising from the union of two disparate musical media within the field of 'high-art' music: electroacoustic technology and folk instruments. This paper is a companion to the performance of music for charango and tape on Tuesday evening at the Pollack Hall. Attendance to that performance is necessary for full comprehension of the ideas which I shall be developing. However, it is not my aim to offer a programme note to that performance, nor do I intend to bore you with a technical analysis of the pieces concerned. Rather, my intention is to discuss the aesthetical background which gave rise to the composition of that repertoire.

By way of preamble, I shall take a detour which in due course will bring me back to my central topic.

Those familiar with Aldous Huxley's final book, *Literature and Science*, will remember the distinction between the two worlds referred to in the title. The man of letters, Huxley reflects, 'accepts the uniqueness of events...the radical incomprehensibility of existence'[1] and 'addresses himself to the paradoxical task of rendering the randomness and shapelessness of individual experience in highly organised and meaningful works of art.'[2] The scientist, on the other hand,

> *is the inhabitant of a radically different universe -not the world of given appearances but the world of inferred fine structures, not the experienced world of unique events and diverse qualities, but the world of quantified regularities.*[3]

Huxley goes on to explain the different approaches to language by the scientist and by the man of letters. It is when discussing language that Huxley' argument fully comes into its own, reaching impressive depths of clarity, acumen and penetration. It is also then, sadly, that his discourse stops being directly applicable to a music-related debate. The reason why I refer to it nonetheless is that I am yet to encounter a clearer summation of the difference between the scientific and the artistic outlook. Far from implying an irreconcilable opposition, Huxley highlights the interdependence between the two. I quote:

> *The sciences of life have need of the artist's intuitions and, conversely, the artist has need of all that the sciences can offer him in the way of new materials on which to exercise his creative powers.*[4]

isea95@er.uqam.ca T : (514) 990-0229
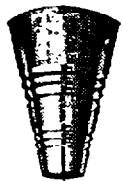
ISEA95 montréal

Albeit in obvious need of updating - not least in the area of terminology - Huxley's thoughts remain essentially relevant. For instance his assertion that, whether we like it or not, we live in the Age of Science, is now as true as ever, except that, in the culture of the late twentieth century, science and technology are bound up in an indissoluble partnership. To what extent the same is true of art and technology is an issue we are all here to examine. Nonetheless, it is probably safe to say, without being too contentious, that the answer is: to a much lesser extent. Art and technology may have formed a recent alliance, but in the case of music this alliance is not wholeheartedly supported by the majority of music practitioners. The reasons lie along the path of Huxley's reasoning. If it is true that we live in the Age of Science, and that science and technology are now inextricably bound up together, it is obvious that the arts occupy a marginal position. To circumscribe the debate to music, let us recognize that, unlike ancient Greece or that Utopian land described in Herman Hesse's *The Glass Bead Game*[5] , our societies treat music as a minority interest.[6] As a profession, music must do as all minorities: struggle to assert itself, in this case against the prevailing wave of scientific and technological advance. The suggestion that, rather than struggle, music should join forces with science and technology and strive together towards now unified aims is a thought which holds great appeal in certain enlightened and progressive circles, but definitely not in the majority of enlightened and progressive circles within the musical world. A strong body of opinion would regard the prospect of such a partnership as a form of capitulation, of betrayal of what music should be about. Should we dismiss these sceptics, branding them as reactionary and backward-looking? Or should we, as supporters and practitioners of electroacoustic music, take account of their reservations?

When the scepticism comes from indisputably enlightened sources, it is indeed rather hard to dismiss. Huxley himself, in spite of being one of the greatest polymaths of our century, provides an early example of mistrust of technology-based development in his novel *Brave New World* . Written in 1932, this book already contains some of the basic critique that is common currency today among the musical techno-sceptics. Where music is private and intimate, technology de-personalises. Where music belongs to anyone, rich or poor, technology relies on capital for production, marketing and acquisition by the user. Where music speaks of struggle and human passions, technology aims at creating ease, comfort and possibly an ultimate numbness of the spirit. Where music demands mastery of complex, subtle, ages-old, painstakingly acquired skills, technology reduces everything to the push of a button or the turn of a knob. Where the tools of music are finely wrought, classical-looking wooden or brass instruments which the player caresses with loving elegance, technology displays unsightly cubes and parallelepipeds of tasteless alloy metal. And, above all, where music speaks to us with the voice of those instruments history has consecrated, technology introduces, at best, all manner of anonymous thuds, whistles and clanks, and, at worst, cheap sampled or synthesized copies of sounds which real instruments would play better.

Huxley's anxiety, and the anxiety of today's sceptics, is centred on alienation, on not recognizing in technology's offerings one's beliefs as to what the world or, in our case, music ought to be. This anxiety stems from the desire to keep at least some areas of human life free from the intrusion of automated gadgets. For the musical techno-sceptics, obviously, music is one such area.

For us, converts or born believers, the so-called alienation may be a figment of ill-informed imaginations, yet such possibility does not exempt us from addressing a real issue. The alienation *is* there and the sceptics, whether right or wrong, are legion. Their attitude to what we do affects the scope of our work, in a practical way when the sceptics are in positions of power to grant or withhold opportunities and in an artistic way when our audiences dwindle to a handful of friends. Can we do anything to eradicate, or at least to reduce the sceptics' indifference to our work?

Those of you who have attended presentations by composers before must have been waiting for the inevitable moment when the composer begins to talk about himself. Today is no exception and I must reveal myself in my true colours. I am a composer and, alas, I am a techno-sceptic. As a child of the 1960s I grew up steeped in Huxley and Hesse, and I share virtually all the reservations I paraphrased earlier. I converted in the mid-eighties, while embarked on research at London's City University, and have reneged many times since. My relationship with technology is one of love and hate.

This autobiographical outburst is only relevant in one respect: the steps which I took, upon conversion, to address my own particular brand of alienation, has produced a certain type of music which, judged against the context of computer music as we know it, can throw a useful light on the vexed issue of the role of technology in composition.

May I provide a few more autobiographical details, only the minimum required to frame this discussion. As a native of Bolivia, I first entered the world of music through the channel of folk music, of the kind now known in the international circuit as 'Andean' music. The soundscape I inhabited as a child was primarily rural or small-town, and the first instrument I performed on was the charango. As a vocation for music asserted itself in my mind, it seemed natural to progress into higher spheres, into studying classical and then contemporary music. A concomitant development, the adoption of classical European instruments, arose as a necessity which I did not then query.

The folk instruments which first awakened my musical interest were and still are limited in range, very sensitive to climactic changes, mostly poorly constructed and therefore usually out of tune. Few players have reached a standard of technical proficiency and versatility comparable, say, to a professional pianist. The vast majority among such players are unable to read

music, since it is in the nature of their practice to transmit their repertoire orally. Above all, the greatest restriction with folk instruments is the fact that they are not internationally available. It is the universality of classical instruments that makes it so natural for a composer of any background to embrace them. Pianos, string quartets, new music ensembles and symphony orchestras are legal tender almost the world over. Charangos, quenas, panpipes, tarkhas and such like are common around the Andes only. If one's music is to have anything more than a local audience, if it is to be judged and, with any luck, accepted as a contribution to the great and ongoing classical tradition, there is no querying one fact: it must be available for the legal tender of classical European instruments.

The need to adapt for European instruments one's musician thinking originally shaped within the environment of folk ensembles is by no means necessarily a harmful imposition. Personally I have derived immense pleasure from the search for ways of recreating effects or textures from one medium with the other. Instrumental pieces of mine such as *Pájaro negro* or *Danza de la loma* are riddled with examples of this quest. Take, for example, a passage from *Danza de la loma* in which the trumpets burst into a hectic figuration in accompaniment to a shrill melody on woodwind.

> EXAMPLE 1 (DAT) *Danza de la loma* letter M
> The origin of this is, perhaps implausibly, in a pattern of charango strumming in Bolivian music:
> EXAMPLE 2 (LIVE) charango strumming
> To pick another example from the same piece, a combination of instruments blown through superimposed to normal playing in the wind section produces the following effect:
> EXAMPLE 3 (DAT) *Danza de la loma* letter O
> This was one of my attempts to reproduce orchestrally the breathy sound of Andean panpipes. I suspect that no illustration is needed for a sound which you are, do doubt, familiar thanks to the ubiquitous South American itinerant buskers.

As these examples show, the resulting sonority can be far removed from the original sound which sparked off the idea. This, in my view, does not mean that the whole exercise is a failure. The history of instrumentation is teeming with instances of cross-fertilisation between instruments and even across families of instruments. The Spanish composer Isaac Albéniz, for example, instituted a piano technique which Debussy and Ravel were quick to adopt. It consisted in rapidly playing single notes with alternating hands, a practice obviously derived from the rapid alternation between guitar strings in flamenco. The classic example of this is *Asturias*, a piece so guitar-like in texture and in character that nowadays we hear it much more often in guitar arrangements which have reclaimed what rightfully belonged to the guitar in the first place.

Another example of a similar kind of conversion can by found in Stravinsky's short opera *Renard*, in which the composer imagined the sound of a Russian guzla to lend a certain colour to the orchestra, in keeping with the folk-tale origin of the libretto. Given the minimal chances of recruiting guzla players in the international circuit, Stravinsky settled for the closest resemblance he could find: a cymbalom, still exotic, much more widely available. More recently, the Japanese composer Toru Takemitsu brought in a biwa and a shakuhachi to play in a soloistic capacity in the midst of a symphony orchestra for his work *November Steps*.

All the above examples represent efforts to address the alienation I was discussing earlier. In Albéniz's *Asturias*, the alien is absent but evoked. In Stravinsky's *Renard*, the alien finds a deputy in the form of a less alien substitute. In Takemitsu's *November Steps*, the aliens are actually present on the concert platform, exotic visitors partaking of a ritual in which they by tradition do not belong. Needless to say, a situation of this kind merely exacerbates the alienness, highlighting the differences between two musical traditions.

Technology, of course, opens up a new kind of universality whereby to a growing extent one can expect to find similar or equivalent configurations in distant parts of the globe. Take the simplest possible configuration for an electroacoustic performance: for instance, a sound system, a mixer, a DAT player, possibly live musicians and their microphones. This equipment is quite likely to be available in almost every city where a public concert might plausibly take place. In extreme cases, even the DAT player and the microphones can be dispensed with.

Needless to say, not all electroacoustic music can be performed with such a simple configuration, but there is a significant body of work which can. It is quite plain that, from the viewpoint of universal availability, some types of music technology are well on their way to matching classical instruments.

Since Stockhausen's *Kontakte*, the idea of exploring commonalities between instruments and technologically generated sounds (or, as Stockhausen puts it, 'the known and the unknown'[7]) has held tremendous appeal for composers. Works such as *Incenters* by Jacob Druckman have explored the possibility of realising with an instrumental ensemble some of the textures commonly associated with the electronic music of the 1960s and 1970s. There is something heroic about live players locked in unequal contest with the superior technical force of an electronic system, whether this is present as in *Kontakte* or absent as in *Incenters*. While exploring points of contact between live and electroacoustic forces, the ethos of these pieces is still one of distinction - not to say confrontation - and therefore redolent of Orwell's - and Huxley's in *Brave New World* - vision of man versus machine.

A perceptible - audible, that is - reconciliation of these opposites came about in the 1980s, in the wake of the advent sampling technology. In Britain, the second half of the decade sparked off a spate of pieces for various instruments and computer-realised tape, investigating the idea of extending the sonority of the instrument by manipulating samples of the same instrument, playing on changing degrees of recognisability. In this manner, the computer-controlled sampled sounds become literally an *extension* of the live instrument.

The aesthetic postulate behind such exploration is appealing in the extreme. One can trace it back to Borges's obsession with the mirror and the otherness of the self, the repetition of our being somewhere in a different dimension, possibly in the world of dreams, and the ultimate doubt whether reality is the dream and vice versa. Julio d'Escrivan, composer of a prize-winning piece for flute and tape,[8] described the tape part of this piece in unwittingly Borgesian terms: the *other* flute. It was clear in the late 1980s that a composer, whether techno-sceptical or not, had no better way of exploring this otherness than by creatively juxtaposing acoustic to electroacoustic sound. It was on realising this fact that I embraced music technology.

Let us now return to the debate on the alienness of non-Western European instruments in the environment of international music-making. By doing so, we should also be able to connect the various contradictions and oppositions which I have outlined today.

On one hand, it is clear that against music technology all acoustic instruments, whether classical or not, constitute a separate class. This shared alienness engenders a new equality between European and non-European instruments, whereby considerations of background and tradition disappear into virtual insignificance. On the other hand, the quest for an extended identity for an acoustic instrument through electroacoustic media constitutes a way of addressing the Orwellian dichotomy of man versus machine, enabling us to bridge this opposition and to create a sonic world in which man is, momentarily at least, at piece with the monsters he has created. After all, musical instruments and electroacoustic systems represent two different stages of music technology, the former being an earlier contribution. Ultimately, they are all gadgets of which we avail ourselves to explore the mystery human destiny through sounds.

In bringing a folk instrument onto the concert platform and surrounding it with an electroacoustic environment which resembles it and extends it, one is merely enlarging the scope of the technological communion, incorporating what in evolutionary terms represents an even earlier stage of music technology. If the artistic approach is a convincing one, this can be a way of putting to good use the inherent cultural statelessness of new technology. Whereas the instrument is laden with a cultural baggage, new technology is still relatively free. The extreme differences of cost, craftsmanship and sonic power between a rus-

tic instrument and state-of-the art technology are, of course, potentially comic. It is up to the composer to create a cogent musical discourse that will enable these two stages of technological advance to put each other in perspective and to throw on one another the salutary light of mutual irony.

© Agustin Fernandez 1995

Notes

[1] Bedford, Sybille *Aldous Huxley: A Biography,* 1974 (London: Chatto & Windus Ltd)
[2] Huxley, Aldous *Literature and Science,* 1963 (London: Chatto & Windus)
[3] Ibid.
[4] Ibid.
[5] Hesse, Hermann. *The Glass Bead Game* London: Jonathan Cape 1987
[6] Let me repeat the clarification made at the beginning: that this paper is concerned with high-art rather than popular music.
[7] Presentation by Stockhausen at the Barbican Hall, London, in January 1985.
[8] D'Escrivan, Julio *Sin ti por el alma adentro* for flute and tape, unpublished 1987. Winner of second prize in the 1987 Bourges Electroacoustic Music Competition.

82

THE SOUND TRACKING OF THE TIMES

By Nicholas Gebhardt

nicholas.gebhardt@history.su.edu.au

I n an interview in 1981, the pianist Glenn Gould commented to his interviewer that one of the things he found most moving about the final Contrapunctus in *The Art of the Fugue* was that J.S. Bach was writing this music against *every possible tendency of the time.*[1] This rigorous observation suggests something at work in the way in which we now think about music, and as a consequence, about sound, that bears directly on the question of art's relation to technical processes, to industry, to economy, and also, to thought. Raising the aesthetic and political spectre of "the times," Gould forces us to consider the degree to which our claims for, and fetishism of, the new communications media as a revolution in art, and therefore, of life, **actually function to undermine the very possibility for the invention of a radical art of sounds.**

Bach wrote *The Art of the Fugue* at the end of his life during a period when the structure of Baroque musical thought was undergoing a transformation from a polyphonic modal or horizontal plane to the mechanical or orchestral imperatives of a vertical harmonic order that saw the fugue as an increasingly redundant form. It is of no surprise then, that Bach should abandon, or withdraw from, the new musical order, proceeding instead with, what might be called an "idealised world of uncompromising invention."[2] For, according to Gould, there was always "...a constant proximity of fugue in Bach's technique. Every texture he exploited seems ultimately destined for a fugue."[3]

In writing a group of fugues that are in no way contemporaneous with their time, that in their actual duration replace every tendency of the time with an art of invention, Bach establishes a certain collective temperament (and tempering), or what the philosopher Gilles Deleuze calls a becoming, in the apprehension of the technical reality that constitutes the Baroque structures of expressive form. *The Art of the Fugue*, if we develop Gould's line of thinking, is an explicit reference to the *framing* of sonorous material as an art that is neither bound by the return to a timeless or eternal state of Transcendent Art (it is grounded on a movement against the times), nor is it an artistic revelation of the present (the times) as the future condition of life. Instead, it marks out the shape of a contrapuntal composition that no longer reveals the fugal technique for what it is, but re-assembles the tempered scale as a giant modulating machine that is, in Nietzsche's phrase, untimely (...always in time, inventing time).

In thinking about the nature of "the times," therefore, we have to ask, at what point does the figure of Johann Sebastian Bach cross over into Glenn Gould? This is not, however, a thematic consideration, nor even a question of identity, but one of modulation (and by modulation I mean both a transposition and a reconfiguration of an event) that involves Gould as a kind of fugitive whose aim is to preserve, not himself, but a secret in much the same way that a melody appears as a motive within another melody.[4] In this sense, Gould's description of *The Art of the Fugue* seems to me to be entirely consistent with his own concept of an art of sounds. The idea of inventing a contrapuntal form of radio documentary based on discrete voices and contiguous sonic elements, according to the textural criteria of the medium is also about a profound resistance to the organisational and bureaucratic tendencies of a present that demands a *pure state of exchange* through the deregulation of all (aesthetic) forms.[5]

So what would an art of sounds consist of now? and how is this perception of art related to "the times"? to the concept of music? to the rise of recording techniques? and to the field of cultural production in general? Strictly speaking, our concern with the organisation of sound, with how sound is organised along either aesthetic, political or scientific lines, necessarily involves thinking about music and implies a concept of musical thought. While the definition of music may have been expanded by composers such as Varese, Schaeffer and Cage, to include all audible phenomena, this historical transition from the musical object to the sound phenomena, from musicology to phenomenology, is still bound by the *expectation* or *anticipation* of musical resonance, by a melodic distribution of sounds across specific frequencies, across the total sound spectrum. In this sense, we are not interested in abandoning music, but asking instead where musicality might lie within a mediated or informatic world?

Gould's great insight is to realise, in the potentiality of sound recording, a cinematic condition that brings about a renewed relation of music to thought in that the visual image is now saturated, drenched, with a dynamic musicality without depth, or more specifically, **an advanced microphony**. This is what I mean by a sound-image: that point at which the combination of visual images and sounds and bodies affects the duration of the moment, of a series of moments; that inhabits and exceeds the internal organisation of sounds through a series of *cuts, fades, dissolves*, and *zooms* in terms of a continuous *counterpoint* between the camera and the microphone.[6] From this contrapuntal movement between a mobile visual image and a sound tracking the possibility emerges of locating distinct zones or fields of sonorities outside of the simple scientific identification or amplification of audible phenomena.

Gould argues, therefore, for an "intense molecular analysis" of sounds through a process of mobile microphonic dissection[7], a microphony, that comes to embody the very reality of

music. Once everything is embued with the clarity of the microphone, the sounds of life, of all moving phenomena - voices static, the wind, music, engines turning over, the buzz of electrical currents, brain waves - can be extracted from the circumscribed forms of musical expression (eg. the sonata, symphony popular song) and rendered expressive in themselves. This i what we might define, following Gilles Deleuze, as the 'active sound-frame.'[8]

The tendency, though, of "the times" is towards the destruction of this sound frame into a pure acoustic replication o the audible universe as the most natural thing of all - into natural sound picture. It is a conception of an art of sounds tha exercises a morphological imperative in the name of an increas ing immersion of the listener in an undifferentiated or homog enous sonic landscape. We are well aware, however, of the lim its of sound, the obvious incursions that take place in the name of an enclosed listening, of an ear that is completely immersed in sound. It has been noted elsewhere, this potential fascism o sound,[9] and it is important to resist calls for a sound state, to question an electronic arts practice that grounds itself in the idea of sound design, in the necessity for sound as the sum o totality of all experience.

Even the name of the first commercially available tape re corder in the United States - the *Sound Mirror*[10] - suggests a concept of the sonic event as a reproduction of the natural orde of things that is completely of its time, that attempts to become the essence of "the times," and as such amounts to nothing more than a reinforcement, a sounding out, of the various modes o capitalist distribution and exchange. After all, once sounds are interchangeable at the level of electronic processing, that is, once all sounds are subjected to codification, to a system of intelli gible equivalence (within the capitalist market and the military industrial complex), it becomes increasingly difficult to pro duce a sound that does not simply effect its code (and I'm think ing here of a lot of sound montages or computer generated pro ductions) as the limit of a technocratic or informatic process.

This desire, for the conflation of what is heard as sound with a mechanical image of our hearing, informs the very struc ture of sonic events and points to an overwhelming tendency o "the times" to inscribe a compositional directive as the limit o what can be heard, to simulate the very condition of audition For Bach, it was the demand for thematic control and harmonic continuity; for Glenn Gould it was the movement from a mono phonic sound source to a stereophonic sound image; and more recently, it's been the ascendancy of the digital domain in rela tion to the composition of auditory space itself. In fact, the his tory of sound can now be posed as a series of problems of per spective and projection that increasingly works to combine wha is heard with the object of our hearing.

The chimera of sound. In the current rush to confront and embrace multimedia, digital and 3D sound possibilities, however, it's not just a case of arguing for, and manufacturing, *new* aural experiences in which the sound event and the production of sound are held to the same kind of formal or mechanical properties that see all electronic productions in terms of their generative potential; that is, as energy to be harnessed in terms of an assumed threshold of audibility or visibility or productivity. Rather, if we think again of Gould's untimely notion of *The Art of the Fugue*, it is a case of inventing a continual variation or thread that acts on our conception of the sonic event; that makes it, in Deleuze's and Guattari's terms, "...necessary for the non-musical sound of the human being to form a block with the becoming music of sound..."[11]

In following this thread of Bach's contrapunctus, the final motive in this brief speculation affects a certain transformation or introduces a new compound, a new collectivity, into our thinking about the invention of a sound image or sound tracking. The opening sound-image of François Girard's film *32 Short Films About Glen Gould* produces a remarkable concept of musicality. The character of Gould drifts from the rear of the image across the ice, pushing into the sound of the wind which, mixed slightly back, becomes Bach's Aria from the *Goldberg Variations*. This moment carries with it a complete transition in the sound-image along a melodic line of composition; neither sound is privileged, nor is one sound established as prior to, or originary of, the other one.

Rather, the sounds inhabit the force of the elemental (the wind, the ice, the biological body) and the cybernetic (the mixture of sounds and music by way of a recording/editing process) through a third phase or character; a solitary musical motif that incorporates the untimely power of Bach's final great inventions, the texture of Gould's *Idea of North*, and the tracking of the visual image with the melodic compound of the Goldberg Variations.[12] Girard's film suggests, in this way, a profound engagement with the relation of a visual image - that of the musician as a combination of different types and materials, rhythms and resistances - to the texture of the recorded sounds as they inflect on and transport the image in time. The combination of sound and visual image into the 32 short films about Glen Gould forms a series of levels that transforms the whole force of infinity, creating a break with the expectations of a musical or creative life, through the melodic counterpoint of this well-tempered sound-image.

So what is an art of sounds to do with "the times"? and how is the artist to work against every possible tendency of the time? to resist the ideological imperatives of networks and codes, of informatics, without falling into a naive naturalism? Obviously, too much time is spent chasing echoes. Subtle manipulations that gather all that is felt and thought and desired into an over-exposure to the times...Once what we hear and apply to life as a rendering of sound is expanded to incorporate all audible phenomena, the real question is not what we have heard? but how to compose in such a way that the life in the sounds follows this modulation from sound image to visual image and back again along a single musical line that extracts from the audible world the actual audio-visual complexity of an event.

An art of sounds moves, in this case, along the twin peaks of sonorous impulsion and compulsion, producing itself as a sound tracking or a modulation of the sound frame that no longer accompanies or inflects upon the structure of aesthetic production, but rather imbues it with a melodic motive that never returns sound to itself. In this way we can dispense with endless reverberations, with desultory echoes, with the telephonic, televisual, or radiophonic murmuring of voices that only ever restore the power of informatics to itself as the essence of a sound picture.

No sound should be called, or considered, inherently musical, but neither is it a case of simply making the whole cosmos an effect of sound, a sound effect. Elsewhere, a melody produces an audience, a crowd, a gathering and a band; it collects people and objects and voices and throws them together as a singular expression of rhythm and precinct and motive to create an art of sounds that abandons the technocratic and corporate structures of "the times" (and its history) altogether; an art of sounds that is composed in the duration **between** a resonant visual image and a melodic sound texture; that is, in the microphonic framing of an audio-visual moment, neither completely heard nor seen, but collected and transposed in time through an extensive musicality.

Notes

[1]Glen Gould, Interview with Tim Page The Glen Gould Reader, edited by Tim Page, (New York: Vintage Books, 1990), p.460
[2]Glen Gould, Glenn Gould Reader, p.17
[3]Glen Gould, Glenn Gould Reader, p.15
[4]Friedrich Nietzsche, "Richard Wagner In Bayreuth," Untimely Meditations, (Cambridge: Cambridge University Press, 1983), p.247
[5]Resistence to the present is central in creating the untimely in art. See Deleuze & Guattari in What Is Philosophy?, (New York: Columbia University Press, 1994) p.108
[6]Jonathan Cott, "Interview with Glenn Gould," Parts One and Two, Australian Rolling Stone, August 29, 1974, p.34
[7]Glenn Gould, Glen Gould Reader, pp.332-346
[8]Gilles Deleuze, Cinema 2: The Time-Image, (Minneapolis: University of Minnesota, 1989), p.cf329, n69
[9]Gilles Deleuze & Felix Guattari, A Thousand Plateaus, (Minneapolis: University of Minnesota Press, 1987), p.348
[10]Russell J. Tinkham, "Anecdotal History of Stereophonic Recording," Audio, May 1962, p.27
[11]Gilles Deleuze & Felix Guattari, A Thousand Plateaus, p.309
[12]This idea of a melodic compound stems from the chapter on percepts and affects in Deleuze & Guattari, What Is Philosophy?, pp.163-199

MUSICAL SYNTHESIS OF DNA SEQUENCES

By Peter Gena

pgena@artic.edu

&

By Charles Strom

DNAguy@aol.com

A bstract

As a consequence of the Human Genome Project, there has been an explosion of primary DNA sequencing data available on CD ROM. This includes complete genomes of viruses, partial genomes of bacterias, and complete sequences for hundreds of human proteins. Consequently, we began to envision a type of computer-generated music that would take cues for its musical parameters directly from the physiological ones present in DNA. A DNA sequence consists of a specified order for the production of amino acids. The physical properties of amino acids (dissociation constant, molecular weight, and chemical class) combined with the properties of the individual bases (melting temperatures) provide the basis for inheritance and evolution and our musical compositions. The converted results, one for each codon, represent distinct musical actions in MIDI note events. Thus far, we have generated musical compositions from several human, viral, and bacterial sequences. This paper outlines our research.

The genetic code is an alphabet made up of four chemical compounds which form the nucleotide bases—adenine (A), cytosine (C), guanine (G), and thymine (T). These bases are linked in a specific order to form the double helical structure known as deoxyribonucleic acid, or DNA. Each individual living organism has a unique order of bases that completely determines its physical structure. The four nucleotides are arranged in three-letter units known as codons. Each codon specifies one of nineteen amino acids. When they are grouped by chemical type, there are eight such categories. The DNA template, located in the nucleus of each cell, acts as a blueprint that directs the production of proteins. DNA is translated into messenger ribonucleic acid, or mRNA that is in turn serially scanned by ribosomes, organelles located in the cell's cytoplasm. Ribosomes use the mRNA as a template to direct the synthesis of proteins.

The initial programming task was to write an algorithm that converts the list of sixty-four codons into distinct musical events according to physical properties. A look-up table of codons and their corresponding amino acid types, followed by the dissociation constant or pK(a) and molecular weight, was constructed as a data-base (Figure 1, below). There are eight
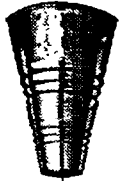
ISEA95 montréal

basic musical timbres; one for each of the eight classes of amino acids. Each of the nineteen amino acids has a distinct pK(a) that helps define pitch. Additional modifications involve physical properties of the molecular bonding occurring in the codon itself, independent of what amino acid it codes for. Using 7.0 as the neutral point in acid/base equilibrium point, pK(a)'s below 7.0 are acidic while those above are basic. Hence, there are two equations for each codon: one correlates higher pitch with acidity, the other with base. The algorithm makes a binary choice with each selection. Pitch bend commands for each note place the music in just intonation.

$$f = ((\ p\ (4G + 2T) + 12) + k$$

$$f_1 = (([p - 7.0])\ (4G + 2T) + 12) + k$$

where:
f & f_1 = MIDI pitches
p = pK(a)
$G = \Sigma G + C$ per codon
$T = \Sigma A + T$ per codon
k = Constant (Hydrogen Bonds):
  $[AA = -2, TT = -1, CC = +1, CG = +2, GC = +3,$
  $GG = +4]$

Intensities (velocity) are also adjusted according to the hydrogen bonding occurring in each codon. As with pitch, there are two corresponding equations for each codon and a binary choice is made with each selection.

$$I = 6H$$

$$I_1 = 109 - I$$

where:
I and I_1 are MIDI velocity levels
H is proportional to codon melting temperature and Hydrogen-bond strength per codon.
$(each\ G = +8, C = +6, A = +4, T = +1)$

The pK(a) and atomic weights of the amino acids determine durations.

$$D = 0.01pM + 0.1Sk$$

where:
D = duration in clock ticks
p = pK(a)
M = molecular weight of amino acid
$S = f$ (sum of hydrogen bonds per codon)
k = tempo constant (>0), higher number = slower tempo

All of the preliminary programming is scripted in Hypercard. The scripts prepare all the necessary data, that is, the table of codons, and the genomes as collections for the MAX object code language (Copyright by IRCAM and Opcode Systems). The initial table data contains the codon, followed by its amino acid, pK(a), amino acid class numbers, and the molecular weight of the amino acid (Figure 1, first column). Each codon is transformed into a list in a collection (Figure 1, second and third columns). The list specifies the address, MIDI pitch, velocity, channel number, pitch bend, and duration of the event for the corresponding codon. A second series of algorithms reads the raw DNA strings for a genome, searches for the start and stop codons, and then forms the three-letter codon sequences (Figure 2, left column). Uncoded filler, ubiquitous extraneous material bearing no significance to amino acid production, is ignored. In addition, each codon from the genome is checked in the look-up table and its codon index number is put into another collection (Figure 2).

dna_MAH		
TGA,STP,2,0 0,0,100	1, 27 78 0 18 20	1, 75 67 0 5 20
TAA,STP,4,0.0,0,100	2, 33 54 0 24 40	2, 99 91 0 5 40
TAG,STP,6,0.0,0,100	3, 59 78 0 19 60	3, 106 67 0 28 60
CGT,ARG,1.821,1.1,4,174	4, 31 90 4 23 32	4, 61 55 4 4 32
AGG,ARG,1.821,1.2,4,174	5, 33 120 4 24 32	5, 58 25 4 28 32
CGC,ARG,1.821,1.3,4,174	6, 38 120 4 24 32	6, 48 25 4 0 32
CGA,ARG,1.821,1.4,4,174	7, 31 108 4 23 32	7, 61 37 4 4 32
AGA,ARG,1.821,1.0,4,174	8, 26 96 4 24 32	8, 73 49 4 1 32
CGG,ARG,1.821,1.5,4,174	9, 39 127 4 18 32	9, 46 18 4 28 32
TGC,CYS,1.900,2.1,6,121	10, 33 90 6 24 23	10, 61 55 6 4 23
TGT,CYS,1.900,2.0,6,121	11, 26 60 6 24 23	11, 73 85 6 1 23
CCG,PRO,1.952,3.3,7,155	12, 38 120 7 1 31	12, 51 25 7 5 31
CCC,PRO,1.952,3.1,7,155	13, 35 108 7 19 30	13, 52 37 7 31 30
CCT,PRO,1.952,3.0,7,155	14, 32 78 7 26 30	14, 63 67 7 21 30
CCA,PRO,1.952,3.2,7,155	15, 32 96 7 26 30	15, 63 49 7 21 30
ACG,THR,2.088,4.0,1,120	16, 34 108 1 28 25	16, 63 37 1 21 25
ACT,THR,2.088,4.1,1,120	17, 28 66 1 31 25	17, 75 79 1 21 25
ACA,THR,2.088,4.3,1,120	18, 28 84 1 31 25	18, 75 61 1 21 25
ACC,THR,2.088,4.2,1,120	19, 33 96 1 24 25	19, 64 49 1 31 25
GAT,ASP,2.122,5.0,2,134	20, 28 78 2 31 28	20, 75 67 2 21 28
GAC,ASP,2.122,5.1,2,134	21, 32 108 2 26 29	21, 66 37 2 10 29
GAA,GLU,2.13,6.0,2,148	22, 26 96 2 24 32	22, 78 49 2 10 32
GAG,GLU,2.13,6.1,2,148	23, 32 120 2 26 32	23, 66 25 2 10 32
TCT,SER,2.186,7.3,1,105	24, 28 48 1 31 23	24, 75 97 1 21 23
TCA,SER,2.186,7.2,1,105	25, 28 66 1 31 23	25, 75 79 1 21 23
TCG,SER,2.186,7.5,1,105	26, 35 90 1 19 23	26, 64 55 1 31 23
AGC,SER,2.186,7.1,1,105	27, 36 108 1 22 23	27, 63 37 1 21 23
AGT,SER,2.186,7.0,1,105	28, 28 78 1 31 23	28, 75 67 1 21 23

Figure 1: Partial Table of Codons
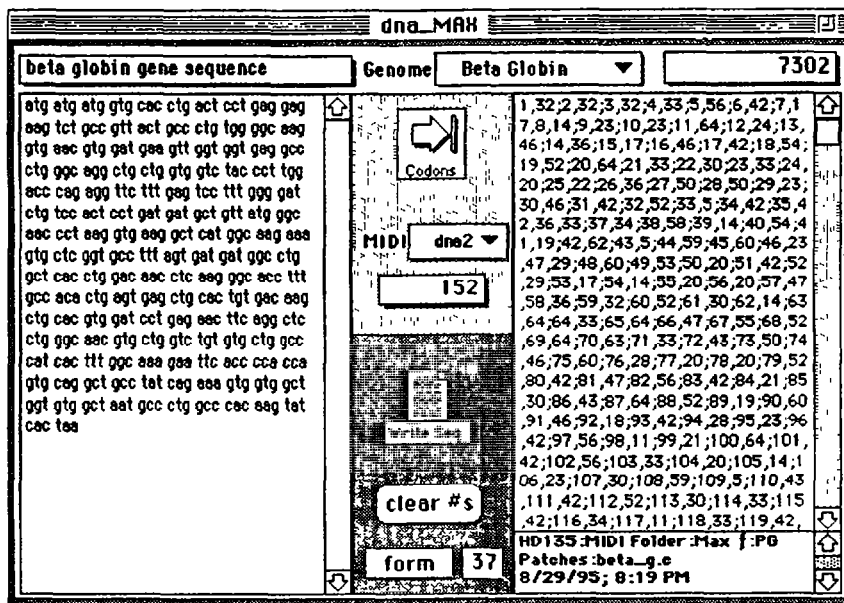
Figure 2: Genome for Beta Globin

Actual genomes of human or bacterial proteins, or complete viruses can then be scanned by the DNA Mixer patch (Figure 3) so that each of the codons is culled from the data-base table and then played in real-time linear sequence as MIDI events. The mixer can play up to five individual sequences at different starting points. This process is analogous to the scanning of the mRNA by the ribosomes as it adds amino acids sequentially to make proteins—a process not unlike several cars (ribosomes) on a roller coaster negotiating the identical track (mRNA), but at different locations, speeds, and spacings. Polyphonic voices can occur just as multiple ribosomes run along a single strand of mRNA. At this point in our work, the computer performs the music on a Yamaha TX802 digital synthesizer according to a duration constant (the greater the constant, the longer each relative MIDI event).

Thus far, we have generated musical compositions for blood and liver cells, the polio virus, botulinin toxin (botulism), measles, rubella, four distinct common cold viruses, and the HIV virus (we have presently avoided most human proteins because of large amounts of uncoded filler found in between sequences). The next major goal is to realize the Smallpox (Variola) Virus (now extinct save for two vials in Atlanta and Moscow respectively). Because of its many distinct sequences and extreme length (20,000 base pairs), the MAX patch presently being used will require some modifications. Future plans also include the investigation of replacing MIDI events with real-time synthesis programming.

© Peter Gena 1995
School of the Art Institute of Chicago
Chicago, IL 60603

© Charles Strom 1995
Section of Medical Genetics
Illinois Masonic Medical Center
Chicago, IL
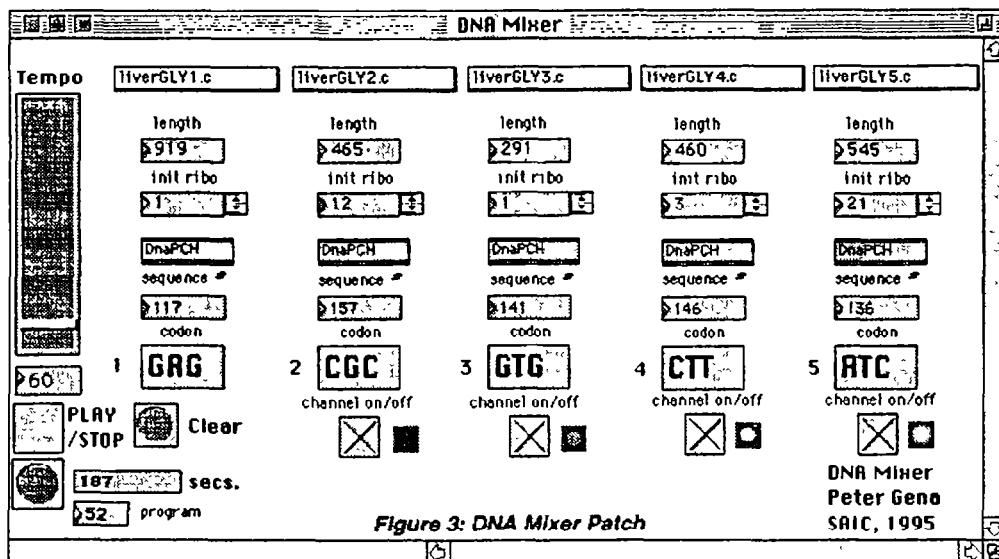
Figure 3: DNA Mixer Patch

IMAGING DIRECTLY ON THE RETINA

A PROGRESS REPORT

By Elizabeth Goldring

goldring@mit.edu

M y intention is to keep my highly damaged visual sense alive by using the Scanning Laser Ophthalmoscope (SLO) as a seeing device to foster visual poetry as well as communication over the Internet. In 1979 I wrote:

> *Things are disappearing*
> *Branches from trees*
> *Pieces of words*
> *Lines in faces*[1]

As I began to lose my eyesight I developed an increasing appetite for technology including cameras, lenses and any available "seeing machine". I used this technology both to bolster my fading eyesight and to create new kinds of visual sensations that I could use to express myself.

At this time I was exceedingly lucky to be a Fellow at MIT's Center for Advanced Visual Studies. CAVS was founded by Gyorgy Kepes in 1967 as a workshop where artists could encounter scientists and engineers. It was at the forefront of a global awakening to art-science-technology as a movement. Its purposes were as humanist as the traditional values of art rather than military or industrial. New tools were being evolved that were replacing "oils" and "the violin"; transmittability of images was becoming at least as important as expression. Artists worked in groups on large-scale installations as well as pursuing individual projects. With MIT as a candy store and the large collaborative artistic projects encouraged by its longtime director Otto Piene as venues, CAVS artists working in diverse media were pioneering new genres of Art and Technology, e.g. Harriet Casdin-Silver's solar tracked daylight holograms; Eric Begleiter's holographic candy; Jennifer Hall's virtual reality glove; Piotr Kowalski's Time Machines; Shawn Brixey/Laura Knott's Photon Voice (light and sound responsive particles levitated in a flask interacted with the movement of a dancer). It was an environment charged with new materials, experimentation, poetry, magic where, among other things, artists were attempting to render the invisible visible. We shared work and ideas at bimonthly Fellows meetings. It was here that I first saw some video synthesis techniques employed by Vin Grabill[2], then a graduate student in the Master of Science in Visual Studies Program at CAVS. In the ensuing months we began a collaboration that has continued for 10 years.

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

Terrified and mesmerized by what I saw "from the inside out "as my eyesight worsened, I was observing something remarkably akin to Grabill's video synthesis techniques of light edged shapes, streaked and pointillist light surfaces and loose green jello movement.

Adapting his video techniques, Grabill and I produced "The Inner Eye: From the Inside Out" (1989, 21 minutes).It is my story of vision loss due to proliferative retinopathy and repeated vitreous hemorrhaging. My Eye Journals, drawings, watercolors, audio tapes and poems provide the basis for the video. In exploring my disintegrating vision as interference patterns of light and color, my poetry, photography and multi media installations also expose interferences among words, images and sounds in tightly serrated space. "The space is locked inside my head...it doesn't even get so far out as your slit lamp lens...it is from the inside out"[3] Grabill and I also collaborated on interactive media installations and environments designed to heighten the viewer/participants' understanding of vision loss.[4]

Grabill accompanied me to medical examinations and therapeutic attempts to save my remaining sight. Physicians at Joslin Clinic's William Beetham Eye Institute and research scientists at the Schepens Eye Research Institute in Boston, supported our project because they felt it might help health care professionals to better understand the psycho-physical condition of vision loss. They opened up their laboratories and research facilities to our cameras and became important consultants to the project.[5]

Ongoing efforts to preserve and augment my remaining sight riveted me in front of two laser propelled devices. I recognized that each offered unique explosive artistic potential. Using a direct feed video link we were able to shoot live footage of my laser treatment or photocoagulation therapy sessions. We also aimed the video camera directly at the laser itself, thus discovering that we could achieve abstract electronic rendering of my subjective impression of laser treatment. These images haunted my remaining vision and are central to the fabric of "The Inner Eye: From the Inside Out".

While we were compiling the video, I was also introduced to the Scanning Laser Ophthalmoscope (SLO), a diagnostic tool used by physicians to visualize the retina (the back of the eye) in order to evaluate it. During one such examination of my retina, the SLO operators asked me to identify a stick figure. The SLO scanned the image with laser projecting it onto my retina, past the hemorrhages on the front of the eye that contributed to my blindness (at the same time my physician could observe an enlarged image of my retina on a monitor).

I was delighted that I could see that stick figure and I asked the SLO operators if they could project a word - the word "sun" - it was the first word I had been able to read for many months. Working with researchers at the Schepens Eye Research Institute, Grabill and I experimented with hand scrawled letters and a camera. These initial experiments using the SLO appear in

"The Inner Eye: From the Inside Out" as harbingers of my concept for "retinal poetry".

Enthusiastic about the prospects of the Scanning Laser Ophthalmoscope for non-medical applications I contacted its inventor, Robert Webb, Senior Scientist at SERI. He was intrigued by a possible new use for his invention. Since 1989, my collaboration with Robert Webb has lead to several experiments in visual poetry seen through the SLO, the genesis of a visible language for the Blind and a test of communication over the Internet using the Scanning Laser Ophthalmoscope.

Frightened by my own experiences, I was determined to keep the Blind and visually challenged from sinking into a state of deep Blindness where, according to John Hall in *Touching the Rock: An Experience of Blindness* (Pantheon Books, 1991), the memory of images disappears altogether, and the visual sense, it would seem, atrophies from disuse. The noted neurologist and author, Oliver Sacks, says of John Hall's account:

> *There has never been, to my knowledge, so minute and fascinating (and frightening) an account of how not only the outer eye but the "inner eye" gradually vanishes with blindness, or steady loss of visual memory, visual imagery, visual orientation, visual concepts (at one time he cannot remember whether the number three points backward or forward); of the steady advance or journey (which for him takes five years) into the state which he calls "deep blindness".[6]*

I became determined to fight isolation (including my own) by creating an electronic palette of tools for visual communication. Existing seeing machines don't work well - it's partly the technology, mostly it's the lack of software. The visually challenged are still expected to be able to peruse tomes like *War and Peace* although the torturous reading of every line of every letter in every word and the ensuing nausea from looking at dense texts on closed circuit monitors often tasks the most persistent attempts. It's no wonder that visually challenged people (myself at certain points included) may be prematurely ready to close their eyes to the dimension of sight.

In my quest for "retinal poetry" and the poetics of a visible language for the Blind I knew I must provide formally simple images that could be transmitted onto the peripheral areas of damaged retinas like my own. In 1991, for "Experiments in Visual Language Seen Through the SLO", Webb and I collaborated with CAVS artists to transmit images onto my retina via the SLO. These images, live camera poems, fires, faces and brushed calligraphy evinced qualities of strong, visceral artworks. During the performance, the audience at CAVS could see a wall size image of my scarred retina watching as Piene's word FIRE written in fire faded to embers and as Keiko Prince seemed to caress my retina with her brush strokes. I was also researching ancient and contemporary pictorial languages as well as international signs and symbols as background material for a visible language for the Blind. One measure would eventually be what I could read using the SLO and my right eye with little or no usable vision.

My emerging visual language employed basic English three and four letter nouns, verbs and words indicating spatial relations (e.g.. prepositions). Looking at pictorial image equivalencies for these words I created word-images - combinations of letters and graphically enhanced forms, signs and symbols. For example, the word sun becomes s o n and is hence easier to read because in this case the curvilinear shapes of the letters are separated. Additionally, the graphic enhances the meaning of the word. These reinforcement aids are desirable, especially when one must read up, down and around the lines of each letter that forms a word before grasping the meaning of the word, unlike the fully sighted person who scans the tops of letters and reads sentences in the same amount of time it may take a visually challenged person to look at a single word. Hence, as I have already suggested, no matter which seeing machine is used reading dense texts is an improbable task for the visually challenged.

My growing library of word-images (stored in Hypercard) is the basis for poems and poem animations that I am creating using the Mac. I find that poetry is a way to express oneself economically - using only a few words and images at a time to provide artworks that visually challenged individuals may take the effort to enjoy. To date, most of the work has not been done in color because the commercially available SLO is currently a high resolution monochromatic system. Qualities of motion explored with the poem animations are of increasing interest to me. At the moment, the cyberspace environment of the SLO is unforgivingly 2 dimensional. Through computer animation this space can perhaps be extended, although the SLO does not rely on stereoscopic vision. I am now animating fonts using a Silicon Graphics Imaging program and am studying color values in terms of spatial potential.[7] These experiments have yet to be tested in the Scanning Laser Ophthalmoscope environment.

Testing the library of word-images stored in Hypercard with the SLO required us to forge a Mac-SLO interface. Once the Mac/SLO link had been accomplished, attempting to communicate over the Internet seemed like a logical next step.

The Internet, established as a means of global communication, is primarily a visual tool. It is my fear that the Blind and visually challenged communities will not become Internet users unless visual as well as audio software is developed to accommodate their specific needs (including the establishment of graphically enhanced WWW sites catering to visually challenged users).

Testing the feasibility of the SLO-Internet connection involved a teleconference over the Internet between two locations at MIT. I was at CAVS. William Mitchell, Dean of the School of Architecture and Planning, Dr. Lloyd Aiello, Robert Webb and Vin Grabill were in the Dean's office several blocks away from CAVS. Using software that produces live video over the Internet the group in the Dean's office were able to observe my retina on their computer screen as I looked at examples of my word-images and poem animations. The group then turned a live video camera on each other's faces and I was able to see each of them as they spoke. This was exciting for me since faces normally appear as unrecognizable blurs. The implication is that communication over great distance seems possible allowing Blind and visually challenged persons to read a poem or see a child's face, a micro-organism, a quasar or a star.

To date the SLO is an unwieldy, expensive, exotic machine that only works if you have some living retina. Hopefully one day there will be cheap, portable Scanning Laser Ophthalmoscopes and it will be feasible to bypass the retina by going directly to the heart of the visual cortex. So far, although I suffer from macular degeneration and proliferative retinopathy , two leading causes of blindness, I am a "tested" audience of one. Software and hardware must be coordinated and made flexible and pervasive enough to respond to many. The time is ripe. The Internet needs to attract visually challenged users now, at "the dawning of the age of global communication". Technology is now sophisticated enough to be able to include us all if our inclusion becomes a priority. Electronic palettes used interactively and creatively by the visually challenged can potentially produce new ideas and new forms of expression that in fact cannot be made by the fully sighted. By attacking the problem of how to include the visually challenged on the Internet, it is quite possible that some general communications problems will be resolved - such as how to make WWW sites graphically stronger and hence globally more accessible. It is my hope that Internet activists and sponsors will enable research institutes like MIT to make their laboratory technology available for exploration and play so that the visually challenged constituency can promote multi-sense communication.[8]

Notes

[1] Elizabeth Goldring, in Laser Treatment (Boston, Blue Giant Press, 1983).

[2] Vin Grabill is associate Professor of Media at the University of Maryland, Baltimore County

[3] E. Goldring, Eye journal/video narration, "The Inner Eye: From the Inside Out", 1989

[4] "Eye/Sight", Lights/OROT, Yeshiva University Museum, 1989; Celebration of Light, Savonlinna, Finland, 1990; Options, Washington Project for the Arts, 1991, "Eye Room", Light, Space, Time, MIT Museum, 1994.

[5] in particular, Dr. Lloyd Aiello and Drs Jerry Cavallereno and Sven Bursell (Joslin clinic); Dr. George Timberlake (SERI)

[6] from "The Dark Paradoxical Gift", New York Times Review of Books, April 11, 1991

[7] The SGI work uses programs developed by the Visible Language Workshop, Media Lab, MIT and applied by YinYin Wong as part of her thesis project.

[8] Canon USA, along with Apple Computer and SONY have supported the SLO Internet and Visual Language for the Blind projects. MIT's Council for the Arts, CAVS, the Undergraduate Research Opportunities Program and School of Architecture and Planning have also contributed substantially to these explorations.

The CUBES

Gary R. Greenfield

Department of Mathematics & Computer Science
University of Richmond
Richmond, VA   23173

email: grg5l@mathcs.urich.edu

Abstract

This project exploits author-developed tools for computer art that are based upon artificial life principles. The goal of this project was to extend artificial life art-by-choice methods for creating abstract two dimensional computer art to methods for creating abstract three dimensional computer art. Of particular importance were: (1) exploring artist's tools that could "control" artificial life art, (2) escaping the so-called "tyranny of the rectangle," and (3) meeting the challenge of expressing oneself in virtual non-planar abstracts.

This project culminated in a series of twenty-two screen-rendered hollow cubes — The CUBES — which are witness to an uneasy alliance between an electronic artist and his sense of virtual vision. Though evolved using artistic art-by-choice aesthetics, this series of cubes cannot escape their mathematical nor technological underpinnings. They do, however, evince new ideas about both dimensionality and expressionism. The CUBES documents the struggle inherent in the emergence of a new art form.

The artistic directions established by artificial life art (also referred to as art by choice [9]) are now progressing beyond the initial visions of its founders and luminaries, Karl Sims [11] and William Latham [13]. The "look and feel" of the evolving images interface has becomes more prevalent, the paradigm of images governed by aesthetics has become (for better or worse) more widely accepted, and the implementation skills and technical requirements underlying the methodology have become better understood. Application domains have expanded to include sculpture [10], virtual reality [4], and the automation of aesthetics [1]. But one might ask: What advances have been made by the digital fine artist?

The author has been concerned with the development of artificial life methods for *computer artists*, because they represent an exciting new future, one reaching beyond classical drawing tools and first-generation compositing tools. This concern has led to a a more carefully conceived version of artificial life methods; one which fosters greater involvement by the artist and seeks to minimize the amount of computing power required. The author has implemented a suite of algorithms which enhance the basic artificial life evolution of images system and provide new *artist's tools* for controlling this *next* computer art [7]. This led directly to the project described below.

In three dimensions, artificial life art has been relegated to a functional role, serving as a "generator" for form, texture, hue, and motion primarily for animation purposes. It has not been conceived of as a "generator" for expressionism. The project described here assumes this latter point of view. This project arises from an implementation of artificial life techniques designed to take classically flat, in fact, square two dimensional abstracts which such methods recognizably create (see Figure 1) and extend them to cubes, NOT by surface mapping, but by generating 3D volumes. This resulted in the series of virtual images called "The CUBES."

The works themselves touched on a a variety of themes. There was no way to confine the subject matter. The works are a response to two innate but difficult questions. What should the artist attempt to communicate through the cube? What should the viewer as participant sense about the cube? It will be worthwhile to consider in necessarily brief detail four explicit examples. They will deftly illustrate what can be seen, felt, experienced, and learned from the cubes.

Gift Logged Equation (see Figure 2) is a cube that is most assuredly a
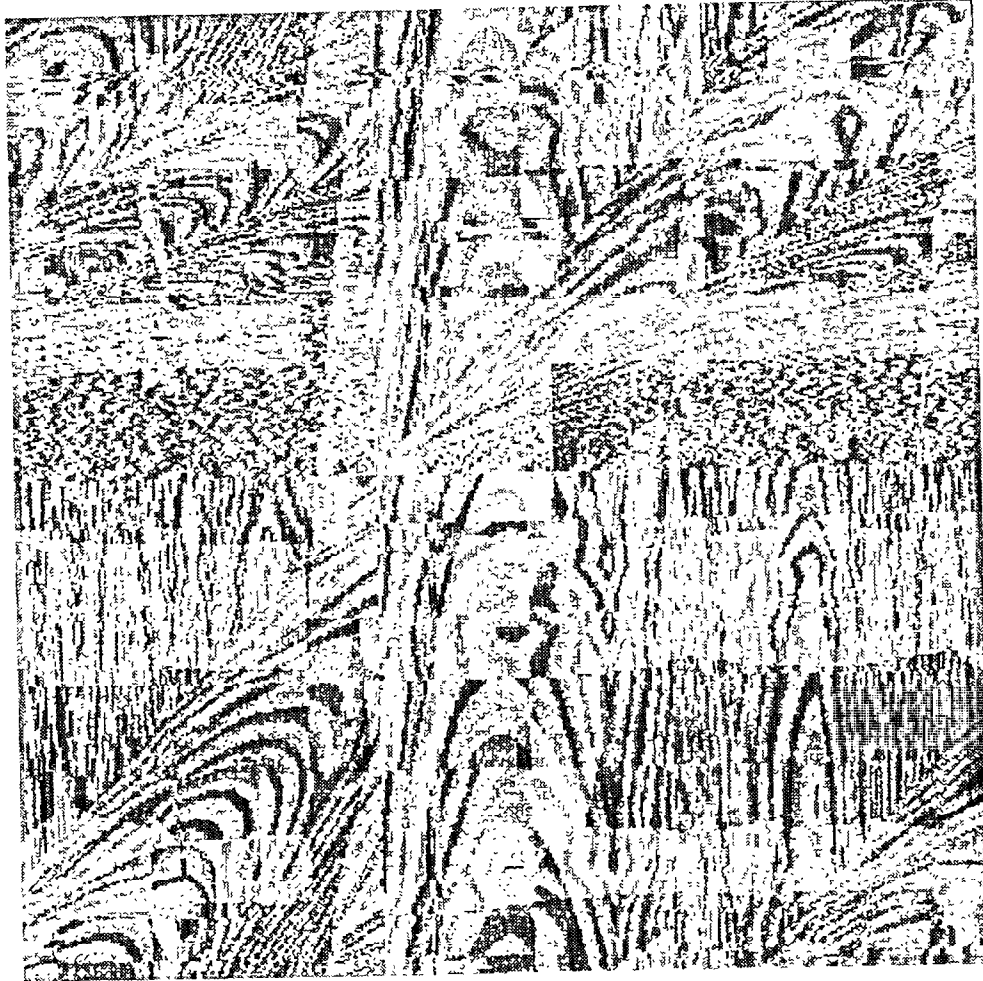
Figure 1: Artificial Life Art example: *Yellow and Gold.*
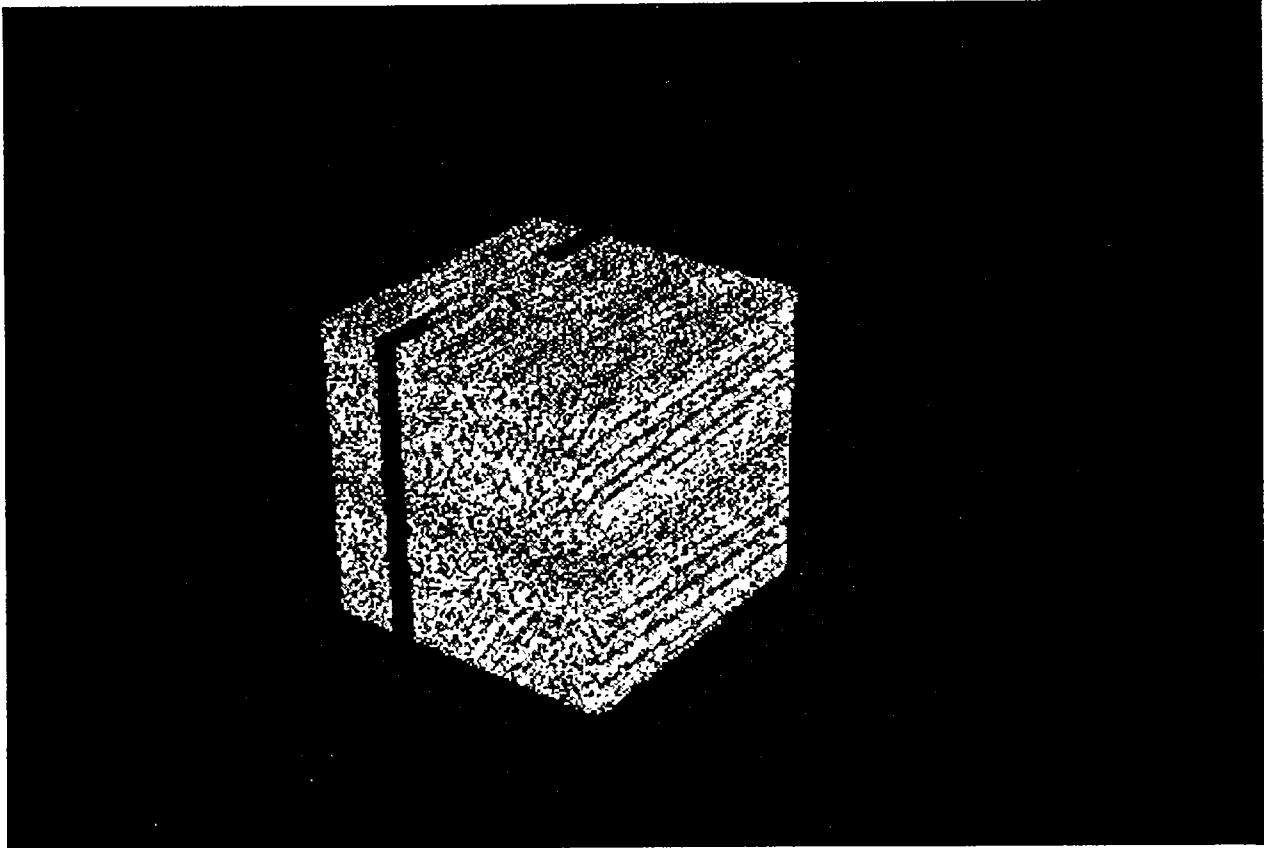
Figure 2: The CUBES: *Gift Logged Equation.*

present to the viewer. But does the viewer remember that an evolution scheme gift-wrapped this cube for us? Where is the dividing line between artist creation and algorithmic creation? This cube is a stark technical cube, cold yet inviting. It tests the limits of our believability in the virtual image. Sometimes it is real, often it is not real enough. Why is there so much sense of form and pattern but no sense of color? Some will quickly dismiss it, others will see it as a prime example of the new art form.

Sultan's Cube (see Figure 3) is a cube of contrasts, conceived in secrecy yet still very personable. It reminds us of the isolation of the harem in spite of the harem's pervasive human contact. It is permeated with gentle overtones of its Persian origins, a hint of the exotic, and a sense of its own luxury. It
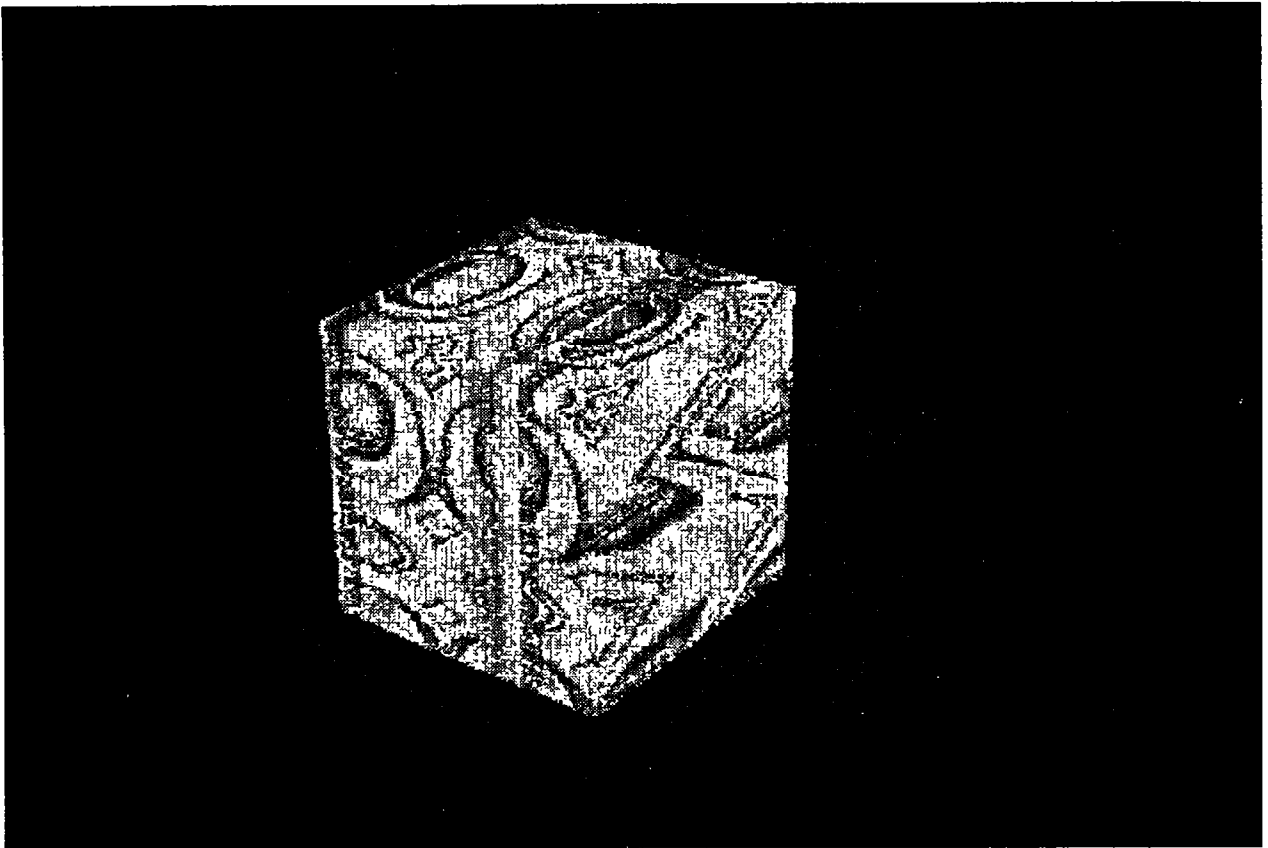
Figure 3: The CUBES: *Sultan's Cube.*

is at once inviting and unattainable. The viewer lingers, the artist lingers. It is perhaps the most serene cube. The viewer is required to reconcile its "hard" geometry with its is "soft" theme.

The Covenant Cube (see Figure 4) has strong psychological content, for now we yearn to know what is inside the cube. Evidently, the markings on its front are signs made by those who formed the covenant. It is clear we will never know much. The cube is conspicuous. Its creators have little to fear from us, or little care of us.

"Engulf" (see Figure 5) is a seething, passionate cube. It has a dangerous, hot, and fiery temperment. It has already begun to follow its course of
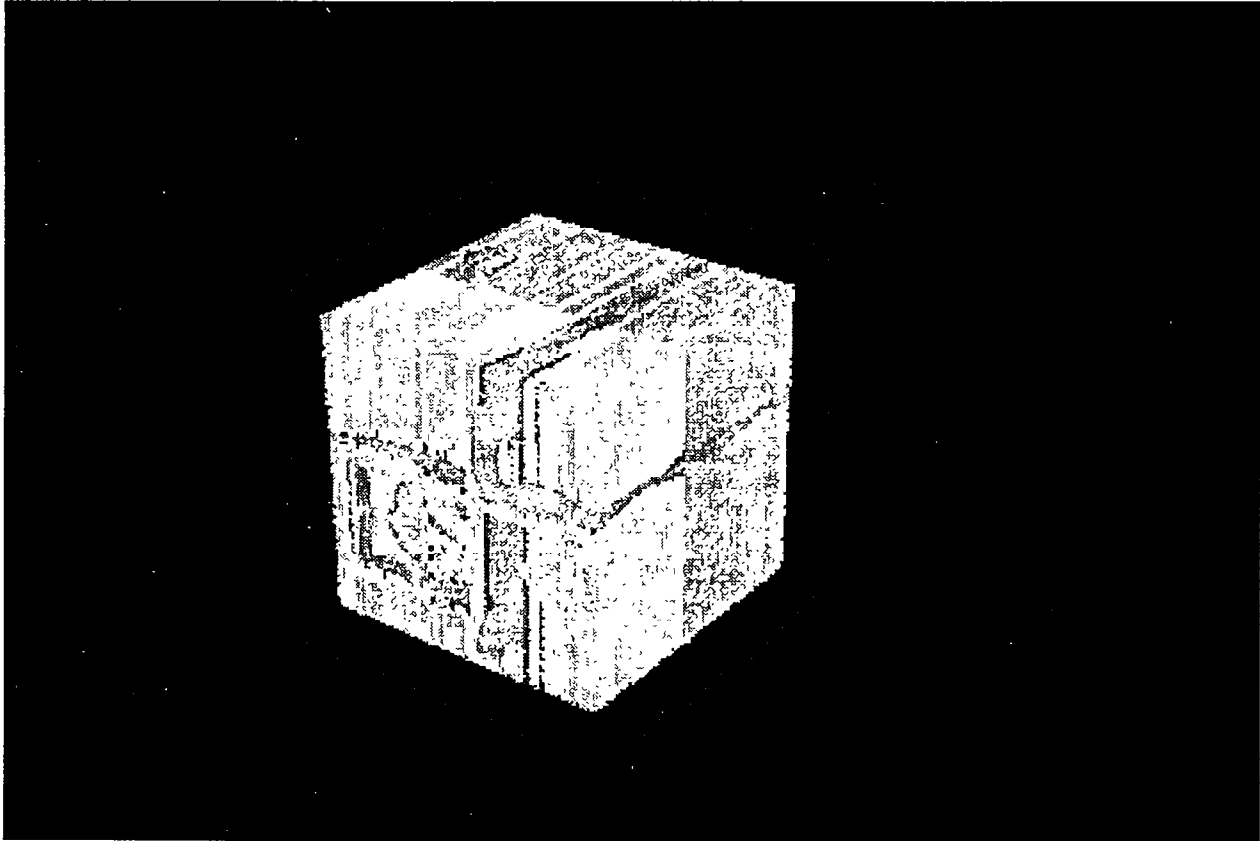
Figure 4: The CUBES: *Covenant Cube.*
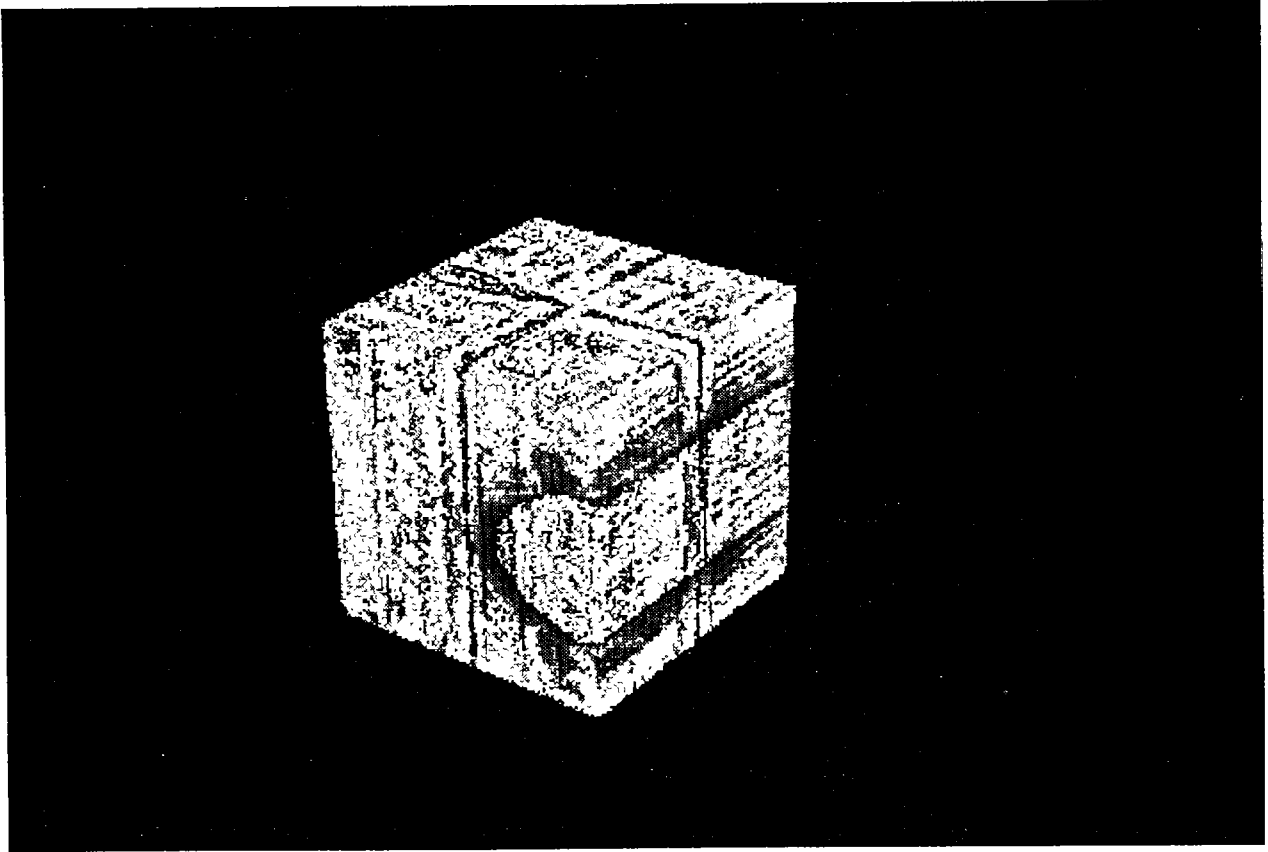
Figure 5: The CUBES: *Engulf.*

confined destruction. The viewer feels lucky to be at a safe distance from it. But might the viewer wish to be engulfed? The viewer should ask, Why is this cube so successful?

There is much to see and experience in every cube. As a presentation, The CUBES will include slides of most of the cubes, allowing the viewer to pierce through their surfaces with the aid of additional commentary, clues, cues, and prompts. There are brief clips from a video that was made of the author trying to search, capture, coax or mold, as the case may be, an emergent cube. The presentation is a forceful example of the variety, diversity, *and expressive content* that artificial life brings to the artist's sense of vision.

Acknowledgements

References

[1] S. Baluja, D. Pomerleau & T. Jochem, Towards automated artificial evolution for computer-generated images, *Connection Science*, **6** (1994), 325–354.

[2] E. W. Bonabeau & G. Theraulaz, Why do we need artificial life?, *Artificial Life*, **1** No. 3 (1994), 303–325.

[3] Richard Dawkins, The evolution of evolvability, 201–220, *Artificial Life*, Christopher Langton (ed.), Addison Wesley, Reading, MA 1989.

[4] S. Das, T. Franguiadakis, M. Papka, T. DeFanti & D. Sandin, A genetic programming application in virtual reality, *Proceedings of the First IEEE Conference in Evolutionary Computation, June 1994*, **1** (1994), 480–484.

[5] James Elkins, Art history and the criticism of computer-generated images, *Leonardo*, **27** No. 4 (1994) 335–342.

[6] James Foley, Andries van Dam, Steven Feiner & John Hughes, *Computer Graphics — Principles and Practice*, Addison-Wesley, Reading, MA 1990.

[7] G. Greenfield, Controlling art by choice, in preparation.

[8] Craig Hickman, Why artists should program, *Leonardo*, **24** No. 1 (1991), 49–51.

[9] Lev Manovich, The engineering of vision and the aesthetics of computer art, *Computer Graphics*, **28** No. 4 (November, 1994) 259–263.

[10] F. McGuire, The origins of sculpture: evolutionary 3D design, *IEEE Computer Graphics and Applications*, (January, 1993), 9–11.

[11] Karl Sims, Artificial evolution for computer graphics, *Computer Graphics*, **25** (1991) 319–328.

[12] Alvy Ray Smith, Panelist, Computer Technology and the Artistic Process — How the Computer Industry Changes the Form and Function of Art, Siggraph '94, Orlando FL, 1994.

[13] Steven Todd & William Latham, *Evolutionary Art and Computers*, Academic Press, San Diego, CA 1992.

[14] Steven Todd & William Latham, Mutator, a subjective interface for evolution of computer sculpture, IBM UKSC Report 248, 1991.

[15] Mark Wilson, *Drawing with Computers*, Perigee Books, New York, NY 1985.

HORIZONTAL RADIO
A TELEMATIC RADIO
NETWORK PROJECT

By Heidi Grundmann
ORF KUNSTRADIO
&
Concept, Planning and Coordination
By Gerfried Stocker
x-space

http://www.thing.ac.at/thing/orfkunstradio.html

*A co-production between the Ars Acustica experts group of the EBU
(European Broadcasting Union) and TRANSIT, KUNSTRADIO (Austrian
National Broadcasting Corp.) and the Ars Electronica Festival'95.*

24 hours live on the frequencies of many radio stations in Australia, Canada, Europe, Scandinavia, Russia and Israel.

In the Internet and at the network intersections in Athens, Belgrade, Berlin, Bologna, Bolzano, Budapest, Edmonton, Helsinki, Hobarth, Innsbruck, Jerusalem, Linz, London, Madrid, Montreal, Moscow, Munich, Naples, Québec, Rome, San Marino, Sarajevo, Sydney, Stockholm, Vancouver.

June, 22 noon to June, 23 noon (CET)

H ORIZONTAL RADIO was a telematic radio network project, that took place simultaneously at different locations, in different media and on different frequencies and bandwidths.

The starting point was the analogue cable and broadcasting network of the EBU (European Broadcasting Union), which served as a primary telematic sphere of action and was connected in several cases to independent radiostations or interfered with by pirate radio. Linked to this network was the Internet, which served as a medium of access and distribution beyond the broadcasting range of the participating radio stations but also in some aspects as a possibility to influence the broadcasts.

The basic intention was to allow the unfolding of a media structure as heterogeneous as possible - as opposed to the unifying and standardized pressures of "communications' by the big broadcasting institutions and entertainment conglomerates.

HORIZONTAL RADIO functioned as an experimental field of tension generated by the highly differing characteristics of transmission and communication of the classical isosynchronous properties of radio and the asynchronous context- and download-related properties of digital data networks (on demand, random access, caching).
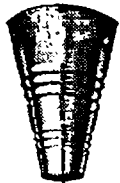
HORIZONTAL RADIO, instead of perpetuating the vertical hierarchy between clearly defined transmitters and receivers turned into a platform for the exchange of transmissions.

Each individual radio station had to determine its role in the network, e.g. by making its own selection of artists, subprojects and materials.

A series of regional sub-networks not only served as geographical bridges but also as gateways between different media and bandwidths. As a consequence. they created the preconditions for the desired decentralised structure, in which the individual station did not have to build up links to all other stations in order to be connected to them.

The following devices were employed
As carrier media analogue modulation lines for the transmission of hi-fi audio signals (stereo/mono)

- ISDN and standard telephone lines with corresponding frequency range reductions (7kHz: 3.4kH)
- data transmission lines in the shape of ISDN or standard telephone lines for the remote access to musical computer equipment (e.g. for the purpose of real-time sound installations).
- the Internet as a caching server and as a medium of communication, interaction and distribution as well as a stage for conferences (telnet. ftp. irc. www. social netbrowser)
- VHF, MW and SW.

The resulting differences in sound quality served as an artistic tool and provided one of the very few means of orientation as regards the geographical areas and media covered by HORIZONTAL RADIO. Differences in sound were consciously used by some participants as "soundscape signatures" which helped to identify transmitters acoustically.

Such a network environment implies an artistic conception that places less emphasis on primary production and more on dialogic distribution and administration.

"Hi friends!
I am sorry your event is closing down in one and a half hours. I have been listening to your night program on FM4 until the small hours of the morning and I have not missed one of the programs on the cultural channel.
To me - a radio and net freak - it was a fantastic adventure to somehow have been part of it. The event has changed my attitude towards nets and about what radio could be in the future as well as my attitude towards information .... "
(e-mail msg. to the Austrian Radio on June 23rd)

HORIZONTAL RADIO proved to be a unique event. It was realised by more than 200 artists (the exact number may never be found out) together with a truly unknown number of technicians and organizers. At locations far apart, in different media and on different bandwidths, a wide variety of projects took place simultaneously and, together, drew an image of the rapidly changing communications technologies of our time and their cultural implications.

Unlike e.g. the transmission of the New Year's concert of the Vienna Philharmonic or the soccer championships HORIZONTAL RADIO did not have a center, from which the event was transmitted to the whole (passive) world. Instead, the stations, while receiving contributions from - sometimes many - other participants, simultaneously transmitted their own contributions into the net. The result were constantly changing constellations and connections between the participating radiostations, the Internet and the physical sites, at which performances and concerts took place in front of big and small live-audiences and/or people walked through - in some cases interactive - installations. The hierarchical transmitter-receiver model of traditional mass-media was replaced on many levels and in differing intensities by a model of being a participant or at least being part of it...

In projects like Horizontal Radio artists first assume the role of initiators, organizers, managers, who develop a situation inside networks, in which an unknown number of participants/users will in an effort of distributed authorship be able to contribute to the unfolding of a "piece". This "piece" or "work of art" relates, if at all, only in some aspects or rather fragments to traditional definitions of a work of art. Similar to Christo, artists acting as initiators/organizers of telematic events consider the preparation and design of the situation as part of their artistic activity. But - other then in Christo's projects - the unfolding of the event itself, its holistic form ("gestalt") and its specific contents escape any control by the initiators, who turn into co-authors among many other participants and users. Each of those - even the most passive user of a radio-programme - develops his or her completely unique image of the whole structure (sculpture), an image that cannot be anything else but a fragmentary memory of something much bigger, something that is breathing like a living organism, constantly changing shape and energy - sometimes resting, sometimes almost bursting.

The theme : M I G R A T I O N

How and by which artistic means the participants interpreted this theme was completely open. There was no central agency controlling content or form of any contributions. (It would not even have possible to spot contributions differing from regional or national broadcasting laws in time to prevent their live transmission....) Due to this artistic freedom the material used for HORIZONTAL RADIO in retrospect proves to be an unexpectedly rich anthology or international radio- and telecommunications art of the 90's: all possible genres were represented from live-soundscapes to complex tape-compositions, from live- concerts to multi media performances, from moving

collages of interviews/sounds/music and literary texts to telematic simultaneous events between some of the participating stations, from sound sculptures to sounds, texts and collages triggered by the Internet etc.

Anything delivered into the Net - sounds, compositions, texts, images - data - turned into material, which could be manipulated and changed by any other user/participant to be sent on and changed again....Our ideas about authorship or intellectual property lost their meaning. In the case of HORIZONTAL RADIO also the most traditional sound-text-compositions, broadcast on the radio broke down into data, that could be mixed, layered, manipulated live with all the other data arriving simultaneously from other places in the world or recorded in an earlier stage of the event. Parts of the live mixes were picked up by other stations and woven into new broadcasts and so on...No performing rights association will ever get an accurate report on HORIZONTAL RADIO....For instance it is entirely impossible to unravel the collages, mixes, layerings of material that arrived live on telephone lines, stereolines, monolines, ISDN during the 10 hours broadcast by the Austrian National Radio as to what their exact sources let alone their authors were. The mixes and layerings were not done by one particular author; sound engineers had as much to do with them as the narrators in the studio, chance effects or the artists working on the Internet projects which again released sounds into the radio-mixes etc.

No user/participant/author/"co-conspirator" (self-definition of participating artists group) could come close to perceiving the event in its entirety how it spun itself around the globe. Each location - the physical locations of performances or installations delivering material into the radio-net and the Internet, as well as the different radio broadcasts by national or independent radios around the world or the Internet - presented a completely different "image" of the event to its users/listeners.

A project like HORIZONTAL RADIO is - we thought - only alive as long as the network organised for the event stays active, i.e. for the duration of the time-span negotiated in a complex process between organizers, institutions, technicians, subsidy-givers, sponsors etc. It is here that analogies of telecommunications art to "art in the public space" make a lot of sense.

With HORIZONTAL RADIO a 24 hour period had been given as the frame-work in which radiostations transmitted and received by whatever lines they could technically and financially muster. The 24 hours were also the framework for live performances and installations with or without live audiences in a physical space and they were the framework for Internet activities.

In the meantime it has become apparent, though, that the project did not stop at noon on the 23rd of June. The performances and installations are gone, true, but radiostations keep on broadcasting bits and pieces from HORIZONTAL RADIO

and though some of the servers active during the project seem to be inactive now, others go on (REAL AUDIO Server) and some of the on-line projects will be revived. The documentation of HORIZONTAL RADIO keeps quite a few people busy, challenges them with questions on how or whether it is possible to "write" a history of telecommunications art. And new plans are made for other versions of HORIZONTAL RADIO.

HORIZONTAL RADIO just as its - less complex - predecessors was and is a collage of different spaces, locations, materials, technologies and systems. The project operated in the "found" (existing) transmission and broadcasting spaces of international public and independent radios, of the telephone of Internet. In telecommunications art we can recognize artistic strategies and intentions, which have been crucial to the development of art in our century. These strategies and intentions however are transferred into a context, which challenges both the role and definition of art and artists in our society.

The importance of sounds (and text) in HORIZONTAL RADIO points to the fact, that it is still more promising - also artistically - to get a hold of virtuality, virtual reality by means of sound - and therefore the absence of images - than by computer images rooted in a naive realism. Just as minimal art has taught us to reconstruct the wealth of the concept of sculpture out of the absence of its many possibilities and aspects, sounds permit the reconstruction of an incredible wealth of virtual images out of our individual memories.

A project like HORIZONTAL RADIO amassed so many data that an image of our changed relationship to data/information developed. It became clear that metaphors like speed - let alone infobahn etc. - belong to the past, do not apply. Instead one got the image of a geometry in which each place is of equal distance and in which data is not located at any specific place but floating. It is either there or not there, the users/listeners are either in it/with it or out of it. On or Off. Nothing in between. The passage from being without to being within the domain of information is abrupt, sudden, complete. Once you are in, you are.... everywhere.

As soon as the floating data become visible/audible to a specific user they turn into information: they are endowed with meaning by the user not the artist, whose information has turned into floating data once it is released into the net/web. What the pre-structuring by artists/organizers/technicians/institutions provided in HORIZONTAL RADIO was points of possible entry - in different media, on different locations, different bandwidths.....The rest was out of control.

Recent history

HORIZONTAL RADIO was a further development of earlier simultaneous telematic projects of the 90's. Especially important in this context are the projects Chipradio (92), Realtime

(93), and State of Transition (94). which were realised for TRAN-SIT and the ORF-KUNSTRADIO. These projects took a network of simultaneous live performances as a starting point and then used various means of communication (radio, television, telephone, data networks) in order to explore the communicative potential of mass media. Special emphasis was placed on strategies to reconcile the requirements of linear, one-way media, with he diametrically opposed requirements of open communication networks.

In addition HORIZONTAL RADIO explicitly referred to the period of the pioneers of telecommunication art. In Austria, this was roughly the time between 1979 and 1986. It was therefore no coincidence, that artists like Robert Adrian X (Vienna), Hank Bull (Vancouver) or Art Pool (Budapest) participated in this project as they were closely related to some of the very early projects in Art & Telecommunication.

Therefore, HORIZONTAL RADIO not only reflected the technological development and changing characteristics of the media, but also the political changes, that have taken place since these early projects - among them telephone-music -projects between Western and Eastern Europe. In 1995 radio stations in Russia or Hungary contributed substantially and with all kind of technologies to a telecommunication project that incorporated much more than just the transmission of telephone music. In Sarajevo, though, the situation has regressed to the early telephone music stages...

HORIZONTAL RADIO - a few statistics:
Participants:
- 14 national public radio networks on
- 24 channels
- at least 10 independent stations
- pirate radios

VHF, MW, Short-wave
- 7 INTERNET SERVERS
- 1 REAL AUDIO SERVER
- 24 cities in the whole of Europe, Israel, Australia, Canada with performances, installations, concerts, poetry readings
- more than 200 artists, composers, writers
- an audience of millions (Ostankino Radio's Short wave service alone has 300 Million potential listeners in Asia, Africa etc.)

HORIZONTAL RADIO was not only broadcast in programs dedicated to radio-art, but on news programs, youth-programs, cultural magazines, science-programs, on Pop-channels, on Music-channels, Culture-channels etc. In some cases also in prime-time slots.
    - Numbers of hours broadcast: so far unknown.
    - So far 69 DAT cassettes plus a number of tapes have reached us from the participants. But not all of them have sent their material....

- Some radiostations used the project to test technologies, e.g. ISDN lines.
The technical standard was very high.
- A publication attempting to document some aspects of this undocumentable project is planned.

Notes

1. EBU: the European Broadcasting Union is an organisation of public broadcasting corporations. (Canadian and Australian broadcasters, as well as New Public Radio [USA] are associated members.

2. TRANSIT is a non-for-profit organisation specialised in the praxis and theory of artistic projects in the electronic space, with an emphasis on the changing nature of radio & TV. TRANSIT is based in Innsbruck/ Austria and is funded by regional and national public funds and the National Radio & TV, ORF.

3. The 24-hour-schedule of HORIZONTAL RADIO was a conscious reference to a specific project, which was realised at the Ars Electronica in 1982: "The World in 24 Hours". The project was initiated and developed by Robert Adrian, and its character is still exemplary.

THE COMPUTER GRAPHICS CRISIS

By Ian Haig

I.HAIG@rmit.edu.au

T his poster session is entitled The Computer Graphics Crisis. By crisis I am referring to an aesthetic crisis, which I see currently occurring in the areas of computer graphics, computer animation, digital image making and multimedia. This crisis can be pinpointed in a number of different areas. It also throws up a number of questions which I have left unanswered. Computer Art, multimedia and technology based work, is certainly not in short supply of interesting ideas. However it is often the aesthetic systems which deliver some of these ideas, which I believe need to be evaluated and questioned more, before they are used.

The Computer Graphics crisis can basically be broken down into the following, which I see as the critical points:

1. The over use of default software tools
2. The fetishism of the photographic model in computer graphics
3. The rejection of Popular culture and popular iconography within the realms of computer art

I should state from the outset, that this poster session is not intended to be derogatory to any particular work or person working in electronic art. Indeed I see my own work as suffering from some of the very problems I am questioning.

The dreaded image filter:
In much the same way as the personal computer revolution had the side effect of producing instant graphic designers overnight, simply because one used a computer, Electronic Art, Computer Graphics and indeed multimedia is in danger of travelling down the same path. This syndrome is perhaps most visible at the base - consumer domestic level, where instant one stop shop computer graphic/multimedia kits and software packages offering quick and easy solutions, with their standard set of default-factory presets, image libraries and clip art, don't help the situation either. However this kind of thinking by default syndrome, is also prevalent where it shouldn't be - in the development of new and innovative electronic art.

The reliance and overbearing use of programs like Photoshop for example with it's standard set of default image processing tools, can sometimes result in work which looks the same. Contrary to the claims that the computer is liberating and free of all creative constraints, the opposite can sometimes occur: generic and predictable computer graphics, with a major image problem.

This in itself is part of a more critical problem I see, concerning the design and over simplification of the computer user interface. User friendly systems might enhance productivity, but are another story in promoting real aesthetic difference and diversity for the artist. Where by the user can sometimes become locked in to a certain way of working, which is dictated and reduced to available "user friendly" default software tools. Certainly there is a great deal of interesting work being produced in computer graphics, animation and multimedia, however I feel more artists should be aware of producing work which is of a particular and distinctive graphic style and of their own individual aesthetic, rather than the aesthetic and mark of a particular default image filter or software tool.

Already we have "Internet in a Box" I can see the advertising now for "Computer artist in a box":

"Thinking about computer graphics, what about computer art ? No time to learn complex software, introducing "Computer artist in a box", no fuss, no messy manuals to tie you down. "Computer artist in a box" gets you up and running fast, letting you produce amazing works of electronic art quickly and easily from our extensive image libraries and data sets..."

You get the idea...forget about creativity, forget about individuality and artistic vision...just point and click, and while this maybe humorous, it is also kind of scary.

This kind of reduction to default software tools reaches it's worst and most literal example in those programs that simulate the brush marks of master painters, a kind of depressing technological join the dots. where by just because technology has made it possible, it doesn't necessarily mean its a good thing.

Experimentation with a given medium's tools and their methodology is of major importance to the creative development of any medium. However the emergence of computer graphics and in particular multimedia, has seen that everyone seems to use the same industry standard accepted software. The concept of medium experimentation and exploration becomes a real concern. And how is real aesthetic diversity ever likely to develop if everyone uses the same basic tools in the same way ? And more importantly, software tools, which in a sense are already a point of view and a pre-determined set of rules laid out by someone else: the software programmers and developers.

My own introduction to computer graphics was with the low end, accessible Amiga computer, where one couldn't disguise the outcomes as anything but, raw, electronic graphics in their crudest pixelated form. Certainly a long way away from the latest state of the art in computer graphics, which I am working with these days, but so what ? I have always seen the pixel as a stylistic device and a graphic feature unique to low end computers and something to embrace, rather then disguise. The pixel itself is the lowest common denominator of the machine generated image, and when visible, in a way de-mystifies the computer image, destroying the surface and breaking it right down to it's most primitive of all elements. Which in many ways, is where my particular aesthetic in computer graphics has developed from - this notion of the technologically primitive, as both a graphic sensibility and thematic device is carried through in all elements of my work. It is because of the nature of low end and low resolution systems like the Amiga, that my own aesthetic style has emerged. It's within those chunky and crude paint programs and rudimentary drawing tools, that I have had to rely not on the limited software tools at hand, but on the aesthetic bent and attitude I have brought to the computer and to the software

There is also a case here, I believe for obsolete technology in computer art. The latest doesn't always signify the greatest, and certainly if one looks at Techno and rave culture, as living proof of how the integration of obsolete technology can have a profound effect. Along with the real time control and manipulation of Amiga computer generated imagery...analogue musical equipment from ten and twenty years ago has been embraced by Techno, because it delivers a specific sound unobtainable with the latest digital technology.

Computer graphics and multimedia can suffer from the perpetual 'state of the art' syndrome, where value judgments are passed on hardware and software standards and we are quick to talk more about hardware limitations, and current software versions, then we are content, ideas, concepts, etc...

The photographic model
The technical evolution of computer graphics has seen the emulation of photographic values as a major goal. From the 3D software package, which simulates camera lenses, f-stop settings, and light sources through to the process of scanning and digitizing existing photographic images, the computer has re-defined the site of actual image production and aesthetic creation for the artist in many ways to the site of image processing and image transformation. These days many artists, manipulate, distort, transform, and process images, and popular software titles from Digital Darkroom, Photoshop, Photo Styler, Photo Lab, to Texture Explorer and Image effects, give further indication to these photographic and image processing preoccupations...

The fetishism of the photographic image and process is in many ways the basis of another aesthetic dilemma for the computer artist - leaving one with the question: what of the connections of computer art and computer graphics to the rich and non photographic aspects of our visual cultural history and aesthetic production.

Their is a already a long history of image styles, codes, and gestures within our visual culture, that are indeed non photographic, and non cinematic, but - graphical and which communicate their meanings graphically opposed to photographically.

These days technology has redefined our visual landscape, images are increasingly mediated electronically and more importantly: iconicly, for example the reduction of computer game characters to graphic symbols, or the computer user's interface reduction to graphic icons. The very concept of graphic language underlies the production of meaning in our culture in many different ways.

Fine art and specifically Pop Art has already absorbed the graphic iconography of Comic Culture, Japanese Manga, and cartoons etc... However the development of computer graphics can sometimes sidestep the graphical and consume the photographic model. It is as if photographic realism and the photographic process carries with it a higher aesthetic currency and meaning, because it approximates actuality, or at least actuality as seen via a computer, opposed to a graphic sensibility which interprets reality symbolically and iconicly. For example the invention of photography at the turn of the century saw that Impressionism in fine art did not merely try to emulate the new technology but instead focused on those elements unique to the medium through a symbolic and subjective representation of reality. The question remains why is computer graphics spending so much time re-inventing the photograph? and the photographic process?

My own endeavours in computer graphics, computer animation and interactive work over the last five years or so, has partly been in response amongst many other things, to some of these aesthetic issues and concerns I see surrounding me.

Aesthetic diversity it seems has not historically been the mediums strong point. Partly I see this as systematic of artists relying on default software tools, which has resulted in the emergence of a generic look of 'computer art', but possibly because the aesthetic development of computer art and computer graphics has partly been associated with a technological one - higher resolutions, more convincing raytracing and more sophisticated texture maps etc, rather then a development of individual graphic technique and application of illustrative style.

Pop culture and computer art
Currently I am working on an animation entitled "Astroturf" which came about as an attempt to bring my particular aesthetic bent and graphic style to the world of high end 3D computer animation.

"Astroturf" tells the story of how humans are devolving through their interaction with new technology, consisting of different 'technological time frames' from prehistoric times, to the 1950's and through to the 23rd century and beyond. "Astroturf" presents a number of test cases which attempt to show in comical terms, just how humans have related to the machine.

Technological devolution is part of an ongoing theme in my work. And while such a premise is largely tongue in cheek, it is also in some ways, a stab at new technology hype and the interactive hysteria we are experiencing. Such a premise is also well suited to humorous scenarios relating to how we are interacting with emerging technologies.

The name "Astroturf" has it's origins in the boom period of the 1950's and the invention of a wondrous new synthetic product, an artificial replacement for a natural surface.

Tied in with this is a wide eyed 1950's utopian vision of the future and technological innovation along with it's references to both the Jetsons and Astro boy. The name Astroturf lends itself to interpretation - it's that place where the future happens, and the territory or the turf, of technological invention, where the synthetic replaces the natural.

"Astroturf" depicts a world where as a result of our accelerated evolution through technology, we are actually evolving to such a point, that the only place left to go is backwards to a pre - technological state. One scene for example, currently in progress will depict how the increased miniaturisation of microchips has developed to such a point that microchips have become invisible and therefore no longer exist, which results in a new pre technological primitive environment.

With so much attention these days focussed on the acceleration of our culture through technology and our integration with it, many of the concerns in my work are grounded in the everyday (reasonably) low tech world, which draws on many of the cultural and urban myths surrounding our irrational fears of technology, its so called dangers, and our obsessions with it. For example: If you watch too much television, you will get square eyes, or radiation from computers can cause mutations etc.

The way in which these cultural myths surrounding technology have been depicted throughout films, television and the media in general, via stereotypes of technology running amok and machines controlling peoples lives, to destructive computer viruses and crazed mad scientists, these serve as inspiration to my animations, which seek to heighten and exaggerate the absurdity, and hysteria of our integration with technology in a variety of different ways.

Humans in particular in my work, have a grotesque, mutated quality - possibly the result of some unknown technological radiation source. These characters are also the result of unhealthy habits and obsessive compulsive behaviour associated with their technological environments.

Aesthetically, computer art largely depicts a technological utopia. I see my work as drawing somewhat on a dystopic world, or at least a world which is malfunctioning somewhat and where the side effects of technological integration has given way to mutation and the grotesque. This basic theme is also carried through to much of the technique and style of my animation work, which is almost non animation, movement is simplified, and mechanised and characters are resolutely one dimensional

and under developed. In many ways the antithesis of much 3D animation which models it's environment on reality and actuality. The environment in my animations are unashamedly cartoonish and exaggerated. I am less interested in simulating realism and life like behaviour, then I am in conveying a stylised subjectivity in animation through caricature and humour.

While much 3D animation lends itself to high degrees of realism and verisimilitude, the more real then real appearance of 3D surfaces and environments can at times appear almost hyper-real and truly otherworldly. This synthetic, artificial look is something my own work has attempted to capture using current 3D software, which I see as just another stylistic device, much like the use of the pixelated graphic surfaces of my earlier work. In many ways my recent work is a contradiction - while it uses relatively sophisticated hardware and software to realise outcomes, my aesthetic concerns are essentially primitive ones: limited animation, reduced narratives, simplistic characters, etc..

The crude and economical movement in my animations are as much a result of animation shorthand and impatience with the animation process on my part, as they are attempts at humour in a medium so obsessed with conveying life like behaviour and realism, sometimes for no other reason then simply because it can. What many see as the way not to do things, I have always thought the opposite - you should always do what you are not supposed to do.

The twilight zone

The electronic artist is an odd species and appears to live a strange contradiction, between being dependent on commercial facilities and the consumer world of the latest hardware and software and yet at the same time trying to distance themselves from this world in an attempt to maintain their own artistic integrity and personal vision. This uneasy collaboration seems to have an effect on the artists own sensibilities, where aesthetics and content is taken to the other extreme of the cultural spectrum, often resulting in work which is completely removed from the popular culture from where technologically, it sprung.

As a result of this, no middle ground has emerged between popular culture and the cultural location of electronic art. The dilemma for myself, is because I am working with popular imagery and iconography in a medium (the computer) which is essentially popular, is that by the time my work is received in the fine art/ electronic art context and has crossed that invisible cultural boundary between high art and popular culture, anything I am trying to say in my work is instantly diffused and evaporated.

Like much of my work "Astroturf" sits somewhere between the world of commercial computer graphics and character animation on one hand and experimental animation and fine art on the other. I have always had an interest in all of these areas with varying degrees and see no reason to work exclusively in one or the other.

While this awkward cultural location which most of my work occupies, being neither here nor there, but in limbo somewhere in the twilight zone between electronic art and the commercial world, could be seen as contradictory and problematic to some, I have always viewed such a location open mindedly as offering the basic foundation of a rich cultural diversity: a dynamic site where the exchange of ideas and processes between electronic art and new media touch base with the pulsations and vibrations of popular culture.

Rather then adhering strictly to a fine art tradition, my own sensibility and concerns have been informed by and traveled the historic and aesthetic route of Pop art, cartoons, caricature design and comic culture. My graphic style is a rejection of those classic high art values concerning the depiction of beauty, and instead draws upon what are essentially low art influences: the grotesque, the comical and the slapstick.

While there is already a strong history to ugly and grotesque art, (Daumier, Grosz and Charles Burns are examples that spring to mind) the technological age gives the grotesque great significance. It is the dirt and grime of contemporary computer graphics, the antithesis of the pristine, flawless, virtual world. Currently the depiction of the body in contemporary culture, where the advances in cosmetic surgery and genetic engineering technology, have given rise to a concept of beauty of truly unnatural proportions. The whole idea of what is beautiful and what is freakish these days is questionable. And this is where I see my own ugly, computer graphic aesthetic emerging out of...

Often dismissed as the site of low art and not worthy of serious consideration in the heady world of new technology and electronic art, the graphic surfaces of comic culture and cartoons (for example) have had a dynamic impact on graphic language and aesthetics over the years in all sorts of ways, which is largely ignored in the realms of computer art, for one reason or another.

Computer graphics, multimedia and new technology based work has the potential to be revolutionary mediums, and they should be used in revolutionary ways...and in the process should always question the very notion of accepted standards, values and aesthetics...

For as much as Computer graphics and electronic art has already emerged as an interdisciplinary medium, I feel it must also accommodate a multiplicity of styles, aesthetic sensibilities and attitudes, in order to expand and grow as a medium. The fact that my very own aesthetic sensibilities and concerns are at odds and in some ways a contradiction with current electronic art practices and the general status quo, is precisely the point - and reason enough to see that there is a cause for concern. There is a need for electronic art to open it's eyes and ears and look towards alternative cultural histories and real aesthetic diversity, to counteract the current computer graphics crisis.

MATERIAL MEDIA

By Ross Harley

s8900047@aix00.csd.unsw.OZ.AU

Making a dinosaur for *Jurassic Park* is exactly the same as designing a car." That's how Ed McCracken, CEO of computer mega-corp Silicon Graphics, figures it. Truth is, few of us would disagree.

Entertainment and commercial manufacturing have always made good bedfellows, though in the past we would seldom mistake one for the other. American industrial designers of the 1920s and 30s like Henry Dreyfuss and Norman Bel Geddes may have dreamt up sets for Broadway, and General Motors car stylist Harley Earl may have lived in Hollywood, but that's about where the connection ended. Well almost. But at least there was an epistemological difference between their stylised sets and props on stage or screen and the built environment of consumer products.

Nowadays their interchangeability hardly raises an eyebrow. Hollywood and Detroit work out their "'market ergonomics'" (a niche for every body) and concept development on the same computers, sell their products through the same media (TV, radio, print, billboards) and dump their goods in the same old places (western suburbia or third world economies). Makes no difference to them.

At the same time, television has been let out of the studio and shoved headfirst into the world of space, time and architecture — *NBK*-style.

There's no denying it. Media, telecommunications, marketing and computing are congealing into newly corporatised urbanlandscapes that bear none of the dark romantic hallmarks production designers Lawrence Paull and Syd Mead materialised for *Bladerunner's* bad-new-future. Forget the utopian soothsaying and gothic crystal-ball gazing. For the large majority of us the future is already here — and it's not what you'd call pretty. It's planned, it's calculated, it's flashy, it's corporate-global. It's most probably at a shopping complex or video/computer/TV screen near you. And it's gonna cost.

Our sprawling cities provide the new outlets for a determinedly material culture in which design appears to know no limits. We see and hear evidence that things have been deliberately cast (as if we don't know by whom and to what end) at every turn — from fetishistic consumer objects to urban planning; from TV graphics and virtual voyaging to the loud packaging of cereals for the supermarket shelf or for television; from the austere public bus shelter to the new tollway or tunnel that
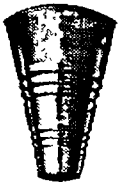
decreases the distance between home and work even as it's annihilated.

It is increasingly hard to avoid contact with a world designed on the totalising scale of global media. Everyone and everything is plugged-in (especially when it's advertised "Unplugged"). We all know this: the distance that used to separate the media and the world it conjures disappeared seasons ago.

But here's the rub: real life is now designed and experienced as an extension of commercial media, and not (as we used to think) the other way round. North America remains the pioneering source of **material media** — the phantasms and obscenities of traditional media (from Hollywood to the Fox Network) have been concretised in a bombastic web (I hesitate to call it a system) of **consumer objects and places**. Small wonder American architecture and design are now so closely aligned with the diverse (often perverse) interests of multinational media conglomerates and magnates, providing the model upon which countless other cities-as-urban-theme-parks around the world evolve.

The following banal "framegrabs" are not from the near or distant future. It's still 1995, and the theme remains the same: consumption is fun. So what if it costs a little?

Frame 1. Even at 30,000 feet. No-one can escape the right to consume, with the credit card of your choice. The High Street Emporium guide, (just like the other Skymall shopping catalogues) gives me instant access to merchandise I wouldn't look twice at on the ground. Inside I find exciting gift ideas for family and friends, as well as items I know I can't live without. Like the solar-powered ventilated golf cap, complete with six 1/2 volt solar cells to power the fan, which directs a constant breeze toward my forehead. Or the vacuum-powered Insect Disposal System. It may look like a simple handheld cleaner, but it's not. Really. Lined with a non-toxic gel (harmless to humans and pets) and powered by a built-in rechargeable NiCad battery, the 14,000 rpm fan System lets me quickly capture and dispose of insects at a comfortable distance without ever having to touch them.

Freedom of choice is a wonderful thing. I continue browsing: the Portabolt (to lock myself and my loved ones safely inside any opening door), the Auto Toothpaste Dispenser (of course), the world's smallest 8-digit credit-card-sized calculator that records up to 20 seconds of instant voice-notes, or the odour absorbing PoochPads for dog owners who love their dogs but hate the mess. Just call the 1-800 number conveniently accessible on the Airfone Service the phone company have installed in the seat in front of me. These telephones aren't for talking to people. They're for ordering more stuff.

Frame 2. I remember this the next time I dial a 1-800 number to purchase some other stuff (tickets for a 3D Imax movie at a brand new retro-styled multiplex cinema at Lincoln Plaza, Manhattan — the screen measures eight stories high).

The call is promptly answered by a friendly female voice who thanks me for using their service. "Welcome to the Sony Cinema network. Please enter your zipcode to locate the theatre nearest you. Press 9 for more information, or 0 for the operator." Nothing strange about this — though I can't recall my zipcode, and the theatre I want is not in my neighbourhood anyway. I press 9 and the increasingly irritating calm voice thanks me again (as she does for the nine remaining multiple choices). "If you would like to see the following movie, please press the corresponding number now." This is the future of interactive TV.

More instructions. If I want to see the Underwater Movie press 1, the Buffalos press 2, the ... Next, enter date of the booking. And the time of the session.

"I'm sorry, the 3pm session is full. Please choose another time." I do, making sure to punch in the number of tickets I require, the number of my credit card, and of course its expiry date (a rigorous safeguard against fraud I presume). Tickets confirmed, funds are invisibly sucked from one cyberspace to another. I'm ready to watch the show. After one more machine transaction that is — at the front of the lobby, attached to the wall in front of the long line. Swipe my card, and out pop three tickets for the 5 o'clock show. Amazing. Only an extra buck per ticket.

Frame 3. At Universal City's *ET Adventure* ride, cards and telephones find another convergence. Sponsored by telecommunications giant AT&T, the ride flies dozens of bicycle riders at a time to a land somewhere beyond the narrative limits of Spielberg's original filmic universe.

After waiting in line, everybody gives their name to the tour hosts. In exchange, we're each given an individual "passport" (coincidentally the same size and dimension of a regular AT&T calling card). Everybody clears "Customs", and we riders soar off above the earthly world — with noisy jeeps and a swelling John Williams soundtrack in hot pursuit. On towards the night sky, and in a minute we've reached ET's cute cartoon planet — a world we've never seen (in the movie at least). The most magical highlight is left till last. As we swing past the animatronic Extra Terrestrial waving us farewell at the end of the ride, we are all called — individually and by name — by Him, ET. After such an experience, who could ever forget how to call home again?

Frame 4. At the motion-platform Omnimax ride, *Back to the Future* — a fifteen minute experience that ushers the participants through an architectural maze of corridors and check-

points inside the neo-brutalist Institute for Future Technology — we make it home via other means. For a quarter of an hour at least, we're supposed to go along with the idea that we're actually participating in an extended narrative from the film of the same name. The uncomplicated labyrinth that distributes us from one checkpoint to the next— complete with surveillance cameras, familiar actors giving us backstory on video monitors, written LED instructions, and real Institute "assistants" — is only vaguely engaging.

Being strapped into the eight seater DeLorean time-travel mobile is another matter entirely. The reality effect rapidly accelerates, and time slows as in a dream (or nightmare). Crashing headlong through a seamless collage of 20th century shopping centres, town squares, Ice Age landscapes, Hill Valley circa 2015, prehistoric volcanoes, exploding Texaco signs and cineplexes of the future, the four-minute ride is the most visceral experience in the entire complex.

Souvenirs can be purchased at the Time Traveller's Depot on the way out. But everybody seems to know you can get that stuff anywhere.

Frame 5. Like the recently opened New York Skyride on the second floor of the Empire State Building, these flight-simulator attractions blur the distinction between architectural reality and cinematic illusion. The ride propels the traveller from the stasis of the monumental site to the mobile world of the camera. The mechanical simulation and computer controlled movement may be clumsy, but the thrill lures riders back for countless rides.

Of course, it doesn't compare to the "real view" from the Observatory on the 86th floor. But who said it would? It's a supplement, an addition, an orientation to a world which is in its own way just as inaccessible. "Look at the cars down there! They look like ants!"

Plenty of stuff to buy down there.

Frame 6. Which isn't to say that the rest of the built environment hasn't learned from such entertainment machines. The young LA-based architect Mehrdad Yazdani's motion-reality theatre at Universal's Citywalk also incorporates kinetics into its design. Its folded fiberglass screen on the facade functions like an electronically liquid marquee, as if to set static architecture in motion.

Regardless of the building's success, such considered designs endow these entertainment complexes with more than a little Culture. Like the radically deconstructivist KFC outlet in the middle of LA (designed by Frank Gehry disciples Jeffrey Daniels and Elyse Grinstein) or the Planet Hollywood restaurant designed by Anton Furst (the late production designer of *Batman*), these places make a virtue of the high pop-moderne

culture surrounding us — by selling it back to pop's corporate initiators as Status. So what's new?

Frame 7. Indeed, Gehry, Robert Venturi and Denise Scott-Brown, Michael Graves, and Robert Stern have all furnished Disney (under the corporate leadership of Michael Eisner) with designs for some of its most critically successful buildings. Why stop at Florida's Disney World or Euro-Disney in France? (For despite the failings of the European excursion, a Saudi Prince — assured in his wealth since Dessert Storm — has poured over $US300 million into rescuing the operation from its own unpopularity. Go figure.)

If, as critic Michael Sorkin has recently put it, "in theme park nation, life is a ride and everything — transportation, assembly, learning, leisure — must therefore entertain", we're in for a lot more fun. Not just in theme parks either.

Frame 8. Disney again. This time with Gehry at the helm, planning to build a retail and hotel complex at New York's Times Square, just down the road from Disney's New Amsterdam theatre (currently under renovation). A Virgin superstore and an MTV complex are expected to follow hot on Disney's heels. More tangible still are the hundreds of total experience entertainment retail outlets mushrooming in major cities — over 300 Disney Stores worldwide, with Warner Brothers Studio Stores fast catching up. With over $US65 billion a year to be made from merchandising, stores like those in Santa Monica Plaza or midtown Manhattan are blue-chip investments. That's the image unstable media empires have wanted to project all along. Toontown is rock solid.

Frame 9. So is Sony. Not content with the string of movie theatres they inherited during their takeover of Columbia (not to mention the musical interests of CBS and Epic), they're into diversification in a big way. Not only do they want a living museum like Sony World in downtown Chicago, they want kudos of the sort Philip Johnson gave AT&T with his infamous po-mo skyscraper on New York's Madison Avenue. Now it's called the Sony Building. It's public atrium was criticised when the telephone company (somewhat disingenuously) gave over its plaza to palm trees and wrought iron benches. All that's gone now. In its place is a sprawling retail playground of Sony Style, Sony Signature, and — you'll never guess — Sony Wonder Technology Lab. This 18,000 foot amusement park is free, and in America that's as good as being "public".

According to interior designer Edwin Schlossberg, "we wanted to make it human, but in a New York way... We wanted to fill it with props, with *stuff*." Stuff you can buy. If not now, then soon. This is the Universal City of consumer electronics. Sony's Toontown sets are not quite inhabitable film or television, but they're about as close as it gets.

Frame 10. That is of course until we finally get to see computer squillionaire Bill Gate's "San Simeon of the North", currently being completed in the suburb of Medina, across Lake Washington from Seattle. Partially tunnelled into the hillside, the five acre waterfront house has journalists debating whether this is *Batman, Dr No,* or *Citizen Kane* revisited. Truth is it's probably all of the above. While architects James Cutler and Peter Bohlin say they're trying to avoid ostentation and pretension, there's no mistaking Gates' intention to let architecture make concrete what Microsoft can only conjure with floating point geometry. William Randolph Hearst once had a similar scheme.

That doesn't mean the electronic media baron won't find a prominent place for software in the architectural scheme of things. As the *New York Times* has it, the Gates Xanadu will have a network of computers that "will alert the boulder-rimmed hot tub, the video-art walls, the climate controls, the library, the trampoline room and other sections that the master has arrived and expects an evening tailored to his mood." So why is Gates remaining so tight-lipped about the details for his intelligent entertainment mansion?

I'm sure it has nothing to do with the New Establishment leader's current fascination with animation. It seems Gates is desperate to have designed a universally recognisable Microsoft cartoon character along the lines of Mickey Mouse or Bart Simpson. But after a recent meeting with Ren & Stimpy creator John Kricfalusi, Uncle Bill decided his work was too cutting-edge for the Microsoft demographic. And so the quest continues.

One thing's certain though. When his search is finally over, you can bet your last megabyte of RAM it will only be the start for the rest of us. And we actually have to live here — here on the edge of the next millennium these corporations are constructing so obliviousy.

OVERALL CONCEPT FOR THE CONSTRUCTION OF A REHEARSAL OF MEMORY

By Graham Harwood

harwood@artec.gn.apc.org

T he production of this interactive programme has been commissioned by Video Postive 1995 and the construction of the artwork is set to take place during January to April 1995.

The aim of the piece is to work with a group of people from Ashworth Maximum Security Mental Hospital to produce an interactive programme embodying the life experience of those involved. This is manifested in the form of an anonymous computer personality made up of the collective experience of the group.

Ashworth Mental Hospital is located in the north of England near Liverpool and is home and prison to people who are a danger to themselves or to people outside the hospital. The group of patients I am working with ranges from serial killers to rapists, potential suicides, and casualties of the excesses of society. The staff I am working with include psychiatric nurses of twenty years experience and orderlies.

This artwork is about the recording of the life experiences of the client group that are a mirror to ourselves ("normal society") and our amnesia when confronted with the excesses of our society. This forgetting is a dark shadow cast by plenty, a nightmare for some that constructs misinformation and fear about insanity, violence and victims.

This mental space is occupied by the psycho, the nutter, the mad dog and Bedlam, this is the space where strong fictions lie and invisibly glue together the mirror from which we view our own sanity.

This work is about people everywhere who are trying to remember the faces of the extras in the cinema of history.

This Artwork is a rehearsal of memories not quite forgotten. Evil, sleazy, dirty, dangerous, sick, immoral, crazy, or just plain normal.

Returning home at night I can turn a light bulb on or off at will, or even decide when I want to go to bed. My home, one flat in fifty x 5,000 = anonymity. Freedom: I can peel a potato with a knife; I can wake up angry or sad without fear of scrutiny or being involuntarily chemically altered. This apparent safety has
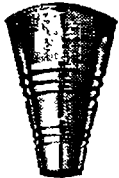
recently been nudged out of its complacency. I lay down, stroke my girlfriend's face, talk to my dog, the luxury of the common place has a background music of questions. When I think of such persons as the murderer, the rapist, the mentally ill, common sense tells me that such people really are evil. But where did I get this common sense from? How did I come to know that the acts of some people are sick, while the acts of others I accept as normal? Is it that these people behave in a more dangerous or destructive fashion than other people? I used to think so...

Travelling to Ashworth Mental Hospital buy train 1st February 1995 A quiet middle age man smoking a pipe looks up at me. He's reading a copy of Philosophy Today, and as I find out later he is lecturing at Warwick University and freelances as a management consultant to some very big companies.

"What are you reading"
"Oh, it's about Memory and Amnesia"
"Work or fun?"
"I'm trying to get some background for a project that I'm doing at Ashworth
Mental Hospital."
"That's where Ian Brady is isn't it."
Yawn. "Yeah, that's right"
"I've killed quiet a few people in the past, when I was in the army. I
don't value human life in itself: individuals, but not life itself."
"Didn't you worry about it?"
"What"
"Killing. From what I understand it's a pretty hard thing to get over?"
"No, they were terrorists and I had a moral right to take their life. I'd
reasoned it out, you only get hung up about it, if you don't know why
you're doing it."
"What do you mean reasoned it out?"
"Well, they were breaking the law and anyway the British government gave me that right... Don't get me wrong, I understood what they were doing was defending themselves from an invading army. Let me explain. If I decided to kill you I would, but only after I'd reasoned it out. I might feel bad about killing you as an individual, but not about ending your life" I'am more than a bit uncomfortable by being informed that my life is worthless and that a trained killer has just suggested extinguishing it.
"Let me get this right. You don't believe life in itself has value, and if the government says to kill someone who you believe is justified in their struggle defending themselves you will still kill them?"
"Yes."
"Sounds like voices in the head to me."

Murderer. Nutter. Psycho. Child abuser. Bum Bandit.

Think of the kinds of people described above. Are their behaviours truly more harmful than those of people who are normal? In many cases the answer is no. Consider the lawfully wedded husband who physically and mentally assaults his wife, his battered wife suffers as much as any victim of a convicted rapist or child abuser. Similar things might be said of the sane general whose decision to defend national honour at any price may harm society in a much worse fashion than the actions of any so-called mentally ill person.

Insanity it seems to me never exists except in relation to strong fictions of sanity. Normality is maintained by common sense, a standard by which sanity can be measured. Fictions grow from folk law, fed by the deluge of rhetoric poured out from the technology of Hollywood, the art world and the media. These electric images fill the mental spaces left by our own lack of personal knowledge about the mentally ill individual. This misinformation sentences the mentally ill to be executed, beaten brutally, fined, shamed, incarcerated, drugged, hospitalised, or even treated to heavy doses of tender loving care. But first and foremost they are excluded from passing as normal women or men. They are branded with the image of being a sickness in society. Living specimens of what we are not, positioned within emotional and technological microscopes know as mental hospitals.

From the preceding examples we can predict that there are many forms of labelled sickness that are not more costly to society than the behaviours of people who are less likely to be labelled sick. Why are the mentally ill viewed as such? Is it because they threaten the controlling structures of those with enough power to shape the way society imagines itself? And in that imagining erect the boundary between good and bad, normal and pathological. This is the crux of the effort to understand the battle between this form of unacceptable behaviour and the social control that surround it. Social sickness is always the flip side of the coin used to procure the myth of a healthy society.

Chemical altered states. Surveillance. Forensic Testing. Medical records. You can't argue with it. That's what the computer says. It is no accident that social control reproduces itself into technological forms. The reduction of information to binary representation leads to a levelling process of data, whether that information be psychological profiles, battle tactics, or credit card details. Here, number crunching produces an image of anonymity through its incomprehension to humans at machine level. We take no responsibility for the way the calculator adds its numbers together and in the same way we take no responsibility for the way data-bases collate information. The binary mechanism can be seen to lead to an emotionally vacant space interpreted through cathode ray tubes and clicking buttons.

In this respect computers as a primary technology can give us a safe distance from difficult decisions: whether they be deciding which patients to treat, which to leave to die, or which employees are surplus to production. Whether we agree or not, the modern machine is currently perceived as a neutral decision making space. This image of anonymity creates a sufficient distance from events to create a situation in which we are ritually free to give up our ability to feel the consequences of our actions.

Rehearsal of memory challenges our assumptions of normality and at the same time confronts us with a clean comfortable machine filled with filth, the forbidden and the demented. Its hygienic procedures contaminated with the effluent of excluded human relations. For a long time we have assigned machines our dirty laundry whilst maintaining the image of their enamelled white veneers. Now is the time for filth.

GRANULAR SYNTHESIS AND THE FCURVE SOUND GENERATOR

By Mara Helmuth

mara@meowing.ccm.uc.edu
http://meowing.ccm.uc.edu

& Aladin Ibrahim

aladin@viz.tamu.edu

A | bstract

Granular synthesis programs, written in the Cmix music programming language, have been expanded to provide more function curves which describe sonic gestures. The Fcurve/Sound Generator System links digital sound created with granular synthesis on a NeXT computer, with graphics created in SoftImage Creative Environment on Silicon Graphics workstations. Through an interface to SoftImage which stores data in sound templates, these curves can be applied to various graphical parameters. The artist/composer may choose the mapping from the sound parameter hierarchy to the graphical parameter hierarchy through menus in the interface. In an image-to-sound transformation, data from graphical morphing and distortion

Since the graphic interface does not display actual scene elements such as models, the best method of using the system is currently to create sound templates, or graphic primitives, which have sound data mapped into their function curves. Then, function curves can be copied from the templates to other objects in Softimage.

Results

One study produced so far is composed of two layers of granular synthesis sound, and graphics generated from the sound data. The graphics consist of a wave with motion based on the frequency of the grain parameters of one sound, and several spheres moving in relation to the other sound's frequency. Less obvious mappings link grain parameters such as grain rate, duration and location with color, transparency and object location. This example shows potential for more complex and interesting multimedia work with this system.

Image to Sound

Translation from graphical data back to sound is an obvious, desirable extension. In another experiment, we used a set of images sequentially. Each image first distorted geometrically, and then morphed into a new image. The amount of morphing

and distortion was mapped into sound parameters, such as changing frequencies and grain rates.

Future Research

We plan to expand and integrate the programs for sound and graphics. An interface for sound generation can be created similar to the StochGran application on the NeXT for fsgran. As fsgran already runs on the SGI, sound generation may also be done on the same platform as the graphics. Finally, we plan to work with other graphical artists and composers to create multimedia works with this system.

Conclusion

An integrated approach to creating multimedia work has been sought by relating granular synthesis sounds and graphics. The sound program component, created on the NeXTstep platform, makes use of powerful granular synthesis techniques. The Fcurve interface allows the user flexibility in ways of mapping this sound data to image.

© Mara Helmuth & Aladin Ibrahim 1995
College-Conservatory of Music
Division of Composition, History and Theory
University of Cincinnati
Cincinnati, OH 45221-0003

References

(Helmuth, M. 1991) Helmuth, Mara. "Patchmix And StochGran" (in) Proceedings of the International Computer Music Conference. Montreal: McGill University, (1991).
(Helmuth, M. 1992) Helmuth, Mara, "Timbral Composition and Gesture", (in) Proceedings of the 1992 CCMR Computer Music Conference and Festival, Delphi: Center for Contemporary Music Research, (1992).
(Roads, C. 1978) Roads, Curtis, "Granular Synthesis of Sound", Computer Music Journal, 2(2):61-62, (1978).
(Truax, B.) Truax, Barry. "Real-Time Granular Synthesis with a Digital Signal Processor". Computer Music Journal, v. 12, no. 2. Summer, 1988. Cambridge, MA: Massachusetts Institute of Technology.
(Zettl, H. 1973) Zettl, Herbert, *Sight, Sound, Motion, Applied Media Aesthetics.* Belmont, CA: Wadsworth Publishing Company, Inc., (1973).

SOUND; ARCHITECTURE: CATASTROPHE

By Nigel Helyer

nhelyer@extro.ucc.su.oz.au

S *ound, Architecture and Catastrophe* examines the nexus of historical relationships between sound-power and ideology by exploring the metaphoric structures of two sound-sculpture installations (one recent and one which I am currently developing).

"Oracle" (exhibited at the Museum of Contemporary Art, Sydney 1995) inhabits the nexus between the body and architectural space by proposing the voice as the carrier of both prophesy and of ideological imperative. In this fusion of *corpus* and *polis* the soundfield simultaneously operates as actuality, as virtuality and as metaphor, to create an architecture *un*-frozen!

The second installation; "Silent Forest" (to be mounted at the San Francisco Art Institute as part of "SoundCulture 96") proposes that we listen to a silence decreed by political and military power. The work is constructed as a tracing of colonial and (neo) colonial relationships linking cultural form with political force. The installation (& its accompanying Radio broadcast) weave a sonic web between a natural environment under chemical siege - to metaphorically link the creation of an *Ecological* silence (by the massive deployment of dioxin de-foliants in VietNam) with the *High* culture of Western Opera exemplified by the French built Ha Noi Opera House - here Opera is employed as both a sign and transmitter of the colonial process. (I shall explain the leitmotiv later).

" Oracle"

It is indeed :- *A Tale of Two Cities*, but two cities in the process of falling down. Let us begin with "Oracle"-These are the original instructions for dissolving architecture (Q).

"And the Lord said unto Joshua, See, I have given into thine hand Jericho, and the king thereof, and the mighty men of valour. And ye shall compass the city, all ye men of war, and go round about the city once. Thus thou shalt do six days.

And seven priests shall bear seven trumpets of ram's horns: and the seventh day ye shall compass the city seven times, and the priests shall blow the trumpets.

And it shall come to pass, that when they make a long blast with the ram's horn, and when ye hear the sound of the trumpet, all the people shall shout with a great shout; and the wall of the city shall fall down flat, and the people shall ascend up every man straight before him.

Joshua 6, verses 2-5.

isea95@er.uqam.ca   T : (514) 990-0229

ISEA95 montréal

We are still amazed that a city might be razed to the ground by sound (but listen closely) its is not the sound of trumpets, but the sound of a "great shout" the sound of the voice, of human resonance. We are sounding bodies, and so a great part of our knowledge of sound is formed in relation to our own sounds and principally through the voice.

Again this falling under the pressure of the voice is distinct from a falling under the agency of the "Word" as propaganda or the metaphorical and imperious - *"in the beginning was the word"*. Here the voice is an embodied and powerful instrument - somewhat akin to the *granular voice* of Barthes; operating at the juncture between music and language.

"The grain of a Russian tenor is....directly the cantors body, bought to your ears in one and the same movement from deep down in the cavities, the muscles, the membranes, the cartilages, and from deep down in the Slavonic language, as though a single skin lined the inner flesh of the performer and the music he sings".

Although explicitly corporeal such a voice is detached from individual expressivity to act symbolically, in effect to act politically - it is body without personality from which issues a battle cry.

In adopting the voice and to a certain extent, musicality "Oracle" enters the problematic and habitually dualistic manner in which 'sound' is conceptualised - as real or as virtual, as signal or as noise, as low-fi or as hi-fi *et al* - establishing the conditions of dilemma - when it may be more useful to consider sound as effectively filling and flowing between the poles of such binary categories, rendering them as marginal rather than central characteristics.

Our (in)ability to recognise and describe sonic experiences is in part due to a dearth of appropriate acoustic metaphors. The metaphoric structure of English is visually overdriven and typically surrenders experience of the aural dimension to the nearest codified category; that of Music. As a surrogate conceptualisation of all sound, Music and to some extent the Voice, absorb our acoustic experiences and suppress the invention of alternative categories of expression. The central issue being - how are we to describe an aural sensitivity which recognises that sound by nature androgynously embraces the real and the virtual, to operate simultaneously as phenomena, as representation (a sign for its source) and as a metaphoric substance, active in the memory and the imagination.

But we should return to ancient history. Naturally the Walls of Jericho *should* have acted as sound baffles - reflecting and rebuffing the sonic assault as they would have deflected arrows and lances - for it is the function of such walls to mark out an interior space; able to guarantee the differentiation of culture and identity - a singularity in the midst of chaos, in the sea of noise.

In the 'architecture' of "Oracle" however, the function of the defensive wall is inverted, the imperative and prophetic voice fusing with the architecture to address us, as citizens. The very fabric of the city is re-formed as an architecture of transmission and prediction and pressed into the service of ; a king? the state? of corporate culture?.

You might be familiar with Hitter's statement from the 1937 Manual of German Radio ."*Without the loudspeaker we would have never conquered Germany*" - It's an old story.

Architecture lends its morphology not simply to contain or propagate sound but to modulate and designate sound within a spatial identity. In this respect sound memorises the spatial and textural character of architectonic space, sound being the primary key in our perception of space. Italo Calvino describes the metaphoric correspondence between the physical structures of the body (and perhaps the body politic) with those of architecture - here a king , transfixed upon his throne - trapped immobile, is listening at the centre of his kingdom. From - *The King Listens* by Italo Calvino -

The palace is all whorls, lobes; it is a great ear, whose anatomy and architecture trade names and functions; pavilions, ducts, shells, labyrinths. You are crouched at the bottom, in the innermost zone of the palace-ear, of your own ear; the palace is the ear of the king".

"Oracle" develops this, perhaps passive, metaphor by constructing a dynamic Oracular Architecture which functions as a mnemonic device, where language unfolds itself from cold storage. Here the visions and auditions of Nostradamus - memorised across time as text replicate themselves (*a la* Burroughs) in a viral contagion - the word, as the *analogic form* of thought, re-populating, migrating and colonising geographical space and historical time.

To conclude this section quote Nostradamus (perhaps).

When the animal tamed by man begins to speak, after great efforts and difficulty, the lightning so harmful to the rod, will be taken from the earth and suspended in the air.

(Radio?).

Silent Forest
At the second site of falling down we encounter a multitude of silences, but naturally these silences are drowned by the cacophony of rocket motors, aero engines and wailing sirens (but unlike the argonauts we have no wax for our ears!).

Conceptually a "Silent Forest" is intended to address the negative spaces generated by political and cultural events, in the belief that it is these in-articulate voids which often hold the key which allow us to grasp the massive contradictions of our economic and aesthetic realities. So the principal axis here is to activly seek zones of cessation, of inertia of smothering, for they are traces of suppression and marginalisation.

"Silent Forest" juxtaposes multiple silences and loss. The work is sourced within the specific historical and geographic locales of the Vietnamese forest, a forest reduced to silence by chemical defoliants. In the cultural silencing implicit in colonialism, embodied here by the imported culture of European Opera and ironically, in the silence of the Divas themselves since they departed Hanoi in 1954.

As its central icon the work adopts the form of the large carousel of early-warning speakers that still surmount the Opera House in Hanoi. This siren configuration acts as a physical and sonic leitmotiv, delivering the audio works which interrogate the politics of French colonialism and subsequent North American neo-colonialism (and believe me this is a process which has been accelerating since April 1994!!!).

The work weaves a sonic web between a natural environment under chemical siege and the events of 'Opera Culture' as they unfold across a historical matrix in Paris, San Francisco Sydney and Hanoi. The voices of absent species re-emerge alongside arias in a direct linkage of the principal events of the conflict.

Between the sound loci of the Forest and Opera, voice narratives drawn from archival and contemporary sources will flow to locate these historical moments within individual subjectivity - the subjectivity of those who experienced these events.

Physically the work will consist of two sound delivery systems - one modelled on the early warning siren acting as an incongruous image to ironically link the technologies and soundscapes of Warfare with the technologies of Music culture. The second gallery space will house a sonic forest of absences. A matrix of sculptural objects will relay fragments of archival 78 rpm recordings of endangered animals, birds and environments.

The loss, silence or absence evoked by such usage is manifold: in a real sense, many of the animals, habitats and singers on the recordings will be dead - indeed, some of the recorded species may well be extinct. This extinction is doubled by the fact that analogue, disk based recordings are themselves an *endangered species*, the majority of these 78rpm recordings are, in effect silenced ,or drowned in their own surface noise. Relegated to the margins by the *hygene* of digital fetishism.

This is then a re-composed forest, a forest of surface noise, the sound of the needle in the groove, the scratches and clicks creating as much of the rhythmic drive and texture of this forest as the faint calls of creatures.

The vast, empty, dome of the Opera House, as reverberant as a political vacuum, the siren's wailing call and a muted ecology technical and natural ~ may have the resonance of poetry - But I assure you they are also objective realities.

THE WAY
IS NOT DIFFICULT,
BUT YOU MUST AVOID
CHOOSING

By Michael Hill

m.hill@afc.gov.au

T his is the Pergamon museum in Berlin. It houses the ceremonial walkway brought back from Babylon by German archaeologists late last century. Like a lot of museums, you can hire a cassette player with an audio tour, which provides a running commentary to the exhibits. Its a very simple way to tie together moments in time with places in space. The information on the tape is also there on cards beside the exhibits to be read, but the majority of people take this tour and prefer to be led around the place rather than spending time with each exhibit and letting the stones speak for themselves.

What does this mean when we see that all these people want to make their non-linear experiences linear? Unfortunately it seems to say that most people still like to be told things in a sequence. Perhaps this has a little to do with the centuries of television that people have watched, and we might start to unpick this as television's hold is lessened.

But what I think people appreciate from these tours is not so much the sense of order, but the sense of duration. The experience has been made linear, but it also has been made finite. For two marks, you can get closure on four thousand years of Assyrian history.

I want to talk about how the interactive form can begin to create more deeply emotional experiences than we are currently used to, and what may in fact be stopping us from reaching the depth of experience that, for example, the cinema offers. I like this image because it offers an example of an oscillation occurring between the roles of observer and participant. I think that we need to grasp the paradox of these two seeming opposites and draw them together if we are to create deeper and more emotionally affecting experiences within the interactive form. For the purpose of this talk, I'm only concentrating on those screen-based works on the spectrum between the video game and the interactive movie.

We tend to dismiss cinema as old media. We deny that we have more deeply immersive experiences at the cinema than at the arcade. Are these deep experiences only to do with the quality of the programs, the sex, the violence, the cinematic apparatus, the popcorn, or is there something else at work?
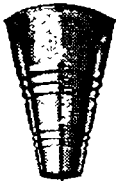
The predominant analogy for the cinema throughout its life has been the dream. Many people have drawn the similarities between the immobility of the spectator and the sleeper, the dimming of the lights in the auditorium and the descent into sleep, the dance of images in a void, and the inability of either sleeper or spectator to respond to a call to action.

We can look at the more contentious extensions of the analogy where Hollywood is a Dream Factory, the screen is a breast, the film is psycho-analytical material, and the entire chain from dream to cinema is a subject to be studied as though mentally ill. Which of course should not be discounted.

Even though the cinema/dream analogy may present more problems than it solves, what it does do is suggest that the cinema exists in a state of symbiosis with the unconscious. This connection is also a way of understanding why the ultimately passive cinema is more immersive than contemporary efforts in interactive media.

By preparing the spectator for what comes after by what comes first, the cinema can create a greater depth of feeling, a more direct road to the unconscious. Timing and placement can be carefully controlled to create epiphanies and realisations in the spectator. In good hands, the spectator feels spiritually renewed, in bad hands, the spectator feels manipulated.

I am interested whether we can create the same feeling in interactive media, or whether the constant call upon the conscious mind to make choices, actually short circuits our ability to stir the lower depths of the unconscious. I wonder whether there is a form of interactivity which can offer the deep, dream-like state of the cinema, and still let us hold on to our new-found role as participants.

At about the same time as computers started to make it possible to make more vigorous explorations of non-linear narratives, dream researchers started to seriously examine the role of the lucid dream.

Lucid dreaming is where you are dreaming, and you know that you are dreaming. Your dreaming self can move within the dream and shape its content. Even though danger may be present, you feel protected because you know you can change the outcome of the dream, or even wake up.

In its most heightened form, the lucid dream is accompanied by sharpened sounds, strengthened colours, smells, tastes, and feelings in such a pronounced state that they are similar to waking hallucinations. There is an accompanying sense of clarity and of calmness.

Ancient cultures and now dream researchers also believe that the lucid dream comes from a higher plane. Mystics have used them as a place to find answers. You would ask the question before you slept, and then again in the dream.

Often your answer would come to you from a wise person or an ancestor in the course of the dream.

In many ways it is seen as a state to attain, like enlightenment. Significantly, the lucid dream is also always seen as psycho-pathologically healthy.

It may be interesting then to try to create an interactive work which operates like a lucid dream, just as many early film-makers consciously tried to make dream cinema. While we know that there can be nothing less surreal than consciously evoking the surreal, this line of inquiry has left us some magnificent works of cinema from Melies, Bunuel, Tarkovsky and countless others.

If we wanted to create an interactive work with similarity to the lucid dream, we would want it to be totally immersive, to be hyperreal to the point of hallucination, we would want it to stimulate all the senses in a way which the cinema can stimulate our hearing and vision, we would want to be able to enter the work and negotiate it, even change it, we might even want to be able to ask a question before we entered the work that might be answered by our interactions, and most importantly, we would want to be able to choose when to be an observer, and when to be a participant and not be penalised for either.

I realise that works like Myst and Cosmology of Kyoto can be traversed without recourse to action and the user can pass between the states of simply looking around and acting within the world. Likewise the second Journeyman project CD has a mode where you can simply scroll through the environments without having to do all the tricks and gather weapons, but these works don't quite suggest how best to create a balance between observation and participation.

Interactive cinema artist Graham Weinbren grapples with the issues of continuous interaction in the program and the relationship of the unconscious to the program material. In his laserdisc installation, Sonata, Weinbren offers a number of streams of story which can be entered by the participant as they flow past. The work has duration, it offers continuous interaction, and instead of choosing options from a range of preselected outcomes, the participant feels that they are channelling a stream. You choose when you want to intervene. If you don't interact, you don't die. Small movements and changes are made which obviously have outcomes further down the track, but the feeling is of making small deliberations instead of life changing choices.

Weinbren talks of the importance of balancing the program's sense of continuity with the participant's desire for interaction. In Sonata he has managed to create a work which is interactive without being interruptive.

Interestingly, Weinbren describes his work as interactive cinema, as a temporal art form. And his metaphor takes the form

of an emotional and intellectual landscape to negotiate, rather than a depiction of a space.

To my mind this work offers the beginnings of a form which draws together the observer and the participant, much in the manner of the lucid dream. Material can be altered, meaning becomes apparent after the choice is made, the participant deals with the arrival of the next image or event, and places it in the context of a gradually increasing meaning.

So the question becomes, how can you embed the decision making process into the experience of the work? How do you keep the participant from stepping outside the work every time a choice is made. The model of the multi-path drama is wrong because it doesn't allow the participant to interact at any time, and the videogame model is wrong because it doesn't allow the participant the option of not interacting for certain sequences. Neither of these models are close to life. Life doesn't call upon us to make choices every second, nor make a decision under pain of death every time we turn a corner. Nor does it offer us cleanly branching paths. Life doesn't ever give us the feeling that we are in control for any longer than the time it takes it to see our parents.

Perhaps I am making too much of this distinction between observation and participation. In Heisenberg's universe perhaps it's even foolish to establish this separation. As we are getting very used to the idea of observers who change their world through the act of observing, maybe there is no longer a difference between the participant and the observer.

Yet, in our efforts to create a more viscerally interactive form , we seem to have let the term 'interactive' describe only those works which we manipulate with our hands. The way in which the audience projects their fears and desires onto the screen hero still remains one of the simplest and most elegant interfaces. The next stage of the interactive cinema has to re-establish the psychological connection between viewer and screen by helping the audience become active observers rather than remote and diminished participants. Until we restore the balance between observer and participant (and I suggest we look for clues within the lucid dream) the interactive form will sway between reflex-tester and novelty. In the words of the sage: The Way is not difficult, but you must avoid choosing.

WORLD UTOPIAN PROCESS W.U.P.

ÉTHIQUE DE LA CRÉATION

Par Jake

Avant de vous présenter quelques-unes de mes réalisations et mes projets récents, je voudrais esquisser les perspectives d'ensemble de mes recherches, telles que je peux les analyser à l'heure où je vous parle.

Tout d'abord, ma démarche. Elle consiste à explorer successivement des territoires qui me sont a priori inconnus, mais dont je découvre, au fur et à mesure que j'avance, que ce sont des fragments d'un même tissu. Je veux dire que j'entre au coeur de chaque problème qui se pose à moi d'une façon tout à fait particulière, convaincue de la singularité de ce que j'explore... jusqu'à ce que je découvre que je suis dans la continuité de mes démarches plus anciennes.

Que disent Deleuze et Guattari? "C'est un des caractères les plus importants du rhizome d'être toujours à entrées multiples".

Et encore: "Le rhizome est un système acentré, non hiérarchique et non signifiant (...), uniquement défini par une circulation d'états". Ainsi donc, chacune des entrées par lesquelles j'aborde ce système multiple non hiérarchisé me fait accéder à un segment du même principe. La cohérence de ma démarche est confirmée. Mais les dimensions de chaque segment augmentant au fur et à mesure que j'enrichis mon expérience, le système change de nature, en vertu du principe selon lequel les lois de combinaison croissent avec la multiplicité.

Ce sont encore ces deux philosophes (ce sera ma dernière citation) qui voient dans le cerveau le même principe d'organisation: "La discontinuité des cellules (...), l'existence de micro-fentes synaptiques, le saut de chaque message par-dessus ces fentes, font du cerveau une multiplicité qui baigne tout un système probabiliste incertain." J'espère que la suite de mon exposé vous montrera en quoi ce modèle de structure multiple généralisé jusqu'au cerveau humain donne sa cohérence et sa légitimation à l'ensemble de mon travail.

Quelles sont, pour dire les choses simplement, les questions qui me tiennent en alerte, et auxquelles je tente de répondre dans mes recherches?

Première exploration: Ce que j'appelle l'empreinte de lumière, comme on parle d'empreinte digitale. Je m'intéresse à

la lumière réfléchie (et non à la lumière émise) en ceci qu'une fois captée par tous les moyens que nous offrent les nouvelles technologies, elle "dit" l'univers physique selon deux modes, l'analogique (le corps mué en une matière nouvelle, le flux lumineux) et le numérique (l'image comme virtualité métaphorique). Au sein de cette exploration, une investigation plus fine: à travers l'empreinte, comment exprimer l'identité, par exemple - et ce n'est pas un détail - comment différencier les sexes?

Deuxième exploration: Le corps dans l'espace. N'importe quel corps physique, à n'importe quelle échelle, mais plus particulièrement le corps humain en tant que volume en mouvement dans l'espace, puis, en tant que résonance. L'exploration des divers moyens de dématérialisation, de réflection, de déplacement, de duplication, de superposition, conduit à bâtir une dialectique de l'apparence et de l'être, de la présence et du regard, de la résonance biologique et de la résonance du comportement individuel.

Troisième exploration (mais si les deux premières ont été menées à leur terme, celle-ci et la suivante restent à faire): il s'agit de donner à voir le corps social et le "corps" cosmique dans lesquels baigne chaque individu autrement que celui-ci ne les perçoit. La question n'est pas de produire, par les moyens que m'offre la technique, des images belles ou inconnues, mais de poser de nouvelles questions à partir d'une vision de l'homme dans son champ social, dans son environnement physique, du plus proche au plus lointain, y compris le moins perceptible (comme l'autre côté du globe terrestre).

Le quatrième territoire est encore plus vaste: c'est celui de l'espace infini - et plus rhizomique qu'aucun autre - du savoir, de la mémoire, de l'information, dont je veux faire une matière plastique, au sens de la création artistique. C'est le questionnement sur la place de l'homme dans le cyberspace qui m'occupe, et sur la création de l'outil de navigation qu'il faut pour "travailler" cette matière.

Human Light Human 2074
Rendre visible l'invisible
Paul Klee
Mémoire lumière de la présence de l'homme
Installation multimédia, 1994

On peut considérer cette oeuvre comme un corps qui se déploie, puisque, pour que l'image de l'être en lumière soit vue, il doit passer par l'espace lumière, là où se combinent visible et invisible.

Human Light Human 2074 a été créée à Madrid pour l'ARCO'94 avec le concours de la Fundaçion Arte y Tecnologia y Telefonica. Comme son titre peut vous le suggérer, mon propos est d'aller de l'homme, image actuelle, corps en mouvement, à l'homme, image virtuelle, "passé contemporain", comme disait

Bergson, de l'image actuelle, en passant par la lumière et un "assemblage machinique" destiné à la capter.

Je parlais à l'instant de l'investigation qu'il m'a semblé indispensable de mener pour étudier, puis identifier l'empreinte de lumière, comparable à une empreinte digitale, que laisse un corps. Cette investigation je l'ai menée à l'aide d'un dispositif constitué de réseaux de fibres optiques, de lentilles et de systèmes de digitalisation des images par régie vidéo et ordinateurs. J'ai pu confronter la réalité d'un être humain, ce que j'appelle son image actuelle - à savoir le sentiment ou la vision par miroir interposé qu'il a de son corps - avec une icône lumineuse, mouvante, née de la compression des informations lumineuses captées par un appareil de ma conception appelé *Voxel Light*.

Que nous donne à voir une telle installation? Que nous apprend l'observation des phénomènes qu'elle suscite?

Human Light Human déploie l'esthétique de la forme en mouvement de la matière fluide indéfiniment transformable. De même que le mot donne corps au concept - est à la fois la chose et son abstraction -, l'empreinte de lumière signifie le corps dont elle s'est détachée. Elle laisse deviner le corps sous la densité de la lumière. Mais en même temps, elle baigne l'univers. Captée, interprétée par mon dispositif, la lumière ramène donc l'univers entier à la dimension humaine, celle de notre vision.

Le corps s'installe dans la fragilité d'une identité précaire. L'être prend les attitudes non contrôlables, individuelles, son empreinte lumière essayant de gommer l'individualité et le sexe.

Il y a également à l'image des passages de figures humaines sous leurs empreintes de lumière. La matière fluide de la lumière quitte sa matrice corporelle: elle reste à proximité, mais elle demeure cependant inaccessible.

Pour mieux comprendre de quoi je parle, je dirai un mot de la technique particulière de *Voxel Light* : cet appareil à capter les empreintes lumineuses est composé d'un réseau de fibres optiques que l'on peut disposer à 360 degrés et tous azimuts, y compris hors du champ de vision de l'être humain qui en est le sujet - à l'autre bout du monde. Oeil à innombrables facettes, il rassemble, comme sur le nerf optique, les multiples empreintes lumineuses qu'il a captées dans un minuscule cercle où elles se juxtaposent. Ainsi *Voxel Light*, micro-objet, radicalise et élargit notre vision du monde. En inscrivant dans ce cercle exigu le corps et ses multiples enveloppes (du vêtement à l'espace), *Voxel Light* radicalise et élargit la problématique de l'art corporel. Ici se révèle le flottement entre l'être et l'apparence, dans une singulière cohabitation d'empreintes, dans une fluidité d'identités juxtaposées.

Cette oeuvre qui inclut un espace-lumière, des capteurs optiques, un dispositif de compression - la *Voxel Light*, un dispositif optique d'expansion, un dispositif de projection en

temps réel des images actuelles et des images virtuelles produites par *Voxel Light*, un laboratoire d'images.

Ainsi se met en place un processus involutif où s'échangent les rôles entre spectateur actuel (physiquement présent) et spectateur virtuel (dématérialisé, numérisé), créant de la sorte un supplément de présence.

Cette dualité de la présence du spectateurs à la fois sujet et objet, renvoie à une perception temporelle: celle d'un passé en coexistence avec le présent qu'il a été. Le présent, c'est l'image actuelle, la réalité du spectateur - son passé contemporain, c'est l'image virtuelle. Un phénomène qui répond directement à la question de Bergson: "Comment le souvenir ne naîtrait-il que lorsque tout est fini?"

Pour conclure cette première présentation, je dirai que, pour résoudre l'ambiguïté dans laquelle ce dispositif place obligatoirement le spectateur, puisqu'il est impliqué dans une actualité-virtualité aussi déconcertante que stimulante pour l'imaginaire, une photographie est réalisée, sorte de document-témoin à un seul exemplaire de cet instant suspendu, qui authentifie sa présence dans l'oeuvre.

Le Corps du corps
Installation vidéo
Virtual Fluid, 1994

Quand on regarde, c'est exactement comme quand on lit: le corps et les yeux du corps jouent un rôle déterminant. Il s'agit d'additionner d'infimes particules du passé et du présent, et de les stabiliser dans la matière. Sans la lumière, on n'y parviendrait pas.

Entre le spectateur et les batteries d'écrans qui diffusent les images, un écran virtuel recompose les images planes et les images actuelles dans un espace tridimensionnel fluide.

La manière dont le spectateur va se placer, se mouvoir ou simplement "plonger" dans cet espace virtualisé va déterminer sa perception temporelle et spatiale.

La fluidité où baigne toute chose, y compris le spectateur dont le reflet est lui-même multiplié, déterritorialisé, superpose et confond trois temporalités: le présent de ce qui s'agit, le passé des images virtuelles venues, comme on l'a vu, de plusieurs sources, et le futur - ou tout au moins l'anticipation - de celles que son comportement va susciter.

La même fluidité déstructure l'espace, reflets, transparences, échos, anamorphoses, ruptures d'échelle, gauchissement des perspectives, inversion des plans, subvertissent la perception euclidienne de l'univers.

Un tel dispositif produit en permanence des phénomènes dont l'observation suscite plusieurs niveaux d'interprétation dont il faut refuser de chercher la cohérence.

Il y a un décollement de l'image entre l'écran et ce qu'il produit. Un décollement fondamentalement pictural, mais qui n'est pas une image. Quand on se déplace, c'est exactement comme si on additionnait le corps à l'espace. Le simple fait de se déplacer dans l'espace produit déjà une projection hors de soi vers l'autre.

Les points de fuite classiques de la perspective inventée à la Renaissance volent en éclats. Seule la façon de se placer, de se déplacer dans cet espace virtuel et de le percevoir organise les perspectives et les distances.

Pour revenir à Deleuze et à sa forte vision d'un agencement sans modèle structural:

- Dans chaque partie de l'univers physique, il y a des lignes d'articulation ou de segmentarité, des strates, des territorialités, mais aussi des lignes de fuite, des mouvements de déterritorialisation et de déstratification. Les vitesses comparées d'écoulement sur ces lignes entraînent des retards relatifs, des viscosités, des précipitations et des ruptures. Tout cela, les lignes et les vitesses mesurables, constitue un agencement. C'est une multiplicité - mais on ne sait pas encore ce que le multiple implique quand il cesse d'être attribué.

Virtual Process, 1995

La question du corps devient centrale lorsque les procédures de dématérialisation se multiplient. Vous avez vu qu'elle est au centre de tous les projets que je vous ai présentés jusqu'ici. Elle redouble d'actualité dans le projet que j'ai réalisé cette année à l'UNESCO, à Paris, sous le titre de *Virtual Process*. C'est la raison pour laquelle j'ai voulu le distinguer de mes recherches formelles de *Virtual Fluid* bien que par plusieurs aspects les deux projets soient voisins.

Virtual Process est un dispositif à la fois formel et sémantique qui met en résonance interactive la présence réelle d'une personne et la "pulsation" d'une image virtuelle, le "coeur de lumière". Placé entre le corps humain et le corps de l'espace traduit en lumière, il visualise et virtualise les résonances de l'un et de l'autre au rythme de ces deux "corps".

Comme dans le dispositif *Virtual Fluid*, un écran virtuel recompose la réalité en fonction des déplacements du spectateur. Comme *Virtual Fluid*, il met l'observateur dans une relation fluide à l'égard de l'espace et à l'égard du temps. Mais surtout il plonge dans une virtualité nouvelle, celle du savoir, par superposition de ce que Leibniz appelle des mondes incompossibles: la résonance du corps interne vu par les dispositifs médicaux, *Echo Dopler System*, *Résonance Nucléaire*

et celle de la matérialisation lumineuse d'une présence humaine et d'un espace machinique.

Cet agencement machinique combine: la traduction en lumière de la configuration de l'espace; l'écho lumineux de la présence du spectateur; une première caméra qui, en *Feedback System*, transforme la somme de ces phénomènes en résonance - un corps lumineux battant dans un rythme accordé au dispositif.

De même, l'espace n'étant plus perçu de la même façon, l'observateur est face à une subversion spatiale et temporelle. Sa perception est nouvelle, presque physique. Les deux corps deviennent fluides.

World Utopian Process - W.U.P.

J'ai présenté ce projet hypermédia, en 1994, aux Assises de Métafort. C'est un projet ambitieux que je n'ai pas craint de placer sous le signe des utopies, celles qui autorisent l'avènement de réalités nouvelles. Il met en oeuvre, dans sa configuration majeure (mais, sur le même principe, on peut imaginer des configurations de plus faible envergure), des transmissions par sattellite et Internet à partir de dispositifs fixes ou ambulants investissant les grands centres urbains de la planète, ou des espaces de proximité à l'échelle de la ville.

La conviction qui m'a poussée à concevoir un projet d'une telle ampleur, c'est que sous le ciel des mégapoles, l'organisation ne peut plus, désormais, être pensée sans son complément de décomposition/recomposition. Retour à Deleuze et Guattari: on ne peut plus satisfaire, disent-ils, d'un modèle arborescent des structures d'organisation, qu'elles soient sociales ou spatiales. En ce qui concerne les villes, on en voit la preuve partout.

A quel complément de décomposition/recomposition suis-je en train de faire allusion? A un dispositif permettant, grâce à *Voxel Light*, ce que j'appellerai la connexion stratifiée. Je m'explique. On confie à *Voxel Light* le soin de compresser les informations perpétuellement changeantes de l'espace urbain. On se souvient des empreintes lumineuses que fournissait, dans l'espace restreint du dispositif *Human Light Human*, son réseau de fibres optiques compressées. Ici, il rassemble un flot d'informations en un micro-espace de 15mm de diamètre, sous forme d'anneaux concentriques correspondant chacun à une strate de la ville: sont mis en relation de proximité, et à l'échelle de la vision oculaire d'un individu, des zones de vie naturellement séparées - du plus grand au plus petit, le ciel, les bâtiments et les arbres, la rue, la foule. Le centre de ce micro-espace reste vide, libre, ouvert à une action, à la présence directe d'un corps, celui d'un spectateur-acteur: l'empreinte d'un corps devenu langage dans un espace-limite de proximités. Ainsi peut s'animer en permanence une sorte de démocratie du temps réel: des virtualités de significations partagées s'élaborent, à travers des connexions de toutes sortes et des "corps-à-corps" au-delà des frontières établies du statut social et des langages appris.

Avant d'aller plus loin dans mes hypothèses de fonctionnement social et culturel, voire politique, de *World Utopian Process*, et dans ce que je crois devoir être ses conséquences éthiques, je voudrais en décrire rapidement le dispositif.

Une même installation est reproduite dans chaque capitale choisie pour l'expérience, comme Paris, Berlin, New York, Montréal, Pékin, Tokyo, Sydney, etc.

Chaque dispositif comprend un appareil de:

Enregistrement:
Capting Machine (appareil de traitement des informations lumineuses) - appareil muni d'un réseau de fibres optiques FOL, capte l'information lumineuse et la compresse en icône, *Voxel Light*. Elle traduit en empreintes de lumière les mouvements et la matière du flux continu.

Transmission:
Une caméra vidéo capte et émet l'image de *Voxel Light* vers les villes mis en réseaux par l'expérience par satellite, ou par le réseau Internet (via digital network).

Observation:
On appelle *Spot d'observation* l'endroit, lieux publics, où sont disposés plusieurs moniteurs vidéo recevant les *Voxel's Light*. Living-room TV, lieu privé.

Dans le dispositif proprement dit, un nouveau software est mis en place pour numériser les informations optiques (intensité, fluidité, couleurs, etc) produites par *Voxel Light* et les restituer, à partir de leur forme algébrique, selon diverses cristallisations nouvelles. La matrice fluide - *Voxel Light* - devient une puce électronique du programme - hardware.

Comme je l'ai indiqué en commençant, *World Utopian Process* est un dispositif de captation, de transformation et de retransmission à grande distance de toute réalité matérielle dynamique (l'homme, le groupe, la foule) ou statique (l'environnement proche ou lointain), telle qu'elle est révélée par la lumière - autre "matière" dont la particularité est de défier les contingences temporelles et spatiales.

Un agencement est tourné vers les strates qui en font une sorte d'organisme, un corps sans organes qui ne cesse de défaire l'organisme, de faire passer et circuler des particules asignifiantes, intensités pures, et de s'attribuer les sujets auxquels il ne laisse plus qu'un nom comme trace d'une intensité.

Loin de s'opérer "à l'aveugle", de telles relations résultent, dans l'instant, d'actes d'écoute, d'expression, de décision et d'évaluation fondant un nouvel ordre éthique.

Éthique du paradoxe, puisque l'acte physique - situé dans l'espace-temps - une fois transmué en molécule de lumière,

s'oppose aux représentations communes, résiste à tout ce qui s'engendre aujourd'hui dans la "communication de l'information".

Éthique de la création face au pouvoir de l'opinion et du sens commun; *éthique de la résistance* face au règne écrasant des "consensus mous".

Éthique du "micro" face à l'hypertrophie du *"macro "*, face aux tendances "lourdes" des majorités.

Éthique du minoritaire, des minorités de toutes sortes, celles qui existent en chacun de nous, et pas seulement du point de vue ethnique.

En somme, une *éthique de la vie inventive, libérée et multiple*, celle qui fait le plus durement défaut à chacun de nous.

Voxel Light donne, dans le champ restreint de son micro espace, un mode d'unité non bureaucratique, non "représentatif", au sens statistique du terme, de l'organisation de la cité. Il révèle, dans son apparente unité, une "philosophie" de la différence, au sens où toute différence y est différence d'intensité. La différence de différence, infiniment dédoublée, écho infini d'elle même.

Comme toute création artistique, *World Utopian Process* part d'une matrice - ici, la planète - qui va être remodelée, transmuée, par une intervention technique spécifique - en l'occurrence une combinaison d'appareils de traitement des phénomènes lumineux. La "matière" captée dans ces lieux de vie intense et de déferlement continu de phénomènes lumineux que sont les coeurs de grands métropoles du monde, va constituer "l'oeuvre".

World Utopian Process est un dispositif planétaire dans son principe. Toutefois, il peut s'appliquer à des territoires de moindre ampleur. Il comprend un nombre variable de points d'installation mis en réseaux par satellites. A l'entrée de chaque installation sont captés des informations lumineuses, statiques ou dynamiques, de vitesse et d'intensité variables. Cette matière en expansion est, en temps réel, compressée à l'extrême à travers *Voxel Light* pour produire une icône en perpétuelle mutation. Cette icône est la recomposition (image virtuelle) d'une réalité (image actuelle) inaccessible à la perception hors de ce traitement. Les diverses icônes ainsi créées par le monde sont regroupées, via les satellites ou par Internet, dans les diverses métropoles impliquées dans l'expérience.

Le moment est venu de vous dire quelles pourraient être, selon moi et en fonction des résultats de mes autres recherches, les conséquences d'une telle "oeuvre", en termes de vision du monde pour moi-même et, en termes d'intervention dans la vie culturelle et sociale de la collectivité planétaire.

Nietzsche disait quelque chose comme: Jamais une montagne n'est séparable des vaches qui la peuplent et qui sont également les nuages du ciel - et Héraclite, cité par Platon, rappelait que l'on ne saurait entrer deux fois dans le même fleuve. C'est devant les fontaines d'images virtuelles de *World Utopian Process*, saisie globale de la planète mêlant le présent et le passé, l'action et la contemplation, la communication et l'action, que le spectateur-acteur peut entendre, méditer et comprendre ces deux aphorismes anciens.

Tout d'abord, parce que, à l'intérieur des cercles concentriques de chaque icône, et dans les espaces de restitution de l'ensemble des icônes collectées sur la planète, la juxtaposition de points de vue aussi bien spatiaux que sociologiques donne à voir ce que jamais personne au monde n'avait pu expérimenter - sinon en imagination - la simultanéité d'éléments hétérogènes baignés dans la même lumière, et la potentialité de "passages" (échanges, rencontres) entre ces éléments sans cohérence logique apparente. Voilà pourquoi j'ai aimé citer Nietzsche.

Quant à la phrase d'Héraclite: comment ne pas voir dans la permanence apparente de ces empreintes et le grouillement ininterrompu des événements dont elles témoignent à leur façon, une invitation à la conscience aiguë des différences, et à la constitution d'une éthique des minorités, non seulement ethniques mais aussi idéologiques, culturelles, etc? La permanence des images en tant que telles (métaphore de l'effet anesthésiant de la communication de l'information) ne doit en aucun cas nous dispenser de percevoir nos diversités et d'en faire les fondements d'une éthique de la vie inventive, libérée et multiple.

Se connaître, s'assumer, se transformer, se faire aimer, trouver sa place dans la ville, dans l'univers, tels sont les thèmes proposés aux spectateurs-acteurs de *World Utopian Process*: le dispositif fait apparaître pour chacun de nous, avec notre singularité, la multiplicité de nos identifications et la relativité de nos existences symboliques et biologiques.

Prendre conscience qu'il existe pour chacun de nous un atlas de l'espace conceptuel - un peu comme, lorsque nous fermons les yeux après avoir regardé la lumière, des myriades de fragments lumineux demeurent sous nos paupières - et élargir cet atlas pour parvenir à une lecture du monde à la fois plus personnelle et plus ouverte, telle est, sur un autre plan, la possibilité offerte par notre "agencement machinique" planétaire.

Ainsi comprise, l'esthétique prend en charge la question morale. L'imaginaire, sollicité par le processus narratif mis en oeuvre, contribue à l'émergence de nouvelles directions éthiques, encore imperceptibles parce que non réalisées.

Pour conclure: le projet Pilote

«On ne peut pas parcourir l'infini.»
Aristote

Dans la logique de ma progression en rhizome, il n'y a pas de conclusion. Il n'y a qu'une fin de séquence.

Le présent projet de recherche s'inscrit dans la continuité de *World Utopian Process*, mais plonge plus radicalement encore dans la matière multimédia.

Depuis quelques années, vous l'avez vu, je mène, comme artiste, un travail sur les processus de transposition de la matière en lumière, sur sa visualisation, sur l'addition des différents modes de transposition, etc. - et ceci à différentes échelles. Un tel principe s'apparente d'assez près au fonctionnement de notre esprit, et plus particulièrement de la mémoire, qui se déplacent entre les objets qui les habitent à une vitesse inimaginable.

C'est selon ce même principe que j'aborde mon projet nommé *Pilote* - l'outil de navigation conçu comme un logiciel, le cerveau de l'espace imaginaire qu'on explore.

Pilote fonctionnera sur le réseau Internet dont il utilisera les ressources. En plus de cette prise d'appui sur un réseau universel, *Pilote* trouve dans les travaux de mathématicien développer Nicolas Flawizky et l'astro-physicien Laurent Nottale, théoricien de l'espace-temps fractal, une base conceptuelle indispensable à la conduite du projet. (Laurent Nottale, directeur de recherche au CNRS travaille au laboratoire d'astrophysique extragalactique et de cosmologie de Meudon).

Je n'aurai pas la prétention de développer la théorie de Laurent Nottale: je me contenterai de dire que sa nouvelle explication du monde montre que l'univers est structuré comme un fractal, c'est-à-dire qu'il présente des structures cohérentes quoique d'aspects différents quelle que soit l'échelle - et que, donc, on peut "zoomer" à l'infini sur n'importe quelle partie.

Cette notion de continuité dans la structure et cette possibilité de passer en temps réel d'une échelle à l'autre, de l'infiniment grand à l'infiniment petit, sans solution de continuité, est sans doute le principe le plus riche et le plus nouveau de mes travaux. Laurent Nottale s'est du reste associé à l'équipe que je réunis pour mener à bien ce projet.

Pilote est un outil de repérage, une sorte d'atlas - ou, mieux, ce que les navigateurs de la Renaissance appelaient un portulan (cartographie et description des ports et des accidents côtiers du monde connu) de l'espace infini du savoir et de la mémoire universels.

Supposons par la pensée l'application à cet espace conceptuel de cette notion de connexions illimitées dans le temps comme dans l'espace: chaque objet se présente à nous dans ses caractéristiques pures, à quelqu' échelle qu'on l'observe. Le dispositif hypermédia permet une navigation simultanée à travers l'infiniment petit de la matière fluide de l'objet observé, comme des informations de toute nature qui constituent son environnement. Autrement dit, dans une description globale de l'espace, les objets existent simultanément à toutes les échelles, bien qu'on ne les perçoive qu'à une seule. Les échanges d'informations entre niveaux sont permanents.

Dans le dispositif hypermédia auquel je travaille, la "lecture" devra pouvoir s'effectuer à plusieurs niveaux, en fonction de la commande opérée par le navigateur. Les réponses qui lui seront données seront visualisées, à sa transformation, se comportant comme une résonance de lumière. L'outil de navigation dans l'espace fluide et infini de l'information devra être capable de mettre en relation d'infimes particules intelligentes captées à n'importe quel niveau d'échelle et sous des perspectives multiples, qu'elles soient scientifiques, sociales, culturelles, géographiques, historiques ou autres.

Je me rends compte que l'évocation du dispositif peut occulter les objectifs fondamentaux qui m'animent. Je les résumerai en trois points, et j'en aurai fini:

*Si nous avions la faculté de nous déplacer sans entrave dans les profondeurs du savoir, notre vie, nos actions, les échanges entre les hommes en seraient transformés. Nous pourrions sans doute organiser différemment l'espace de la communication, par la médiation d'outils à connexions multiples et simultanées comme Vo*xel Light.*

*La question des connexions sans contraintes d'échelle ni de temps, ne se résout que par un troisième terme, essentiel, de la capacité de choix de l'outil de navigation. Comme le cerveau, il devra être capable de raccourcis audacieux et de sélections imprévisibles. Le navigateur qu'il va emmener dans son trajet va voyager sur une onde à haute capacité de variations.

*La réflexion que ce projet va m'amener à faire a, au départ, toutes les apparences de l'abstraction. Et de cette réflexion peuvent naître d'autres matrices abstraites. Pourtant, sans manier le paradoxe, je dois affirmer ici, au moment de terminer cet exposé, qu'au centre de toutes mes recherches se trouve la matière vivante, la nature et l'Univers, en tant qu'espace de vie.

Chacun a une résonance particulière. Chacun est sensible à certains phénomènes et pas à d'autres. Pour ce qui est de ce projet, qui plonge au coeur des espaces conceptuels pour déboucher au coeur du vivant, du social, du créatif, seule la sensibilité qui est la mienne m'y a engagée.

GEOGRAPHY OF THE VOICE

By Kathy Kennedy

kathyk@alcor.concordia.ca

"the only major channel of communication that actively vibrates inside the body...sound is felt in addition to being heard. It is...a way in which we possess others and are possessed by others." [1]

T he voice is an extremely immediate mode of transmission, directly from one body to another. When we hear another voice we recognize instantly (albeit subconsciously) how the sound is being produced. We read a series of physical cues, or more succinctly, we "sense" them, receiving the information through the body even before the brain. Is this kind of recognition translated through the various modes of technological mediation that we are subjected to daily such as radio, telephones, or anything amplified through a microphone? Or has it become an insignificant social convention relegated to a past era, making us, as a society, sonically desensitized.

There are at least two significant trends in contemporary culture that address the issue of vocal transmission (immediate or mediated). One is that of disassociation from the body. The "cyborg" has been implanted into the vernacular. The theorists speak of the body as if it were an endangered species in need of preservation. Ethical questions in fields ranging from genetic engineering to synthetic reconstruction to cosmetic surgery revolve around the genus of the body. The concept of "manpower" as in manual or physical labour has become almost obsolete since industrial automation, and the testing of our physical tolerances and extremes has been limited to a secondary role in our society, that of leisure or sport. Gender has never been so ambiguous (transformational surgery evoked), and race and age are becoming less determining features of the individual.

The second trend is that of the fading of geographical or physical space in the contemporary psyche. A twelve year old spending hours each day netsurfing knows little of geographic restrictions. Nor does he or she sense any distinguishing qualities between one place or another. The experience of globetrotting takes place on a computer screen with sensory cues being restricted almost completely to the visual. We are all "virtually" inhabiting...cyberspace.

Sound, conversely, exists within physical space. There are very real parameters that define this space such as the distance and speed at which bigger, lower, and slower sound waves travel compared to smaller, faster, and higher ones, resonance factors and so on. The physical matter that blocks these waves or conducts them more easily (from metal walls to water) are other

isea95@er.uqam.ca T : (514) 990-0229
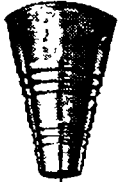
ISEA95 montréal

aspects that continue to define sound within the laws of nature. There is, of course, the element of time that continually reminds us of its physical reality.

As a musician, my experience of sound has always been primarily physical. That is, before the emotional stirring caused by Barber's *Adagio for Strings*, the intellectual admiration for Schoenberg's *Verklärte Nachte*, there was the basic impact of sound on my body. I was aware very early on, as I'm sure we all were, of the effects of slow, soothing tones or the impact of heavy, driving beats on my body. The concept of absolute music, restricted solely to the intellectual, the "dark, silent recesses of the mind" has failed to entirely hold my interest.

There was also a telling of the shape and parameters of my environment through sound. To hear a clap of thunder rolling across the horizon was to be reminded of the full breadth of my surroundings. I was taught in music school that one never played one's instrument in a void, that one should be conscious of the reverberations against the walls, to play *with* the space, the room, the hall in which it was being heard. In fact, the room is part of the instrument and so is the listener and the performer. There is something about the practice of music making, or more generally, about the perception of sound that has served to link me to the physical surroundings of my environment, to make me more aware of my own body. As for singing, the idea of producing sound from my body out into the environment has always been the most direct form of expression I could imagine.

2.
My work with the voice has gone through a progression of stages from technical obsession (practicing to become a classical singer), to composing specifically vocal and choral music with electroacoustic elements. It lives now in a series of questions about the role of the voice in our society.

What is the voice? Surely it encompasses more than just the sound formed in the larynx. Doesn't everything have a voice? Isn't it simply the channel through which everything speaks? Do animals have voices? Do computers? "Voice" can also be a medium of expression, a vote or opinion. To be of one voice is to be in unanimous agreement, and to give voice to one's feelings is to give utterance to them. A friend recounts a Bedouin woman's statement "we have to fight for our voice every day or we will lose it." To understand more deeply the distinctions made in defining voice, one should read a more in-depth analysis that differentiates between voice, sound, and language.[2]

As in Aristotle, "the sound of a living thing" describes well what I have been listening to in the voice. It is less physical, more ephemeral than Barthes' *grain de la voix* . His rather complex description includes "the body in the voice that sings, the hand as it writes."[3] His focus is on the very materiality of

language and the creation of significations having nothing to do with communication or expression. My preoccupation with voice is not necessarily that which impregnates the physical world with sound. It has always been "the channel" through which ideas or feelings are allowed to speak. An opera singer friend captured it recently by explaining that during singing she must remove herself from her voice in order to be an instrument or a channel through which the music passes.

"A singer's voice sets up vibrations and resonances in the listener's body.... The listener's inner body is illuminated, opened up: a singer doesn't expose her throat, she exposes the listener's interior. Her voice enters me, makes me a "me," an interior, by virtue of the fact that I have been entered. The singer, through osmosis, passes through the self's porous membrane, and discredits the fiction that bodies are separate, boundaried packages. The singer destroys the division between her body and our own, for her sound enters our system."[4]

3.
Recently, my voice was recorded as the principle ingredient for the musical composition accompanying a virtual reality project employing a multi-million dollar budget. Curiously, nothing was budgeted for the performer's fee or even the stock material of the human voice. The "grain" of the voice seems to be too ephemeral for the corporate world, a product so difficult to contain and identify that a market value can't be established.

In popular music, sampling has become standard practice . Taking a "bite" or a small quote of a person's voice and placing it in an unnatural context (i.e.. repeated too quickly to be humanly possible) is now commonly accepted and holds no novelty to the listener. We are becoming accustomed to the automation of the human voice.

The digitized voices of telephone information systems such as directory assistance and multi-leveled menu systems seem to produce a chilling yet effective alienation on most callers. People tend to feel helpless in these structures, resentful of being fooled into thinking they have some flexibility or control by that cheap replica of a human on the other end. Since the telephone is a technological system charged with the task of mediating rather than producing messages, the operator's voice is nearly exclusively female. What is still dubbed as the "women's work" in the passive stance of transferring information is a remnant of a popular conception tagged by AT&T's slogan "The Voice with a Smile" from the 1930's through the 1950's. [5]

This once was a human voice, and now is not.. What is it that has been taken away? The soul? Then has it become the voice of a computer, as in that it speaks of the computer's logic and nothing else. It is a voice that can say only what it has been programmed to. It is, most cruelly, a voice that doesn't really hear. Where does the soul lie in the geography of the voice?

The telephone, at the same time, maintains a privileged relationship with voice. It is an important medium for transmitting exclusively audio. It is by virtue of this an instrument associated with intimacy, with direct communication. It is often used to transmit an emotional or psychological message-not a good medium for hard facts and precise details. It is the channel from one mind to another, and generally free of the distractions of either party's personal backdrop {scenery, environment}. This, in my mind, makes the voice a more powerful instrument as the sole transmitter of this information. The kind of information that is being conveyed must also be slightly different when directed at a focussed ear without eyes. Knowing that the receptors of ear and mind are tuned differently , are reading cues differently, a whole other language is set in motion. Maybe this is why we find the automated operator's voice so disturbing.

We have also learned a specialized style of vocal short-hand through answering machines. Many are often secretly happy to be engaged in a game of telephone tag because it can be so efficient and easy to respond to each other in a series of quick messages. Some kind of pressure is off when there is no real voice to have to respond to. The system of etiquette is already in place which dictates that it is exceptionally bad form to leave distressing news on someone's machine instead of live.

We have learned to rely heavily on the phone in this era of telecommunications, and have been taught (possibly by the phone company) to adapt it into our social morays. In the age of AIDS, people are increasingly reluctant to delve into physical contact and have become more reliant on other méans. Perhaps this is what has led to the tremendous success of the telephone-based social scene. "Tele-personals" ads are perceived as a much more efficient, relatively safe way to find a mate than in nightclubs. The outmoded pleasure principle of raw physical attraction is considered by many to be foolhardy. The voice represents the last vestige of the body as a physical characteristic or reference to an individual's personality. People speak into the dark void of telephone party lines, looking for another interested, attractive voice to respond to. They rely heavily on their ability to communicate verbally to attract the other, listening for their sonic cues to detect interest.

4.
Radio is a voice unto itself...sound is transmitted from a small, private space (the sound studio) through the air waves, via super-audio waves actually, into a small box called a receiver, not unlike the human ear. Since the medium is exclusive to sound, visual cues are left to the imagination of the listener and the voice is all important. The radio drama or *hörspiel* has a distinct quality that often conveys what the visuals of the theatre can never reproduce. The format of the radio show can be easily interpreted through the dj host's style and intonation of speech. A louder, clearer voice implies a daily informational show while a softer, more breathy voice speaks

of emotional, personal issues. We tend to think of radio as having a live quality, that voices are passing through the airwaves and are gone again (although in reality most shows are recorded and catalogued). But this direct transmission that makes things seem more fleeting and spontaneous is curiously like normal un-mediated vocal production, i.e. *speech* .

I like the physicality of radio because of the reality of only being able to transmit a certain distance. It's reminiscent in that way, of an unamplified voice. It is a technology that has been far surpassed by other more efficient, powerful media. Yet many of its users remain faithful to it, even faced with the availability of user-friendly supertools. Pirate radio has long been associated with political subversion and community based information.

Margaretta Darcy created a feminist station undermining Ireland's anti-abortion laws, breaking strictly enforced broadcast regulations. It has been one of the most effective devices of revolution in developing countries everywhere.

In terms of subverting the contemporary notion of cyberspace and virtuality, radio is entrenched in the real and physical. It is a relatively low technology that adheres to fairly rudimentary principles of nature. The constraints of low-watt transmission: i.e. distance, obstacles, and weather variability are all things that make one aware of the inherent physicality of the medium.

There are radiofiles that chase after the natural transmissions of the planet that have existed long before we had developed the technology to hear them. With special very low frequency radio receivers, they seek out the atmospheric radio noises created with electromagnetic energy often caused by lightning. These are a range of clicks, pops, and eerie whistles that "natural radio" listeners record and exchange with other enthusiasts.

My own installation pieces called *sonic choreographies* with low-watt radio transmission address issues of territory and physical space. A soundtrack is broadcast onto the blasters of 100 choral singers. They sing the choral part to this piece, of which the transmitted soundtrack is their musical accompaniment. Moving throughout a large public space, they weave through various configurations, producing harmonies, echoes, and other sonic effects that can be heard differently from a multitude of vantage points. The radio serves as the indispensable unifying factor, linking singers and listeners across distances that would normally be unfeasible.

I think of the voice as an effective delineator of territory and that we can create and assert our own personal space with sound. An important part of what I've been trying to determine as "voice" is, within that emitting, a kind of simultaneous capacity for hearing as well. Establish listening skills is essential so that the voice is a whole entity with a yin and yang. As we are learning to project ourselves we must be sensitive to the

personal space or "sonic territory" of others. A self-defense teacher and I have developed a workshop with in vocal empowerment called W.E.N.C.H. (*Women's Empowerment Now...* and the C.H. varies according to the occasion). We combine some elements of traditional singing and vocal production with physical self-defense techniques. Participants are encouraged to use their voice as a tool to combat or ward off aggression. Many have had significant long term memory awakenings and discoveries that have been clearly evoked through the emitting and listening of their own voice.

To say that technology alienates us from the voice is too simplistic. Certain forms can actually help to keep us in touch with what is essential to the voice. How do we maintain the soul of the voice through its mediation by technology? How do we insure that it remains a channel through which the individual speaks? This is something that must be left to the discretion of the listener.

soul vs. technology
technology vs. body
body@soul

© Kathy Kennedy 1995

Notes

[1] Jennifer Giles and John Shephers, "Theorizing Music's Affective Power," in Robert Witmer, ed., *Ethnomusicology in Canada* (Toronto:Institute for Canadian Music, 1990):19
[2] Frances Dyson, "The Geneology of the Radio Voice," in Daina Augaitis and Dan Lander, ed., *Radio Rethink, art, sound and transmission* (Banff, Canada: Walter Phillips Gallery)
[3] Roland Barthes, "The Grain of the Voice," *Image Music Text* (New York: Hill and Wang, 1977).
[4] Wayne Koestenbaum, "The Queen's Throat," (New York, Random House, 1993)
p. 42
[5] Lana Rakow, "Gender on the Line: Women, the Telephone, and Community Life," (Urbana: University of Illinois Press, 1992)

LITERARY HYPERTEXT

FROM A WRITER'S POINT OF VIEW

By Judith B. Kerman

kerman@tardis.svsu.edu

T oday the word on the page has ramified into (at least) oral performance, book arts, and text on the screen, with or without graphics, animation and sound. Hypertext is partly a bridge between the world of the book and the world of multimedia, but art made entirely of words is not going to go away. So I'm going to concentrate on hypertext and on texts made of words. Most of the issues I will discuss map onto my colleagues' presentations as well.

I like very much the two questions printed in the program to describe this panel: Can traditional narrative make a successful transition into interactive media? Is a participatory space between author and audience possible without losing the pleasures of closure and individual uniqueness? To ask these questions is to reflect where most readers and most writers are today. But they are two really different questions, and the answer to one doesn't necessarily determine the answer to the other.

I think the first question, about traditional narrative, is, at the surface level, the wrong question, and the answer is probably "no" - traditional narrative can't make a successful transition, and why should it? New media often start their lives as platforms for performance of old forms (e.g. films of staged plays), but they soon develop genres of their own, which depend on the aesthetic potential of the new medium itself. If electronic literature were nothing but pages on a screen, it would be a failure. But not to worry - it was clear as soon as computers were widely available that interactivity is the most interesting new potential offered by electronic literature. Hence hypertext.

Yet the nostalgia for traditional narrative points to a deeper question, a dynamic which may be based in human biology and even physics, rather than based in culture or technology and susceptible to cultural change. It may be that verbal language is inherently linear.

We humans experience time sequentially. We experience the words and text blocks of hypertexts sequentially, as we do all verbal language and perhaps all high-resolution information. In processing information, we depend on the ability to recognize familiar things, that is on repetition. But without some novelty there is nothing communicated, although the preferred balance between novelty and familiarity in a message is culturally malleable. We have a narrow bandwidth for high-resolution information. The deep question of hypertext is whether and how much satisfactory literary experiences depend on the author's maintaining control of the sequences and iterations. Because both the truly random and the mechanically repetitive are empty.

A traditional story depends on energy created by the reader's identification with a major character in whose life there is an important unsettled issue. By the end of the story, something should have changed, either for the character or for the reader. This is what structuralist critic Tzvetan Todorov calls transformation (POP 218-233), in his analysis of the movement from past or current equilibrium to disequilibrium to a new equilibrium (POP 111) through changes of the character's situation or the reader's understanding. We recognize the "pleasures of closure" when new equilibrium is established.

Twentieth century Western literature has spent huge energies fracturing narrative and point of view. Hypertext is a logical extension of this, so well suited to contemporary texts that we would have had to invent something like the computer if it did not already exist, as a platform for something like hypertext. But a lot of the energy of any nonlinear literature depends on the text's frustration of the reader's desire for sequence and/or identification, and the reader's satisfaction in assembling sequence, identification, and coherence from the fragments.

If the reader can't ever identify with any character, then finally the reader is the only character in the story, which misses a major point of fictional characterization. One logical outcome is the virtual world, a playground for the reader to explore either in solitude or in a communal interactive setting. But I want to concentrate on the writer/reader dyad of traditional literature.

As the hypertext poet Jim Rosenberg says, "speech is an inherently linear medium, writing is a medium with an inherently non-linear potential" (EQ 1:1). The question is not just narrative - experiments with hypertext poetry show that sequence and the balance between iteration and novelty are also critical in poetry.

So the second question is still open: Is a participatory space between author and audience possible without losing the pleasures of closure and individual uniqueness? Can we exploit the nonlinear potential of text in ways that the intelligent nonspecialist reader can experience? Or is the true literary pleasure of hypertext only available to the writer as she creates the hypertext web?

Participatory space may be the crux of the issue, even though hypertext has made newly visible how interactive the old forms of reading are, and how much books are direct-access devices. And even though hypertexts are really much less participatory than the hype surrounding them proclaims and many of us would like to think.

If the reader can do anything, then nothing has any particular valence; in order to shape the experience, the author has to limit choice. Tzvetan Todorov speaks clearly to this issue when he writes, "the narrative is not determined in advance, any direction is (in the absolute sense) as good as any other. The censorship which forces the author to choose only one is

what we call *verisimilitude*." (POP 83) But, as Todorov demonstrates, verisimilitude is not congruence with a larger reality, but rather congruence with "the internal requirements of the [work] itself," requirements based in genre.

"Any possible circumstance of language is a possible circumstance of poetry," says Rosenberg. "It is the job of the poet to invest that circumstance with energy." If the reader is left to do that job alone, the reader has become the writer. But for all the democratic cant which has attached itself to hypertext, writers and readers connect with each other because the communication of one person's vision to another person is a source of wonder and pleasure. This privileged relationship can't be realized if the text does not shape and control the reader's experience to some degree. This is still true in hypertext.

The problem of how to create a satisfactory hypertext link is not a question of navigation after all, but of rhetoric. After all, we don't know where a conventional text will go when we turn the page either. The question is how to create a suitable tension between expectation and outcome, between predictability and novelty when the reader chooses a link. Or turns a page.

As Todorov says, "the literary work does not have a form and a content but a structure of significations whose relations must be apprehended." (POP 43). One approach to realizing the literary potential of hypertext is to create perceptible congruence between the larger and the smaller structures of the work, and between structure and theme. The work's rhetoric must be satisfying, its language must be compelling at the level of the individual image, the sentence, the incident, the page, text block or lexia. But in addition, the shape of the entire work, as well as the processes of interaction with the work, must become perceptible to the reader sooner or later as something that is fitting in terms of the experience being generated. This will almost always require the writer to limit the reader's choices, to create shape, even though this may occur in ways which are not dependent on the linear sequence of traditional text. Brenda Laurel's idea of "close-coupling," a meaningful and timely relationship between user decision and system reaction, is important here.

When I invented the COLLOQUY system of interactive poetry, back in the dark ages before the mouse, I saw that there had to be a connection between the reader's action and the poem's response. To limit the reader's possible action enough to make it predictable to the writer so that she can design a meaningful response, COLLOQUY poems use the words of the poem as the menu of choices. This solution anticipated mouse-driven hypertext.

To provide close-coupling, responses in my own COLLOQUY poems begin with the word the reader chose, a very limited esthetic. Although the COLLOQUY authoring system actually allows a lot more latitude, the principle of a meaningful relationship between the reader's action and the poem's response is critical.

Some successful hyperfictions, such as J. Yellowlees Douglas's "I Have Said Nothing," only allow reader choices at the end of a sequence. Works like Douglas's require and encourage the reader to assemble storyline from fragments, but other structures in the text are essential to create the sense of congruence I am talking about. In "I Have Said Nothing" the story always bangs into "the end" before you're ready. Then the reader has to find a new way to begin reading again. The theme of the story, the repeated premature deaths of loved ones, is an oddly satisfying fit with this process of frustration, which creates the shape of the work. Another work, Stuart Molthrop's "Victory Garden," is a world of interlocking stories, each of them quite linear, which can be accessed through a visual map which actualizes the historical context of the Gulf War which the various stories and characters share. Although it is possible to link in nonlinear ways from within a story thread in "Victory Garden," it's fairly difficult to do.

Richard Gess's "Mahasukha Halo" pretty much abandons linear narrativity altogether, yet it is clearly fiction - reading "Halo" is like walking around in a big, alien, exotic city in a thick fog, encountering strange ceremonies, alien beings, and people who keep reappearing to tell you scraps of their story. The work allows lots of reader choice, but it does not tell a story so much as it assembles a gestalt. It's a very good example of how important striking and beautiful language and imagery can be in such a form.

My own translation of my book *Mothering* to Storyspace was remarkably easy because the hard-copy book is extremely nonlinear, and yet there are threads of quasi-story running through it, unified by the sensibility of the narrative voice. Implementing *Mothering* in Storyspace, the default sequence is the sequence of the book's pages, but the threads can be followed by clicking on words which represent the threads, usually indicating a particular character, setting, or mental process such as dreaming. In a way, *Mothering* was born to be a hypertext. The Storyspace version, insofar as it makes the themes more available to the general reader, is a better implementation than the book, although the book preceded the general availability of computer-based hypertext by almost a decade.

There are a bunch of practical and aesthetic problems to solve in creating this new literature, although I think we will soon solve at least the major ones. There's a real risk when writers get invested in clever subtleties which the reader perceives only as arbitrariness, like sequences in which you can't get back to a place you visited before. If the "yielding words" in "Victory Garden" can't be found except by accident unless you test every word on the page, a full reading depends on spending years of obsessive exploration with a single text. The text will have to be pretty delectable for readers to be willing to do that.

The learning curve is a problem that may not go away. Even if interfaces are standardized, which the Web and HTML-type tools make more likely, the more powerful tools like Storyspace allow each author to create a whole new set of reading problems the reader must solve before she can experience the work. It is easy to get impatient with having to learn how to turn the pages. But this problem goes back before hypertext, at least as far back as James Joyce. How intrusive should the interface be, and how is interface design a part of literary aesthetic?

I'm skeptical about just how democratic the author/reader relationship, in hypertext or elsewhere, can really become, if democracy is defined as eliminating authorial privilege altogether. But hypertext broadens the idea of author usefully, to include possibilities such as film director, architect, liturgist, dramaturge, playground designer, toolmaker. As we learn to make compelling structures in these new paradigms, important literary art will emerge. Some of it may even be hypertext.

ARTIFICIAL CONSCIOUSNESS

ARTIFICIAL ART

By Mike King

A | bstract

The electronic arts derive their energy and fascination from the relationship between artist and machine. Attempts to automate art are increasingly successful as developments take place in artificial intelligence, artificial creativity and artificial life. However, it may take artificial consciousness to create a totally artificial life. This in turn requires the resolution of a the question: is quantum mechanics inextricably linked with consciousness? If it is, then a computable consciousness may be impossible — and the future of a totally artificial art may hinge on this.

Introduction

James Gleik points out in *Chaos*[1] that the 20th century will probably be remembered for three great scientific revolutions: relativity, quantum mechanics, and chaos theory. We are seeing, in embryonic stage, the first scientific revolution of the 21st century: studies in consciousness. The claims for chaos theory are that, unlike for the preceding two revolutions, it relates to the more immediately tangible world of our experience. Studies in consciousness relates in turn to an intangible but infinitely more intimate world: our being. The discoveries by Copernicus, Galileo, and Kepler that showed the Earth to revolve around the Sun became a metaphor for the growing realisation that Man was not at the centre of the Universe, but an insignificant by-product of the forces of nature. One can characterise the universe that grew from this classical physics as anthropo-*eccentric*, that is a universe in which man is no longer at the centre, in contrast to the previous anthropo-*centric* universe. The more recent discoveries of chaos theory show a less ordered universe, with room for 'emergent' properties, however — rocks, weather, organisms, society, the economy: these become non-linear systems with unpredictable developments, but they are still *deterministic*. The individual is a *system* of organs and cells, the result of a gene pool *system*, embedded within social and economic *systems*. The individual is still alienated. Until quantum theory. Quantum theory completes the cycle of scientific revolution and renders the universe anthropo-*centric* once more.

1. Chaos Theory and Quantum Mechanics

Chaos theory involves the study of phenomena whose developments are highly sensitive to small fluctuations in starting conditions. Non-linear systems are, in principle, *deterministic* (or computable) meaning that the same starting conditions will give the same end conditions, and, if we have computers powerful enough, we can predict the outcome. In practice, because of the extreme sensitivity to the starting conditions, it may be very difficult to predict the outcome. Non-linear systems, however, are classical systems, and hence, despite the relative richness of the universe they describe and the fruitful consideration of emergent properties, they remain part of the anthropo-*eccentric* universe defined above. Quantum theory grew out of a seemingly innocent debate over whether light consisted of waves or particles, but, in the last century, it became clear that light behaved as a wave under some experimental conditions and as a particle under other experimental conditions. This simple fact was obstinately unresolveable and its unwanted (by classical science) implications were twofold: firstly that the observer's behaviour could not be removed from the experiment — thus challenging traditional notions of 'objectivity' — and secondly that science was going to have to live with the unthinkable: paradox. Quantum theory as we now know it gives a terminology for the wave/particle paradox, but does not remove the paradox, or the problems of quantum indeterminacy and quantum holism. One view of quantum theory, prompted by Niels Bohr, is that the precise mathematical formulations of quantum theory are successful as a model for prediction, but the wider implications can be ignored. A middle ground, perhaps, was the stance now called the Copenhagen interpretation, which admits that quantum theory is a theory of observations, rather than a theory of objective independent realities. The more radical position is that quantum theory places the human act of observation as essential for the existence of the universe. Some use quantum theory to argue the existence of God; however, we are not arguing here that quantum theory gives us back a theocentric universe, but an *anthropo*-centric one.

2. Consciousness: an overview of current theories and debates

The study of consciousness has only recently become a respectable academic pursuit, as shown by the number of recent books on the subject and the establishment of the International *Journal of Consciousness Studies*[2]. A good introduction to the debates around consciousness is to be found in Daniel Dennett's *Consciousness Explained*[3]. His emphasis throughout is on perception, though oddly, he avoids attempting a solution of the 'qualia' problem (how are we to account for the redness of red for example). He shows that the problems with Descartes' view of consciousness lie in the mind-body split or dualism that it is based on: the dualistic view is not consistent with classical physics, because for any perception to impinge on the mind there must be a chain of energy transformations that reach from the material world to the non-material (upward causation), and another chain from the mind to the body (downward causation).

Descartes proposed a location in the brain where perceptions come together for the mind to view them as a whole; this is done by a homunculus. This Cartesian theatre then presents us with the problems of a reasonable description of the homunculus, and the danger of infinite regress: has the homunculus got a homunculus within it?

While Dennett's emphasis on perception is to some extent reductionistic, it is the work of Francis Crick that takes this to an extreme. His recent book *The Astonishing Hypothesis*[4] claims that all aspects of human experience, including consciousness, are to be understood in terms of neuronal activity. This leads him to discuss the *neural correlates* of perception, and to postulate that one day we shall discover the neural correlate of consciousness itself. One could characterise the view of reductionists on consciousness as being epi-phenomenal, i.e. it is a side-effect. The view of chaos theorists could be described as emergent-phenomenal, i.e. that consciousness arises from complex systems as a whole that is greater than the sum of its parts.

It is no surprise to find that many thinkers on consciousness have sought to relate consciousness to quantum theory. There is a growing sense that quantum indeterminacy may allow a window in the deterministic universe for free will (downward causation), and that quantum wholeness is directly related to the binding problem of perception (upward causation). One of the chief protagonists of a quantum mechanical view of consciousness is Roger Penrose, interested in the extent to which computers can prove mathematical theorems. Building on the work of Gödel, who demonstrated the unprovability of a certain class of theorem, Penrose has argued that computers are therefore unable to 'think' about a certain class of entities that the human mind can. From this Penrose extrapolates a proposition that mind is essentially non-computable, at least by our current technology. Penrose devotes much of *Shadows of the Mind*[5] to an explanation of quantum theory and argues that quantum effects must translate into the 'classical' world of chemicals and neurons in the brain. He is supported in his approach by neurologists and biologists in their discovery of 'microtubules', structures within the neurons that could be the seat of quantum coherence effects.

Dana Zohar's books, *The Quantum Self*[6] and *The Quantum Society*[7] explore quantum theory firstly as a range of metaphors, but also as evidence for the holistic nature of the universe and the self. Her views derive partly from quantum theory itself, and partly from interpretations leaning to the mystical such as that of Bohm,[8] and that of Fritjof Capra[9] and Gary Zukav[10]. However, her interpretations are more accessible than Bohm's, less populist and mystical than Capra's and Zukav's, and less radically paranormal than Jahn's.

3. Creativity: the link with consciousness

The philosopher Mary Warnock has had a life-long interest in the imagination, stating that its cultivation should be the

chief goal of education[11]. For Warnock, imagination is the key to perception and all our values, as well as the driving principle behind creativity. In *Imagination*[12] she charts the developments of our understanding of this faculty, from Descartes through Kant and Hume and Schelling to Sartre and Wittgenstein. For Hume imagination is linked to the everyday ability to receive an interrupted and chaotic sequence of sensory impressions and derive from this a belief in the continuous existence of objects. Kant called this faculty the transcendental imagination to distinguish it from an empirical imagination, the fiction-making power which varies from person to person. Warnock's work has been to seek out the common ground in the different forms of imagination, in particular the creative sense and the world-ordering sense. Margaret Boden is another philosopher with an interest in imagination, but in the narrower sense of creativity. Her work, based in computational psychology, involves an investigation of creativity via attempt to simulate it with computers. Her book *The Creative Mind*[13] covers many aspects of research into creativity, especially those debates around Artificial Intelligence. For Danah Zohar the main question in the creative act is the selection of one outcome from all the possible outcomes, a process that she links with the collapse of the wave function, which in turn is the function of consciousness. One could see this as a special case of a quantum interpretation of the creative world-ordering imagination of Kant and Hume. From both the Hume/Kant tradition expounded by Warnock and the emerging quantum consciousness position of Zohar et al. we can assert that consciousness is at the heart of creativity.

4. Automated Electronic Art

Since the 1950s artists and scientists have been experimenting with electronic devices in the production of imagery the visual arts. These developments are well documented in books such as Franke's *Computer Graphics - Computer Art*[14], and Cynthia Goodman's *Digital Visions*[15]. The author looks at the use of programming for artists and animators in a recent article in *Leonardo*[16]. Evolutionary electronic art is a branch of algorithmic art that uses the concepts of Darwinian evolution to generate family trees of images or forms that are then selected by the artist for further breeding. Karl Simms[17] and William Latham[18] are two computer artists who have been working in this field, and who have been extensively commented on by Margaret Boden. The problems of selection have been avoided in the work of Harold Cohen, originally a successful modern painter, who set out to incorporate his own rules of composition into an artificial intelligence program called AARON. In evolutionary art the selection mechanism becomes paramount: Latham's and Simms' work fails to automate this as a parallel to the natural survival function. For other forms of automated art, such as Cohen's, there must be algorithms at the outset that control design, composition and aesthetics. The field of algorithmic aesthetics has its origins outside of the electronic arts — Franke[19] gives a good introduction to the German thinkers in this area, including Wilhelm Fuchs and Max Bense. Stiny and Gips suggest a computer-based method for evaluating aesthetics in specialised domains.[20]

We are now approaching the point where we can ask what would be a totally artificial art? Clearly it would involve computers and the simulation of both a creative and a critical function. Cohen's work is based on his ability to formalise his own compositional rules; what is lacking is the spontaneous generation of work beyond his own formulations.

5. Artificial Consciousness and the Electronic Arts

Artificial Life or a-life for short, while not originating as an art-form, has been explored as such by computer artists such as Steve Bell[21] and Clifford Pickover[22]. By abstracting from the physical world simple rules and constraints governing entities that live, breed, consume energy, fight for resources, and die, biologists have programmed a-life systems that have given them valuable insights into living systems. Steven Levy[23] gives a good overview of the emergence of a-life, including its applications and philosophical implications. A-life theory is firmly located in the debates around chaos and non-linear systems: the attributes we normally associate with 'life' are seen as emergent phenomenon. There has been little attempt to endow a-life entities with artificial creativity, perhaps because of an intuition that the parallels between evolution and creativity are rather weak, and to date there has been only one serious attempt to create an artificially conscious entity — this is the goal of Igor Aleksander at Imperial College, where he has created an artificial neural net (ANN) called Magnus, designed to be conscious in the sense of being able to tell us what it is like to be Magnus[24]. Nadia Magnenat-Thalmann and Daniel Thalmann, in their quest for synthetic actors have picked up on the work of Aleksander in the hope that it will provide a missing element in their simulations: autonomy. In the Thalmanns' book *Artificial Life and Virtual Reality*[25] Aleksander contributes an article called "Artificial Consciousness?"26 in which he sets out his emergent-phenomenon position on consciousness. The development of autonomous programmes is a recent development in software generation, described in another article in *Artificial Life and Virtual Reality*[27]. A further article in the same book gives an account of how algorithms for autonomy are developing from work in artificial intelligence[28]. The Thallmans believe that for computer simulations to generate truly artificial art, the will have to incorporate some aspects of consciousness; creativity, intelligence, will, and autonomy. It may be that other aspects such as identity, perception and awareness will also be essential, if the artificial art is to have any status alongside human art, leading us to the position that we require not just artificial life, but artificial beings at least as complex as humans. This plunges us into the chaos versus quantum debate: is mere complexity sufficient for artificial art to come forth as an emergent property, or is a quantum dimension required?

6. Conclusions

The attempt to hand over part of the creative act to machinery has a long tradition going back to musical compositions based on the throwing of nails[29]. Algorithmic art on digital computers represents a substantial move in this direction,

while progress in AI, a-life, and artificial autonomy bring together more of the components of a truly artificial art. In the context of chaos theory, no radically new developments are required to reach this goal: only a certain level of complexity. However, in the context of quantum theory and proponents of quantum consciousness as the ultimate creative principle in the universe, artificial consciousness is, at present, the missing ingredient. Some of the best thinkers of our time believe that this is non-computable, but if it were (perhaps with technology not yet dreamed of) quantum mechanics would not just have restored to us an anthropo-centric universe, but also a cyber-centric one.

Notes

[1] Gleick, J. Chaos: *Making a New Science*, London: Abacus, 1994, p.6
[2] *Journal of Consciousness Studies - controversies in the sciences and humanities*, Thorverton UK: Imprint Academic
[3] Dennet, Daniel C., *Consciousness Explained*, Allen Lane, The Penguin Press, 1991
[4] Crick, Francis, *The Astonishing Hypothesis - The Scientific Search for the Soul*, Simon and Schuster, 1994
[5] Penrose, Roger, *Shadows of the Mind - A Search for the Missing Science of Consciousness*, Oxford University Press, 1994
[6] ref. 2
[7] Zohar, Danah and Ian Marshall, *The Quantum Society*, London: Bloomsbury, 1993
[8] Bohm, D. *Wholeness and the Implicate Order*, London: Ark Paperbacks (Routledge), 1980
[9] Capra, Fritjof, *The Tao of Physics*, London: Flamingo, 1992 (3rd edition)
[10] Zukav, Gary *The Dancing Wu Li Masters* London: Fontana, 1979
[11] Warnock, Mary, *Imagination*, London: Faber, 1980, p.9
[12] *ibid*
[13] Boden, Margaret, *The Creative Mind*, London: Abacus, 1990
[14] Franke, H. W. *Computer Graphics - Computer Art*, London: Phaidon, 1971.
[15] Goodman, C. *Digital Visions*, Abrams, New York, 1988.
[16] King, M.R., "Programmed Graphics in Computer Art and Animation", in *Leonardo*, 28, No. 2, pp. 113 - 121, 1995.
[17] Sims, Karl, "Artificial Evolution for Computer Graphics" in *Computer Graphics* Vol 25, No 4, Association for Computing Machinery, New York, 1991, pp. 319 - 328.
[18] Todd, S. and Latham, W. *Evolutionary Art and Computers*, Academic Press, 1992
[19] ref. 26 pp. 106 - 118
[20] Stiny and Gips, *Algorithmic Aesthetics - Computer Models for Criticism and Design in the Arts*, Berkely, Los Angeles, London: University of California Press, 1978
[21] Bell, Steve, ? Leonardo ?
[22] Pickover, C.A., *Computers, Pattern, Chaos, and Beauty*, Stroud: Sutton, 1990.
[23] Levy, S., *Artificial Life - The Quest for a New Creation*, London: Jonathon Cape, 1992
[24] Patel, Kam "Matter over mind for mighty Magnus", *Times Higher Education Supplement*, 6th March 1994
[25] Magnenat Thalmann, Nadia and Thalmann, Daniel, *Artificial Life and Virtual Reality*, John Wiley and Sons, 1994.
[26] ibid, pp. 73 - 81
[27] ibid, pp. 84 - 95
[28] ibid, pp. 97 - 114
[29] ref 33, p.31

INTERACTIVITY AND CONTROL

THE AESTHETICS
OF REAL SPACE INTERACTIVES

By Ted Kruegei

tk67@columbia.edu

T he formation of limestone or petroleum from biologi-cal deposits has long been understood, but the exten-sive relationship between the biological and geological is jus beginning to be sketched out. The recent discovery that, in the US, humanity has become the dominant geological force is sig-nificant. Our combined activities alter more of the earth's crus than weathering, erosion and the activity of rivers.

Having been ejected from the Garden of Eden for the devel-opment of consciousness we have always seen ourselves as apar from it. The categories of 'the Natural' and 'the Artificial' are ancient and fundamental to the cultures within which I and many of you exist. The intricate assembly of a beaver's dam and lodge are understood to be of nature whereas the autobahn and Brazili; are clearly not. Yet, if we suspend the egocentrism for a moment we can see that these are differences in degree rather than of kind All the products of human activity are 'natural' ones.

There is no artificial. Machines are part of the ecosystem.

The development of computation machinery in the last hal of the twentieth century is one of the primary development: during this period. Shrinking from room-size constructions to handheld devices - they are posed to disappear into the wood work. This migration fundamentally changes the nature of the environments that we inhabit. There is an erosion of inertnes: by the injection of intelligence. We must begin to consider the role we are to play within the context of intelligent environ ments

This work is concerned with issues in technology where the inability to control is at the heart of the matter. The projec exhibits behaviors that are determined jointly by the interna logic of the software, the participation of the viewer(s), and by environmental circumstances. The work does not relinquish control to either the public, the environment, or the software but sets up a condition where the confluence of the three result in a particular behavior. It uses rather simple technologies to explore issues that are raised by the larger contemporary tech nical environment in which we find ourselves.

The work consists of two rectangular boxes from which project 24 black tapering rods. Ones presence between the boxe

ISEA95 montréal

triggers an adjacent rod into a slow graceful bend. The motion is fluid and completely silent. Others soon follow, arching foreword or to one side and then the other. After you move on, the activity continues and it becomes clear that the rods were not reacting to you, but that the reaction of the initial rod was spreading through the population in a series of ripples - that the rods are reacting to each other. The intent is to create a work that is simultaneously machine, plant and social insect.

Each of the rods are tensed by two fine strands of Shape Memory Alloy (SMA) wire. SMAs are a class of alloys that exhibit an unusual effect due to differences in the crystalline structure of their martensitic and austenitic phases. When cool, the metal is easily deformed, but when heated above the transition temperature to the austenite phase, it recovers its original shape and in the process is capable of work[1]. The wire used in this project is fabricated from a nickel/titanium alloy marketed under the trade name Flexinol. It is 150um in diameter and has a deformation force of 62g and produces approximately 330g of recovery force[2]. Each strand of SMA wire is 1.5M long and recovers approximately 60mm when resistance heated with 24 VDC.

While current research is concerned with increasing the reaction time of the alloy for use as robotic actuators, in this case, the wire length was chosen beyond the suppliers specifications to decrease the response rate for aesthetic effect. This had additional benefits. As there was no danger of overheating, the temperature of the wire did not have to be monitored. A streamlining of the sensing and control functions resulted. More significantly, because the mass of the SMA strand is very small, the nature of its reaction varies with ambient temperature and wind conditions. Wind cools the SMA rapidly. While the work responds more quickly and strongly in hot weather, in winter, it will not react at all[3].

The tapered rods are fabricated from a graphite/epoxy composite[4] and provide sufficient bias force to stretch the SMA in its low temperature state. The hollow rods serve as a conduit for wiring that supplies power and ground connections to the SMA wires that are fastened to the black acrylic brackets secured to the rods. The lower bracket holds the wires out away from the axis of the rod and provides a reverse bias mechanism[5] as the alloy contracts and the rod is loaded eccentrically. The two wires provide four possible states for each rod.

Each rod constitutes a finite state machine implemented in hardware and assumes a position based on the state of the surrounding rods or the switches in a manner similar to cellular automata. No attempt has been made to program the activity of the rods as a group, but relationships between them are established and the group's activity emerges from the individual interactions.

In software, each SMA wire is controlled by a variable. The value of this variable is determined by simple rules that reference the state of 'adjacent' variables to compute its new state. Adjacency is specified relative to the irregular spatial distribution of the rods rather than by reference to a uniform lattice. The states are computed and then implemented in discrete time steps.

Each base contains a computer that was assembled from modular input, output and processor cards in a proprietary backplane[6]. The processor is an 8-bit Intel 8052AH. Programming was done Basic. The code was converted to C and implemented with a corresponding graphics display running on a Silicon Graphics workstation to verify the software and visualize the sequences[7] while the project was under construction.

The bases are simple plywood boxes that are covered in a resin/aluminum powder product that is used for the repair of boat hulls. This material was ground smooth and waxed to give the bases a metallic monolithic quality[8].

The work undertaken here draws on research done in preparation for a Seminar in Technology Transfer given by the author at the Graduate School of Architecture, Planning and Preservation at Columbia University. This course looks at technologies that are available or developing in non-architectural fields that have potential applications within architecture. Among the areas considered are intelligent materials and structures, robotics, complexity studies, and computation. The underlying thesis is that the importation of these technologies into architecture will fundamentally change the definition of the architectural problem. The task may be redefined as the creation of environments that are casually indistinguishable from biological systems. The current project is an initial exploration of what those environments will become.

The objective in undertaking work such as this is to understand on an empirical level the nature of non-deterministic design. As intelligence, even at a very basic level, is diffused into the environment, as communication between these intelligences is implemented, and as the materials or assemblies become responsive to their environments, we can expect that the resulting behaviors will be inherently nonlinear and predictable only within certain broad ranges.

Yet the words design and non-deterministic do not sit comfortably together. Design implies that there is an objective to the work. Someone is able to project an understanding, an implicit ideology of how things ought to be , upon the world or some portion of it. Not only will this be increasingly difficult, it may, in fact, not be de-

sirable. This imposition of will or the desire to control is linked to our understanding of ourselves and our products as somehow apart from the rest of the world. It grows out of a privileged position that we do not occupy.

Ted Krueger Adj.Asst.Prof. Architecture, Columbia University
Principal- Living Machines, Inc. a research organization dedicated
to creating intelligent synthetic organisms.

Notes

[1] R. Gilbertson, Working with Shape Memory Wires, Mondotronics, Inc. , 1991

[2] Mondotronics Product Literature, undated

[3] K. Kuribayashi's Improvement of the response of an SMA Actuator using a Temperature Sensor, The International Journal of Robotics Research Vol. 10, No.1, Feb 1994. The work was commissioned by the Katonah Museum in Westchester County, New York for the exhibition 'Shelter and Dreams' curated by Jane Dodds. The exhibition, in an outdoor sculpture garden, opened on April 22 and remained in place until November 13, 1994. The expected temperature variation during this period was one of the design considerations.

[4] These were purchased off-the-shelf from a fishing rod manufacturer.

[5] Gilbertson

[6] Alpha Products, Inc.Us A-Bus System

[7] Lyle Seuss, a graduate student at the GSAPP, Columbia University was responsible for the simulation. Additional programming assistance was provided by Paul Krueger.

[8] Much of the construction and assembly was undertaken by Bill Massie of Sub Urban Building Studio of New York assisted by Corey Saft and Scott Enge.. Jean Krueger provided assistance and support over the duration of the project.

THE MEANS TO THE END IMPLIES THE CREATION OF THE NECESSARY TOOLS AND MATERIALS

By Kharim Hogan

O ver the past several years, I've been involved with authoring tools and environments in one way or another. Initially I had absolutely no use for the tools whatsoever. Then I became a user of the tools, and inevitably moved to programming them. Now I argue about and with them. On one hand I am thrilled about all the new developments and possibilities that are continuously emerging at an impossible rate, yet at the same time, of late, I've often wanted to just throw up my hands and seriously request a bit of a "time out!!". Fact is though, both my experiences and those of countless others have brought a number of issues and questions to bear. For example, the question at issue in today's panel — a painter needs many years to master the tools of painting; an electronic artist would not recognize the work environment after such a time span. How does one master the tools in such an environment: by programming them themselves?

Yes and No! Yes, by default one will have theoretically understood the possibilities and limitations of the tool if one has programmed it oneself. But no, that doesn't necessarily imply a mastery of the tool. Using or applying it towards an effective artistic end may still require some time and experimentation. One still has to learn to use it. (A little aside...there are times one spends so long trying to get the tool they are building just right that the original intention is forgotten. But I suppose that's all part of the process). One way or another, the artist must be involved!

Many of the digital tools available to artists today are based on the "traditional artforms". For example, tools available to the photographer such as Photoshop, are for the most part digital equivalents of what one would find in the darkroom. We have been transferring both the tools and techniques to computer platforms. In addition to this, we have added tools and hence techniques afforded us by digital technology which can be applied by artists adapting their traditional artistic practices and creative endeavours to this new medium. The new possibilities available have prompted us to further explore and push the boundaries of digital technology resulting in a plethora of applications, tools, plug-ins and so forth. The rate at which these tools are being enhanced and created as well as the pace of technological change and advancement leaves us today relentlessly striving to stay ahead of the dust. Inevitably this results in considerable time spent learning and adapting to new tools and technologies, perhaps for fear of not being considered "on the cutting edge"?
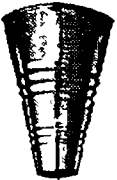
Meanwhile though, there seems to be an ever increasing imbalance in the mastery and development of style and technique. Whereas in the past an artist would go through a period of study and apprenticeship whereby he/she would diligently learn about and then apply the techniques and methods of the masters, emulate styles in order to further develop the craft and finally one's own stylistic character would emerge, today we neither have models to follow nor do we have time to define them as we are constantly bombarded with yet newer, more powerful, and more complex developments in the digital arena. If we opt to stick with a set of tools or an environment, we can come to master it. We are gambling though because what may take us several months to produce might be something which could have been done in a matter of hours had we stayed informed of new developments. By the same token, waiting for the tool or building the tool might take as much time as contorting oneself around an environment where the tool is missing.

Perhaps it is time to sit back and choose a direction! Without tool developers we restrict advancements but then again, without artists to define, refine, and/or demand tools to suit particular styles and creative purposes, the new media will never mature. They will continue to advance technologically but will we be able to "fill the space" or "cover the canvas" so to speak? Are we therefore addressing an audience or are we now only fulfilling our own digital dreams driven by the ecstasy and excitement of the power of the technology? Are we essentially restricting access to the "fortunate" few who can afford to upgrade and maintain the level of platforms and technologies required today to have access to this "cutting edge" fantasy?

Again, can artists use the tools and technologies to their fullest in order to achieve this goal without having to program themselves? In other words, can artists only get there if tools are designed that will allow them to author freely? And if so, who should engage in designing and developing such tools? Is it even possible to conceive of one tool that will be all that is necessary to an artist to create one's pieces or works? Will artists not ultimately either require other tools in conjunction with those they are using or be restricted by the limitations of the "catch-all" tool? Can there really be only one tool which serves every artistic purpose and goal? It seems to me that somehow, somewhere along the way, the whole creative process has been reversed with the advancement of digital technology. It used to be that first we'd have an idea and then attempt to realize it. If that involved building tools, we'd build them. No problem. But now, it's as if it's quickly becoming absurd to consider this method. Rather we go and find out what the tools can do for us, what exists today and what's considered "hip" and then we try to come up with something that can be done using these tools and environments! Why? Are we somehow putting the message across that we want all the tools possible at our disposal now and today, and furthermore, that we want tools and environments that will even go so far as to realize our ideas for us? Have we grown tired of the challenge of taking an ab-

stract idea and making it concrete? Or, are we actually succumbing to the pace of technological advancement? The choice, fortunately, is still there.

What about tools to build tools? Development environments and applications based on open architectures are a fantastic option. They leave artists with the option to either extend the bounds of existing tools, or experiment with other possibilities if they so desire. In the end, does it really take longer to master a programming or scripting language than it does to learn a new high-level tool? With tools such as Director, 3D Studio, MAX, etc., artists have extraordinary potential at their disposal, and if they want to extend them, they can. In this case, one can learn a couple of environments and essentially fly with them simply due to the extensibility of the environment. Consider an environment such as OpenInventor for example. Those who are more interested in the low-level aspects of tool building can concentrate on extending and refining existing tool sets and applications, while those who just want to exploit the artistic potential that the applications created within these environments have to offer, can also do so. One of the interesting and potentially seductive aspects of such an environment is the fact that as more tools, plug-ins, modules, classes, and so forth become available, that are all based in the chosen environment, since there is already a familiarity with the environment, the learning curve should be minimal compared to migrating to yet another set of tools.

There was a time when one could almost actually learn to use a tool in its entirety then go back and learn to use it well!! If we set out to agree on a basic set of building blocks, could we do this again today, and would we even want to go that route? Will converging to one or more environments slow down or otherwise hinder technological developments? On the other hand, one could argue that if we were all using the same set of tools, it could quickly become somewhat boring after all, isn't art partly about doing something new and different?

Aren't we toolmakers by nature? No matter what the medium, do we not usually find ourselves either reworking a method or building some sort of contraption or "tool" to produce a certain new or different effect? At some point in the process, we add or create devices to achieve intended goals. We end up turning away from the work in progress for a few minutes, hours or days, while we go off and try to mix the exact colour we want or create the sound we have in mind for example. Is this not analogous to taking out your digital tool building materials and redirecting the creative process to generate the required module to enhance one's work with an unimplemented idea?

I'd like to return for a minute to the issue of artistic styles and techniques and look at where authoring tools and environments fit in. In what concerns adapting traditional techniques to their digital counterparts, we have a basis. We can and have done so, start by creating the tools which will allow us to pro-

duce much of the same type of output or results we've been used to. We then move to adding what the digital domain gives us over and above this to create different tools and therefore be able to accomplish things that weren't as easily accessible to us in the past, and finally we push the limits of the technology and move yet further with the possibilities. With this in mind, it is possible to create relatively complete authoring environments to relieve the artist of having to go out and gather how many different packages and perhaps as many platforms. But what of "new media"? Are we not still in the process of defining it? And if so, where do we start with toolboxes and full-blown creative environments? Does there not first need to be a certain settling and absorption of the new canvas before we will really be able to prescribe any fixed set of tools? Do we not have to become artists once again, have the creative intentions, try to fulfill them and by this process define and fix some of the basic elements? There will always be variables and these variables are part of the artistic process. Hence, programming some of these tools is part of t1he fun, is it not?

Finally, I'd like to leave you with the following question...can we build a set of tools or an authoring environment that will actually satisfy us for more than 20 minutes? If so, would that imply that we've run out of ideas?

ORDINATEURS ET SCULPTURE AUX ÉTATS-UNIS ET EN FRANCE

Par Christian Lavigne

partenaires : Tim Duffield et Rob Fischer

A vant de vous présenter par l'image les oeuvres des sculpteurs européens ou orientaux utilisant l'ordinateur et les machines-outils à commande numérique, permettez-moi d'abord d'esquisser quelques réflexions générales sur notre sujet, puis de faire un bref rappel historique de notre démarche.

Depuis la nuit des temps, l'interaction de l'art, de la science et de la technique, détermine l'histoire des civilisations. Il a même fallu de gros efforts théoriques à l'Occident pour accepter de distinguer l'une de l'autre ces appropriations cognitives expérimentales du monde. A chaque lieu, à chaque époque, donc, son intelligence des choses et ses pratiques culturelles.

L'Art, tel que nous le pensons en Occident, n'a jamais échapé à la règle d'interactivité générale des commerces de l'esprit et de la vie quotidienne. Ce n'est que très récemment que certains ont voulu le déclarer "discipline autonome et autoréférente". Imbécile et funeste prétention.

Contrairement à l'opinion commune, c'est par le goût de l'art, de l'exploit et de la magie, qu'on a vu naître les plus grandes inventions techniques. Bien longtemps, entre mille autres exemples, la science raffinée de la mécanique n'a servi à rien qu'à fabriquer de merveilleux automates pour notre seul bon plaisir. L'homme d'ailleurs ne fait pas grand chose par "nécessité" rationnelle.

Aussi, marginaliser l'artiste, l'exclure des grands processus économiques et sociaux, et par là-même l'empêcher de découvrir, d'innover, c'est tout simplement vouer une civilisation à l'échec. Qu'on me comprenne bien: il ne s'agirait pas seulement d'un échec affectif, esthétique, d'un échec du "divertissement", mais aussi d'un échec fonctionnel, d'une faillite de l'intelligence.

Pas plus que l'art, la technique d'aujourd'hui ne doit être une activité "autonome", car l'homme ne manipule jamais des objets mais toujours des symboles: je veux dire que toute mise à disposition, toute pratique, n'a de légitimité et de valeur qu'à la mesure du SENS qui lui est donnée. Il ne semble pas que les populations les plus riches et les plus "avancées" de la planète aient jamais pu avaler le flot incessant des nouveautés technologiques du XXième siècle. Il y a là des conséquences graves auxquelles il est urgent de réfléchir.

Les artistes qui ont le souci de leur époque, utilisent, fabriquent ou détournent les moyens contemporains; volontairement ou non, ils contribuent ainsi à l'évolution des mentalités, du regard sur le monde. Récemment, la révolution informatique a trouvé un nouvel essor par le biais de l'art: infographie, musique, créations multimédia...D'antiques "rêveries" transmises à quelques "originaux", artistes et bricoleurs, ont finalement stimulé de grandes industries!

Notre souhait, ici, est de vous montrer qu'il est indispensable de situer aussi le travail de la forme matérielle - autrement dit le travail de la sculpture dans ce contexte d'avance technologique, et que des artistes de plus en plus nombreux font appel aux techniques les plus pointues pour la réalisation d'oeuvres physiques, et non plus seulemenent "d'immatériaux", des artistes de plus en plus nombreux, peut-être en eux-mêmes inquiets d'une inflation de "virtualité", font prendre corps à leur imaginaire abstrait et numérique, afin de mieux transmettre le plaisir sensuel de cette créativité qui parle du monde et n'appartient qu'à l'homme.

UN PEU DE PHILOSOPHIE

Nous n'avons malheureusement pas le temps d'aborder longuement dans cette rencontre la problématique fondamentale du geste plastique. C'est bien dommage car une analyse symbolique et psychologique des mythologies fondatrices de "l'artisanat créateur" nous apprendrait bien des choses sur notre réalité technologique contemporaine. On peut même se demander si l'homme ne s'acharne, pas, avec une obstination millénaire, à réaliser le programme de ses fantasmes les plus archaïques.

D'une manière universelle, autant que je le sache, de l'Afrique à l'Asie, en passant par le monde grec, tous les "dieux-techniciens" sont aussi dieux de la ruse et de la magie. Ambivalents jusque dans leur apparence, ils produisent la beauté, mais l'un est boiteux, l'autre est stérile. À travers eux, l'homme gagne par l'artefact ce que la nature lui refuse.

Pour rester dans notre sujet, reprenons un instant le goût immémorial des automates, des "esclaves mécaniques" qui font mieux, et avec moins d'effort, que leur démiurge. Comme par hasard, l'ancêtre occidental mythique des architectes et des sculpteurs est aussi grand créateur d'automates: Dédale, équivalent terrestre d'Héphaïstos.

Ainsi, je me risque à dire que, par définition, une oeuvre d'art est une ruse technicienne qui nous séduit, nous enchante.

La compréhension globale de l'art comme produit d'une MÉTIS et d'une TECHNÉ, évite bien des malentendus sur cette activité, que certains critiques voudraient réduire à je ne sais quelles catégories de leur choix. Mon confrère américain DAVID MORRIS, pour rassurer un public international ayant une vision romantique et mal informée de l'artiste, s'est vu obliger de proposer le concept subtil et malicieux de COMPUTER AIDED

HAND MADE, CAHM, en opposition à CAD-CAM (CFAO). Si d'aucuns sont persuadés que trop d'outils nuisent à l'art, d'autres sont convaincus d'un art sans consistance. Permettez-moi d'attendre ou bien une extase mystique ou bien la généralisation de la télépathie pour croire à une communication sans support!

En vérité, les modalités de fonctionnement de la créativité et de l'invention des hommes et des sociétés sont universellement identiques, fondées sur un va-et-vient continu entre le réel et l'imaginaire, une dialectique permanente de la formation et de l'information, de l'abstrait et du concret.

Il n'y a aucune différence de nature entre le bel ouvrage d'un artisan, la belle machine de l'ingénieur, la belle composition d'un musicien, la belle sculpture d'un artiste, la belle démonstration d'un physicien, etc. Tous, acteurs, ont éprouvé une jouissance du faire, une aspiration à la perfection, dans l'inquiétude du résultat; tous, spectateurs, ont été séduits, émus, par la nouveauté, la virtuosité, l'harmonie ou le choc de la découverte.

C'est pourquoi le cloisonnement de la société, l'hyperspécialisation des individus apparaît comme un risque majeur de notre Civilisation pour les années à venir. Comme nos pères, il nous faut construire des aventures humaines transversales, qui fertiliseront à leur tour l'esprit de nos héritiers.

ARS MATHÉMATICA

ARS MATHÉMATICA, que j'ai créé en 1992 avec mon confrère ALEXANDRE VITKINE, veut participer à cette aventure humaine interdisciplinaire dont je viens d'évoquer l'urgente nécessité.

Notre domaine d'action est donc celui de la sculpture, envisagée selon les technologies de l'informatique et de la robotique. J'ai nommé cette pratique moderne la ROBOSCULPTURE.

A notre connaissance, il y eut une demi-douzaine de précurseurs de la sculpture numérique.

Les premières expériences suivirent les développements de l'informatique et la divulgation des machines à commande numérique dans les années soixante et soixante-dix.

Cependant, ces tentatives furent sans lendemain, probablement à cause de la quasi impossibilité d'accès aux ateliers de la grande industrie qui détenaient les systèmes, mais aussi à cause de la limitation même de ces systèmes.

Aux États Unis, H. G. Lawrence, architecte et designer, s'intéressa au problème dès 1965, puis abandonna, jusqu'à ce que les développements récents de la CAO lui permissent de reprendre ses recherches.

En Allemagne, Eberhard Fiebig, sculpteur et enseignant, réalisa ses premières études informatiques de sculpture à la fin des années soixante.

Parallèlement, Georg Nees, à la suite d'un doctorat sur l'infographie, a pu réaliser, en 1969, deux bas-reliefs fraisés sur machine Siemens.

En France, Pierre Bézier, mettant au point sa théorie mathématique de la CAO dans les ateliers de l'usine Renault, inventait discrètement le concept de SAO: Sculpture Assistée par Ordinateur dont il publia un exemple en 1969 dans un ouvrage...qu'aucun sculpteur n'a probablement jamais lu!

Quelques années plus tard, en 1975, Yves Kodratoff, proposait de réaliser, avec la participation du public, une sorte de sculpture définie par des choix informatiques interactifs de trous divers et variés dans un bloc de base rectangulaire.

En Espagne, au même moment, Jose Luis Alexanco faisait évoluer sur un écran d'ordinateur une série de courbes de niveaux fermées dont l'empilement, fini, réalisait des espèces de figurines concrétionnées.

Il est néanmoins à noter quel seuls Pierre Bézier et Georg Nees ont franchement lié le processus de création et de visualisation informatique de la forme tridimentionnelle à sa matérialisation par une machine à commande numérique.

En 1990, Alexandre Vitkine et Christian Lavigne se rencontrèrent, ayant chacun de leur côté, en s'ignorant mutuellement, comme d'ailleurs en ignorant à peu près tout de l'historique du sujet, ayant chacun de leur côté, donc, proposé aux organismes culturels d'État la création d'un atelier (Vitkine) ou d'une école d'art (Lavigne) pour la sculpture par ordinateur, que l'un appelait INFOSCULPTURE, et l'autre ROBOSCULPTURE.

De cette rencontre, et de ce projet commun, allait naître ARS MATHÉMATICA, qui rassemble aujourd'hui des artistes, des chercheurs, des enseignants, etc.

Si l'artiste technologique retrouve l'esprit d'Atelier, et se plaît à réunir "une équipe" poursuivant une oeuvre commune et valorisante pour tous, du technicien au chef d'entreprise, chacun montrant le meilleur de son savoir-faire à son niveau de compétence, il n'en reste pas moins que la bonne compréhension publique et politique de ce que j'ai appelé UNE NOUVELLE RENAISSANCE, est encore loin d'être acquise.

Les lieux et les occasions de synergie étant extrêmenent rares, mais finalement inévitables, ARS MATHÉMATICA s'emploie d'une part à mieux faire connaître les possibilités esthétiques du "prototypage rapide" en organisant des manifestations médiatiques, d'autre part à tisser un réseau d'artistes,

de chercheurs, d'institutions ou d'industriels pour le développement de cette synergie créative, et enfin s'attache à promouvoir l'idée du CENTRE INTERNATIONAL DE RECHERCHE ET D'ENSEIGNEMENT DE LA SCULPTURE, où se rencontreraient artistes et scientifiques pour le plus grand profit de tous!

Une première exposition mondiale de sculpture numérique s'est tenue, sans beaucoup de moyens, il faut bien le dire, en 1993 à l'ÉCOLE POLYTECHNIQUE.

Dans le même temps, sans que nous le sachions, TIM DUFFIELD et ROB FISCHER créaient THE COMPUTER AND SCULPTURE FORUM, équivalent américain d'ARS MATHÉMATICA.

Après nous être mutuellement découverts en 1994, et après ma rencontre très amicale avec TIM et ANN DUFFIELD lors de mon premier voyage aux États-Unis, en été 94, nous avons décidé d'unir nos efforts pour la réalisation d'évènements internationaux consacrant la sculpture par ordinateur.

C'est ainsi que nous avons le plaisir de vous annoncer l'exposition interactive et simultanée INTERSCULPT 95, qui aura lieu à la SILICON GALLERY de PHILADELPHIE du 6 au 28 octobre, et à la GALLERIE GRAPHE à Paris, du 24 octobre au 7 novembre.
Il s'agira pour chaque lieu, particulièrement du 24 au 28 octobre, d'une quadruple action artistique:
* présentations de documents, d'images et d'objets
* connection Internet sur les Virtual Galleries
* liaisons en visioconférence, pour des visites à distance, des échanges et des débats
* TELESCULPTURE: création puis transmission de fichiers numériques décrivant des oeuvres, qui seront matérialisées de l'autre côté de l'océan par des machines à commande numérique!
Je laisse à mon ami TIM DUFFIELD le soin de compléter et de commenter cette manifestation.

Je voudrais maintenant vous montrer quelques oeuvres d'artistes utilisant l'informatique pour la création ou la fabrication de sculptures. Nous présenterons les travaux des artistes suivants:
FRANCE
Jean-François COLONNA
Gérard KAMMERER-LUKA & Jean-Baptiste KEMPF
Jean-Jacques LAMENTHE
Christian LAVIGNE
Alexandre VITKINE
ALLEMAGNE
Eberhard FIEBIG
Jurgen LIT FISCHER
HOLLANDE
Anton BAKKER
Koos VERHOEFF

ISRAEL

Isra'l HADANY

JAPON

Masaki FUJIHATA

et au besoin, pour compléter l'exposé de Tim DUFFIELD
et Rob FISCHER:

QUÉBEC

Jean-Jorj ROY

USA

Sydney CASH

Stewart DICKSON

Helaman FERGUSON

Howard Ray LAWRENCE

Franck McGUIRE

CONCLUSION

Nous espérons par notre intervention dans cette conférence vous avoir montré la naissance d'une complicité nouvelle de la recherche et de la création, en soulignant que "l'intendance de l'art " ne passe pas forcément par la main de l'homme, et que des outils modernes peuvent aujourd'hui servir l'art avec le même égal bonheur qu'autrefois la règle, le compas, le ciseau, le perspectographe ou la peinture en tube.

Mais la robosculpture, comme tous les arts électroniques, retrouvant l'esprit d'Atelier, permettra aussi d'en finir avec le romantisme bourgeois qui a voulu faire de l'artiste, moralement et économiquement, un être isolé, égocentrique et introspectif, dont le Moi est une divinité mondaine, un dieu lare de salles des ventes, à la signature apotropaque!

Les oeuvres que je vous ai présentées peuvent être appréciées différemment: certains seront sensibles à la "performance technique", d'autres à la recherche d'une pureté formelle, d'autres enfin exigeront une philosophie.

Une nouvelle pratique permet non seulement de résoudre des problèmes anciens, mais encore d'inviter l'imaginaire à des voyages inconnus. La qualité des oeuvres est celle des hommes. Au "transfert de technologie" doit correspondre un métissage culturel. Dans notre époque "planétaire", aux inventions de nos prédécesseurs s'ajoute désormais la connaissance plus familière des patrimoines de l'humanité, qui enrichissent notre expérience intime, notre alchimie personnelle. Sans doute quelques-uns d'entre nous y puiseront l'expression d'un sens profond et universel.

Prenons bien garde que cette démarche ne vise pas à la constitution d'une petite élite occidentale de plus. J'aimerais qu'un artiste aborigène australien m'apprenne le secret des écorces à peindre, et me raconte bientôt "le Pays du Rêve" en stéréolithographie.

Tel sera, concrètement, le but de notre CENTRE INTER-NATIONAL DE RECHERCHE ET D'ENSEIGNEMENT DE LA SCULPTURE.

En vous remerciant de votre attention, et en vous donnant rendez-vous à INTERSCULPT 95, je communique à ceux qui le souhaitent les coordonnées d'ARS MATHÉMATICA:

1, Cour de Rohan,
75006 Paris, FRANCE
tel: (33) (1) 43 26 45 85 .
fax: (33) (1) 40 46 82 02

CD-ROM : - THE 21ST CENTURY BRONZE?

By Mike Leggett

m.leggett@unsw.edu.au

A bstract

Desktop CD-ROM burners capable of making individual discs has attracted the attention of visual artists and created the opportunity for computer artists to make their work more widely available.

During the development of the exhibition, 'Burning the Interface <Artists CD-ROM>' for the Museum of Contemporary Art in Sydney, in March 1996, some 130 artists sent-in work for consideration.

The paper previews the range of strategies employed by the artists in designing the screen interface and some of the issues raised by the artworks concerning the interactive and the immersive states of engagement are considered.

During 1993, various manufacturers marketed desktop CD-ROM burners capable of making an individual compact disc-read only memory, a desktop technology initially intended for the archiving of company accounts and records. Besides attracting commerce however, the technology has also attracted the attention of artists.

This medium of storage could be said to mirror the impact of the arrival of bronze casting on the development of the art object - plasticity and permanence.

By directly working with clay and bronze, such as those in 5th Greece, or in a developing technology such as digital data and CD-ROM, the artist will reveal more quickly than the technical specialist the full range of a new mediums potential together with the distortions that the technology can bring within the broader spectrum of communication issues.

The ephemeral and fugitive nature of much computer-based work has restricted its exhibition potential to one-off installations or playout through video/film recording, and so on. The option to acquire work and thus experience it over a period of time has been restricted. More recently, parking art on a Web site has become a most intriguing option, particularly as lack of bandwidth has tested the ingenuity and patience of artist and audience alike and introduced fresh nuances to the term ephemeral, the subject of much intelligent research by artists alone.

In this context, contemporary artists are using the computer/CD-ROM medium for the storage of work needing fre-

quent acquisition to large files. The development of this medium has addressed several of the earlier 'problem areas':

List on data screen of following points:
A:
- where previously there was a whole host of 'computing systems' of infinite combinations of hardware and software, the Compact Disc as a publishing/distribution medium has encouraged the convergence of systems for making, and replicating, the artwork;
B:
- the archival specifications of CD-ROM can more or less guarantee that a completed work as "art-on-disc":
    - cannot be erased, or tampered with and altered;
    - cannot be duplicated, with the correct safeguards in place, thus preventing the unauthorised copying of artists work and its illicit commercial exploitation;
    - has relatively stable chemistry and therefore specifications which appeal to the long-term needs of archives. This therefore offers good prospects for financial return to artists through:
    -purchase by collections both private and public, of limited editions of a work;
    -the editioning of multiple runs for wider distribution by niche publishers;
    -the licensing of titles to networks via servers or linked CD-ROM players.

Such arrangements are capable of giving assurance to the artist concerning the time and material resources invested and offer better prospects for financial compensation than through rentals on films and videotapes, or fees for installation.

Other problem areas now being addressed include:
C:
- the cost of transferring computer files from "the studio", (the workstation with hard disc/server) to "the gallery",(the Compact Disc), has been lowered, enabling a relatively low cost of 'casting' - AU$150 per copy commercially down to AU$30 material costs if a 'burner' can be accessed;
D:
- alongside the marketing of tools for the consumption of CD-ROM, the Industry has developed tools for production, designed for specialist users rather than programmers, thus offering artists independence at the production stage from profit orientated facility houses.

The business of developing a studio practice is in its early days, pioneers in the area can begin to remove the structures and procedures erected by computer specialists. For instance the magpie approach to amassing material with which to work, having converted it into digital form, is to catalogue the stuff onto a CD-ROM and use the disc(s) as an archive, accessing onto the working disc as and when the need arises; no backups, no maintenance - in other words, pretty cheap storage.

In August 1994 I commenced researching an exhibition on behalf of the Australian Film Commission and the Museum of Contemporary Art in Sydney, the purpose of the show to survey at an international level the approaches artists are taking to utilising the CD-ROM medium. We called for work which explored all aspects but at this stage in time prior to a definition of what the exhibition will be, we made a short list of work which seemed ontological rather than just exploring the potential of the new medium. For the second section of this paper and in the short time available I will provisionally examine aspects of the issues around Interface raised by some of these artists.

The letter 'i' features strongly in a description of the issues of interface - a case of "the 'i's have it"! Two more are brought immediately to mind: interactive and immersive. And by issues I mean what hack art teachers call ideas. And hack producers call innovation - there's two more... Issues like - incentive, or maybe when viewed as a participant, motivation - 'Why do I want to move through this work that requires my attention, and an active response...?'

John Colette, a Sydney-based artist, came up with a solution to this by providing three starting points based on the same data on his disc '30 Words for the City'.
    - The Card Player randomly plays a loop of the entire work.
    - The Stand Alone Player plays in a loop until Quit.
    - The Interactive Book acts as 'a book format of the piece.'
- his description.
Completed at the end of last year, Colette's work took some mature approaches to the intrinsic attractiveness of small, brightly coloured, moving images offering options of, as the book metaphor suggests, random access and exit from any part to any other. The metaphor is appropriate in describing the relationship that his piece sets-up with the reader for, as auteur, he provides sounds and pictures captured from the two cities of Sydney and Tokyo, manipulated, combined, collaged and edited with startling image clarity, as a backdrop for haiku-like poetic word presentations which record his feelings about moving and existing in these environments. The interacting subject by definition, is in the same kind of close proximity as would be the reader of a book, the artform which through the novel, has come to define the intimacy of the one to one communication process, so commsumately demonstrated in this work.
The clues provided in this 'book' as to 'content' are not found through a contents or index page but simply through combining the two states of interaction and immersion sequentially - you select from one of the button images, you watch, you decide what to watch next - the metaphor of the physical book is thus tenuous, particularly as a real book lacks the hyperlinking feature so particular to interactive mediums capable of moving directly from the content/index description to the source text, sound and images.
Similar states of interaction and immersion I suggest occur in works such as 'ScruTiny in the Great Round' by Jim Gasperini, 'Die Veteranen'* from the group of Leipzig artists,

and Peter de Lorenzo's 'Reflections, Abstractions and Memory Structures' which goes to the 'extreme' of enabling interaction to simply start-stop-start the entirely linear image progression.

'Digital Rhizome' by Brad Miller, (shown at ISEA94), was the first interactive computer piece I encountered 18 months ago and the notes I made then I feel apply as a general strategy for many other works which move forwards using the mouse click on Buttons, labelled for some works such as Miller's and including for instance, 'Body, Space, Memory'* by Chemelewski et al. Or not labelled, such as Ralph Wayment and Phil George in 'Mnemonic Notations', Mark Lycette in 'Autograph'. The anti-button attitude struck by the collaborators of the British work 'Anti-Rom', likewise entertainingly explore a thousand-and-one-things-to-do with a Mouse except click-it, and where the physical dexterity of mouse-moves becomes an issue.

In tracing points at which meaning are established by this process I'll refer to Digital Rhizome, (in which sections from Deleuze and Guattari's, A Thousand Plateaus, are quoted in genuflection to the theoretical backdrop for the piece). The title screen presents eight options including Exit - no clue is given as to the consequence of making one choice or another - a first level of meaning is thus quickly established which proposes that whilst sequence will have significance, a specified order will not, hence the narrative that I will encounter will be unique to my personal interaction with the piece.

A collage of images are deployed across the area of the screen and superimpose on a textured backdrop. As selected buttons lead on to successive screens a pattern begins to emerge about the organisation of the screen space. The interactive contribution is quickly learnt to influence progress palpably, but is recognised as not being "control". A second level of meaning is thereby soon attained.

There commences now a process which attempts to delineate the furthest extent of each sector of the work, clicking outwards in a conceptual circle, attempting to plot 'landmark' images along the way, before returning through the maze to the start point, to then set-out to test the path again before beginning again from another point.

With so little to go on ("..not a beginning or an end; it is always in the middle .."), the"mazeing" process itself offers the third level of meaning as the motivational drive changes into a pleasurable era of reflexivity. Without knowledge of the consequences of taking options, (rather than making choices), the form of the exploration is accepted as being purely aleotoric - chance not choice. This shades into the ludic as soon as some confidence is gained in recognising patterns of image-routes. But visual memory of images, text clusters, button slogans etc, are severely stretched in an effort to map the topography - the game plan is easily subverted. As mazeing continues "Control" is not wrested but at best shared.

The perambulation is as through a series of arcades or galleries , exposing the author's and the interactor's predelictions and prejudices in the tradition of reflective contemplation. Walter Benjamin's flaneur is evoked directly in this sense in another Cd-Rom work, 'Passagen', by Graham Ellard and Stephen Johnstone.

A fourth level of meaning is now available to securely invoke the familiar defuser of subversive strategies - interpretation. In the case of 'Digital Rhizome', on what basis were these images selected? Do they in themselves acknowledge the received (from TV, from print) image as problematic? Are they from a folio of experiments, with cameras outputed to the computer and then 'developed' to challenge received assumptions? It seems from this initial encounter that the element in the piece, the base unit, is the moving image which, as we all know, appeals to our innate hunter's eye. Most of the movies are referencing technology and the technology of war in particular - the hunter's eye is appropriately served. The mind reels under the weight of mass disseminated paranioa - the brutality of the Age of Print; the callousness of the computer-imaged Gulf War. Does the ability to participate through this interactive piece in 'choosing' to steer again the route which will run again the image of Iraqi squaddies running from their vehicles as a missile homesin, make the event anymore meaningful in the wider context? Or does it simply reflect, through the computer technology in front of which we sit, the ability to image what previously could only be imagined? Through juxterposition with images that could only be created by the artist on a computer, is there a dialectic space created a priori to enable us to see a way through such terror? The keynote speakers here at ISEA95 seem to have a real obsession with all images being intractable - whether it is the Kroker's images of The Redundant Body, or Gert Lovink's images of Despairing Youth in War-Torn Europe - could it be that meaning is assumed to be monolithic according to the proclivities of the perceivers? I would suggest that the process which I outline above where there is an option of interacting with 'one-dimensional' images grabbed from mediaspace, whilst it confronts us with what appears to be the intractable image, the process enables us to comprehend the narrative process to which we are subjected by external Agencies, propagated by the Media. We know that constant repetition can render meaningless but to be in a position to determine for oneself the number of repetitions returns the formation of meaning to the perceiver. I would suggest the work of Linda Dement in for instance 'Cyberflesh Girlmonster'* enables the intractable images and social realities that she raises to be successfully interrogated through a process of interaction.

Celebration of the intimacy of the process is enacted in the classic tome 'Les Confessions'* of Jean-Louis Boissier, (after Rousseau), where the smallest of physical movements are mirrored by a response from the Mouse. This gentle and sensuous correspondence, requiring the responding gesture, has almost become the hallmark for the 'artintact'* series from the artists

in residence at ZKM. Much of this work has re-authored material from installations and other projects - the ephemeral and ambitious in distributable versions - but the development of the individual artworks, at an idea and technical level but more particularly at a public interface level enables the process to be examined over a period of time and so become refined. 'artintact' indicates that CD-ROM is at the stage of development where Cinema was 80 years ago, when the great theatre entertainers were putting their acts on celluloid! (Chaplin, Keaton, the Marx Bros et al perfected their scripts and performances in the variety theatres of the day, sometimes involving years of polishing before adapting and recording them for Cinema).

Conclusion

Whilst being regarded by sections of the Industry as an intermediate technology awaiting the arrival of the 'superhighway' networks, the CD media's material immutability will remain a major advantage as a storage device. Through connection to whatever distribution system technology provides, (as time goes by), like the Greek bronze, the disc is a stable repository of cultural evidence capable of becoming knowledge.

The final image is that of the bronze discus thrower which began the presentation - but a wider framing reveals the other components from a magazine page.

Postscript

To anticipate the social impact on the present of electronically compressing time and space is a problem, on the future daunting: could Guttenberg have anticipated the impact of formalising the written word using wooden blocks? Could Daguerre or Fox Talbot have predicted the social effect of organising silver salts onto metal and paper?

To extend the time frame further - what would the Greek artist responsible for the clay model of the Discobulus have felt about his work being reproduced in bronze, let alone some 2,400 years after his death, as a flat image, in colour, in a magazine circulated to thousands of people, so that one of them could then fax to me a copy of the image, to be photographed onto a slide, to be projected onto a screen, in front of us here. Whilst examining how we deal with these complex issues now I sometimes wonder, just for a moment, how these artworks currently being made into a permanent artefact in CD-ROM form will be mediated to an audience in the 44th Century, 2,400 years from now?

Computer Research Laboratory,
College of Fine Art,
University of New South Wales,
Sydney, Australia.
Fax +61 2 339 9506

INTERFACE METAPHORS & NEW NARRATIVES IN INTERACTIVE MEDIA

By George Legrady

legrady@mercury.sfsu.edu

isea95@er.uqam.ca   T : (514) 990-0229

ISEA95 montréal

Digital Interactive media require metaphor based, organizational models by which to conceptually situate the viewer and to provide a way of accessing and understanding data. By knowing "the story" or metaphor, the viewer can successfully navigate inside the interactive program. As a result, these metaphor environments promise to be the key site for innovative developments of a linguistic, symbolic, aesthetic, sensory and conceptual nature, redefining the interactive viewer's experience within the digital environment. This presentation will discuss the relevance and conceptualization of interface metaphors with examples of the artists' recent works.

The following text was previously published in *Les hypermédias, revue virtuelle 12*, 1994, Centre Georges Pompidou, Paris, France

T he mechanized sound of an old movie projector is triggered by the flickering motion of an early 1950's black and white movie. A smiling woman turns her head towards the camera through a shower of film scratches. A man walks into the frame and they kiss. To the right of this scene a color panel comes alive with a fast moving camera pan of a graffiti covered wall and stairs, the movement accentuated by the sound of heavy traffic noises. The camera stops when it reaches the site of the kissing scene recorded some fifty years earlier. With the click of the mouse, the screen changes to an architectural floor plan animated by the sound of footsteps of what we imagine to be archivists silently moving around.

An Anecdoted Archive from the Cold War is an interactive artwork on CD-ROM designed as a museum exhibition display. The Archive features early 1950's Central European personal and official Communist material in the form of home movies, objects, family documents, Socialist propaganda, money, sound recordings, news reports, books, identity cards, photographs of public documents and video footage of Central European places and events. These have been part of my collection of objects and narratives related to the Cold War, gathered during the past twenty years. The items, grouped into some sixty topics, were

organized thematically in eight rooms superimposed on the original floor plan of the former Workers' Movement (Propaganda) museum in Budapest, the original contents of which have been in permanent storage since the end of Communism in 1990.

Viewers experience this Archive both in the digital environment of the CD-ROM and in the real-world architectural space of the gallery in which the computer program is generally exhibited. The Archive's contents are listed in white letters on the darkened gallery's walls surrounding the table on which the computer is positioned. This visual cataloging serves to emphasize the installation's reference to a research archive environment. An overhead projection and loudspeakers amplify the computer's contents to engage the standing audience waiting their turn. Each viewer interacts with the computer archive by selecting stories according to their own interests and chance. As a result, they construct varying synopses of the archive's content and context determined by the sequence of their choices and the depth of their explorations.

The objects, sounds, publications and stories that make up the contents of the *Anecdoted Archive* were collected during sporadic visits to Hungary in the 1970's and 80's. They eventually evolved into a loose grouping of artifacts that came to embody a biographical narrative about an identifiable place and time. In the process of organizing the archive's contents, categories emerged which established their own sense. At this juncture, a transformation began to take place as the *Archive*'s disparate elements of personal to official and ideologically diversified material began to coalesce through a set of internal links. The process by which diverse knowledges merge formally into an institutionalized discourse exemplifies the dynamic nature of the archive described by Michel Foucault as that *"practice that causes a multiplicity of statements to emerge as so many regular events."* An interactive archive consisting of digitally encoded contents became the means to fuse the items and multiple references together to inscribe them into a unified form.

The somewhat irreverent idea of superimposing my personal narrative on the floor plan of the Budapest's Worker's Movement museum provided structural cohesiveness and a rich narrative potential. The appropriated museum's floor plan was subdivided into color coded "rooms" to establish thematic ordering for the accumulated fragments, stories and objects. These "chapters" created contextual meaning for the archive's contents, defining hierarchical relations and differences. The floor plan metaphor further emphasized the discursive potential of its interface as a site where the personal narrative could enter into dialogue with the formal structure and content of the museum's authoritative history. The intent to contrast subjectivities and interpretive commentaries in relation to the distant formality of official material functioned to underscore this archive's supposition that historical inscription as an act of narration refutes the notion of a single unified history, resulting instead in fragmented narratives that contradict and disprove one another.

On first thought, a digital interactive archive might not seem that different from its analog counterpart, for instance such as a standard library where one samples books in a non-linear random fashion by selectively pulling them off-the-shelf. However, near instant access to information across geographic space, simpler modes of information storage with greater precision, simultaneous retrieval of cross-media data such as sound, image and text, and the ever increasing superior sorting and ordering capabilities of structural databases over analog sequential models are some of the obvious advantages of interactive digital media.

The transition from the real-world information environment to the digital model involves an additional necessary component, the interface metaphor which functions as an organizational model that conceptually situates the viewer into a place and provides a framework or a logical way of accessing data. Some of the current familiar examples include "mail", obviously a system of sending and receiving communication, architectural environments, and adventure "treasure hunt" narratives, each of which functions according to the logic of their referential models. By knowing "the story" or metaphor, one can successfully navigate within it to access the information. These metaphor environments promise to be the key site for innovative developments of a linguistic, symbolic, aesthetic, sensory and conceptual nature, redefining the interactive viewer's experience within the digital environment.

Interface metaphors quantitatively transform the information that pass through them. They charge the information contextually with new meaning on both the symbolic and literal plane. When the viewer first begins to interact with the *Anecdoted Archive*, the articulation of the interface's navigational and visual structure becomes the initial experience of the archive's content. The museum floor plan reference, the interface design, the pathways, and architectural metaphor embody the environment through which the viewer must navigate in search of stories. One's focused attention to the interface quickly diminishes with the acquisition of maneuvering skills and becomes displaced by the search and consumption of the Archive's stories. But on further reflection, the somewhat taken-for-granted interface environment, consisting of title bars, selection buttons, color coding, defined pathways and sequentially determined events, reveals itself as the key component of the work - Its site of authorship. Without it, the Archive's stories, images, sounds and references would collapse into a meaningless mass of information; narratives without a place to belong, odds & ends without a context and framework.

The interface metaphor provides the context that weaves the stories together and gives the work its meaning. A narrative evolves in the viewers' minds, constructed through the sequential accumulation of their viewing choices and guided by expectations or a sense of truth or the real. In *Vision & Painting*, Norman Bryson argues that the real is that which "lies in a co-

incidence between a *representation* and that which a particular society proposes and assumes as its reality: a reality that involves the complex formation of codes of behavior, law psychology, etc. all those practical norms which govern the stance of human beings toward their historical environment." In the digitally simulated environment where the viewer actively participates in shaping the outcome of the story as it unfolds, to function within an interactive archive is to engage in constructing a hybridized real, to make visible one's beliefs within a reality articulated by metaphors.

L'INTELLIGENCE COLLECTIVE ET SON OBJET

Par Pierre Lévy

plevy@atelier.fr

L es technologies intellectuelles et les dispositifs de communication connaissent en cette fin du XXe siècle des mutations massives et radicales. En conséquence, les écologies cognitives sont en voie de réorganisation rapide et irréversible. La brutalité de la déstabilisation culturelle ne doit pas nous décourager de discerner les formes émergentes les plus positives socialement et de favoriser leur développement.

En particulier, le développement de la communication assistée par ordinateur et des réseaux numériques planétaires peut être interprété comme la réalisation d'un projet plus ou moins bien formulé, celui de la constitution délibérée de formes nouvelles d'intelligence collective, plus souples, plus démocratiques, fondées sur la réciprocité et le respect des singularités. En ce sens, on pourrait définir l'intelligence collective comme une intelligence partout distribuée, continuellement valorisée et mise en synergie en temps réel. Ce nouvel idéal pourrait remplacer l'intelligence artificielle comme mythe mobilisateur du développement des technologies du numérique.

La notion d'intelligence collective évoque irrésistiblement le fonctionnement des sociétés d'insectes : abeilles, fourmis, termites. Pourtant, les communautés humaines diffèrent profondément des termitières. L'intelligence collective pense en nous, tandis que la fourmi est une partie quasi-opaque, presque non holographique, un rouage inconscient de la fourmilière intelligente. Nous pouvons jouir individuellement de l'intelligence collective qui augmente ou modifie notre propre intelligence. Nous contenons ou reflétons partiellement, chacun à notre manière, l'intelligence du groupe. La fourmi, en revanche, n'a qu'une très faible jouissance ou vision de l'intelligence sociale. Elle n'en reçoit pas d'augmentation mentale. Obéissante bénéficiaire, elle n'y participe qu'aveuglement.

Non seulement la fourmi reçoit moins que l'humain de l'intelligence sociale mais, symétriquement, elle n'y contribue que dans une faible mesure. Une femme ou un homme, dans le cadre d'une culture, est capable d'apprendre, d'imaginer, d'inventer et finalement de faire évoluer, même très modestement, les langages, les techniques, les relations sociales qui ont cours dans son environnement, ce dont une fourmi - étroitement soumise à une programmation génétique - n'est guère capable.

La Communication tous-tous

Le principal outil de la transformation vers des formes plus ouvertes et plus souples d'intelligence collective que celles que nous connaissions auparavant est un dispositif de communication au sein de très larges collectivités déterritorialisées que nous appellerons "communication tous-tous". On peut en faire l'expérience sur Internet, dans les babillards (BBS), les conférences ou forums électroniques, les systèmes pour le travail ou l'apprentissage coopératif, les groupwares ou collecticiels, les mondes virtuels et dans les arbres de connaissances. En effet, le cyberespace en voie de constitution autorise une communication non médiatique à grande échelle qui, à notre sens, constitue une avance décisive vers des formes nouvelles et plus évoluées d'intelligence collective. Comme on le sait, les médias classiques (relation un-tous) instaurent une séparation nette entre centres émetteurs et récepteurs passifs isolés les uns des autres. Les messages diffusés par le centre réalisent une forme grossière d'unification cognitive du collectif en instaurant un contexte commun.

Néanmoins, ce contexte est imposé, transcendant, il ne résulte pas de l'activité des participants au dispositif, il ne peut être négocié transversalement entre les récepteurs. Le téléphone (relation un-un) autorise une communication réciproque, mais ne permet pas de vision globale de ce qui se passe sur l'ensemble du réseau ni la construction d'un contexte commun. Dans le cyberespace, en revanche, chacun est potentiellement émetteur et récepteur dans un espace qualitativement différencié, non figé, aménagé par les participants, exploitable. Ici, on ne rencontre pas les gens principalement par leur nom, leur position géographique, ou sociale, mais selon des centres d'intérêts, sur un paysage commun du sens ou du savoir. Selon des modalités encore primitives, mais qui s'affinent d'année en année, le cyberespace offre des instruments de construction coopérative d'un contexte commun dans des groupes nombreux et géographiquement dispersés. La communication se déploie ici selon toute sa dimension pragmatique. Il ne s'agit plus seulement d'une diffusion ou d'un transport de messages mais d'une interaction au sein d'une situation que chacun contribue à modifier ou stabiliser, d'une négociation sur des significations, d'un processus de reconnaissance mutuelle des individus et des groupes via l'activité de communication. Le point capital est ici l'objectivation partielle du monde virtuel de significations livré au partage et à la réinterprétation des participants dans les dispositifs de communication tous-tous. Cette objectivation dynamique d'un contexte collectif est un opérateur d'intelligence collective, une sorte de lien vivant tenant lieu de mémoire, ou de conscience commune. Une subjectivation vivante renvoie à une objectivation dynamique. L'objet commun suscite dialectiquement un sujet collectif.

Donnons quelques exemples d'un tel processus. Le World Wide Web est un tapis de sens tissé par des millions de gens et remis toujours sur le métier. Du raboutage permanent de millions d'univers subjectifs (les "sites web") émerge une mémoire dynamique, commune "objectivée", navigable. On découvre aussi des paysages de significations émergeant de l'activité collective dans les MUDS, sortes de jeux de rôles en forme de mondes virtuels langagiers, élaborés en temps réel par des centaines ou des milliers de jeunes gens dispersés sur la planète. Sur un mode moins élaboré, on trouve également ces mémoires communes sécrétées collectivement dans les conférences électroniques des babillards, ou les news groups d'Internet, dont la liste changeante dessine une carte dynamique des intérêts de communautés vibrionnantes. Dans les meilleurs cas, ces dispositifs constituent des sortes d'encyclopédies vivantes. Les réponses aux "frequentely asqued questions" (FAQ) de certains forums électroniques évitent les répétitions et permettent à chacun de s'inscrire dans le dialogue avec un minimum de connaissances de base sur le thème considéré. On incite ainsi les individus à participer de la manière la plus pertinente possible à l'intelligence collective.

On trouve encore ces paysages de significations partagées dans les arbres de connaissances, marchés libres d'une nouvelle économie du savoir, qui offrent à chaque participant d'une collectivité une vue synthétique de la variété des compétences de son groupe, lui permettent de repérer sous forme d'image son identité dans des espaces de savoir et de communiquer avec ceux qui ont le profil de compétence qui l'intéresse. Il est impossible d'énumérer ici toutes les formes de mémoire, de pensée, d'évaluation coopérative qui s'inventent aujourd'hui dans ces dispositifs de communication tous-tous.

Le cortex d'Anthropia

La transmission et le partage d'une mémoire sociale sont aussi vieille que l'humanité. Récits, tours de mains et sagesses passent de génération en génération. Cependant, le progrès des techniques de communication et d'enregistrement a étendu considérablement la portée du stock partageable (bibliothèques, discothèques, cinémathèques). Aujourd'hui, l'information disponible en ligne ou dans le cyberespace en général comprend non seulement le "stock" déterritorialisé de textes, d'images et de sons habituels, mais également des points de vue hypertextuels sur ce stock, des bases de connaissances aux capacités d'inférence autonomes et des modelés numériques disponibles pour toutes les simulations. Outre ces masses de documents statiques ou dynamiques, des paysages de significations partagés coordonnent les structurations subjectives variées de l'océan informationnel. La mémoire collective mise en acte dans le cyberespace (dynamique, émergente, coopérative, retravaillée en temps réel par des interprétations), doit être nettement distinguée de la transmission traditionnelle des récits et des savoir-faire, comme des enregistrements statiques des bibliothèques.

Au-delà de la mémoire, les logiciels sont autant de micro-modules cognitifs automatiques qui viennent s'imbriquer à celui des humains et qui transforment ou augmentent leurs capacités de calcul, de raisonnement, d'imagination, de création, de com-

munication, d'apprentissage ou de "navigation" dans l'information. Chaque fois que l'on produit un nouveau logiciel, on accentue le caractère collectif de l'intelligence. En effet, si la fourniture d'information n'accroît que le stock commun (ou enrichit sa structuration), le logiciel, lui, ajoute aux modules opératoires partagés. La programmation coopérative du logiciel dans le cyberespace illustre de manière frappante l'autopoïèse (ou production de soi) de l'intelligence collective, et cela notamment quand le logiciel vise lui-même à l'amélioration de l'infrastructure de communication numérique.

Un des caractères les plus saillants de la nouvelle intelligence collective est l'acuité de sa réflexion dans les intelligences individuelles. Les actes du psychisme de l'humanité deviennent presque directement sensibles aux personnes. Certaines formes de mondes virtuels permettent quasiment d'exprimer, de visualiser en temps réel les diverses composantes de psychismes collectifs.

L'image satellitaire de notre planète, les informations qui nous en parviennent par une multitude de réseaux mondiaux de capteurs, les modelés informatisés qui intègrent ces données, les simulations qui nous laissent deviner les réactions de la terre, son histoire, l'inimaginable intimité de sa vie d'une infinie lenteur, opaque, énorme et dispersée, tout cela fait peu à peu surgir, ou resurgir, dans l'esprit des humains, la figure archaïque de Gaia. Face à la très ancienne déesse, encore mêlée à sa substance, on peut maintenant presque entendre ou voir penser, croissant sous nos yeux, rapide, crépitant, le grand hypercortex de sa fille, Anthropia.

Tout autant que la recherche utilitaire d'information, c'est cette sensation vertigineuse de plonger dans le cerveau commun et d'y participer qui explique l'engouement pour Internet. Naviguer dans le cyberespace revient à promener un regard conscient sur l'intériorité chaotique, le ronronnement inlassable, les banales futilités et les fulgurations planétaires de l'intelligence collective. L'accès au processus intellectuel du tout informe celui de chaque partie, individu ou groupe, et alimente en retour celui de l'ensemble. On passe alors de l'intelligence collective au collectif intelligent.

A côté de nombreux aspects négatifs, et notamment le risque de laisser sur le bas-côté de l'autoroute une part disqualifiée de l'humanité, le cyberespace manifeste des propriétés neuves, qui en font un précieux instrument de coordination non hiérarchique, de mise en synergie rapide des intelligences, d'échange de connaissances, de navigation dans les savoirs et d'autocréation délibérée de collectifs intelligents.

Je propose, avec d'autres, de saisir ce moment rare où s'annonce une culture nouvelle pour orienter délibérément l'évolution en cours. À raisonner en termes d'impact, on se condamne à subir. De nouveau, la technique propose mais l'homme dispose. Cessons de diaboliser le virtuel (comme si c'était le contraire du réel !). Le choix n'est pas entre la nostalgie

d'un réel daté et un virtuel menaçant ou excitant, mais entre différentes conceptions du virtuel. L'alternative est simple. Ou bien le cyberespace reproduira le médiatique, le spectaculaire, la consommation d'information marchande et l'exclusion à une échelle encore plus gigantesque qu'aujourd'hui. C'est en gros la pente naturelle des "autoroutes de l'information" ou de la "télévision interactive". Ou bien nous accompagnons les tendances les plus positives de l'évolution en cours et nous nous donnons un projet de civilisation centré sur les collectifs intelligents : recréation du lien social par les échanges de savoir, reconnaissance, écoute et valorisation des singularités, démocratie plus directe, plus participative, enrichissement des vies individuelles, invention de formes nouvelles de coopération ouverte pour résoudre les terribles problèmes que l'humanité doit affronter, aménagement des infrastructures logicielles et culturelles de l'intelligence collective.

Sur le stade

Comment, passer de l'intelligence collective, qui est inhérente à l'état d'humanité ou à la culture en général, aux collectifs intelligents, qui optimisent délibérément leurs ressources intellectuelles ici et maintenant ? Comment faire une société de manière souple, intense et inventive, sans pour autant fonder le collectif sur la haine de l'étranger, ni sur quelque mécanisme victimaire, ni sur le rapport à une loi ou à une personne transcendante ? Comment mettre en symphonie les actes et les ressources des personnes sans les soumettre à une aliénante extériorité ?

Un tel régime ne se décrète pas et il y faut sans plus que de la bonne volonté. Michel Serres nous a appris à lire sur les stades certains théorèmes d'anthropologie fondamentale. Soit un match de football ou de rugby. Écoutons d'abord le son qui monte des gradins. Les supporters de la même équipe crient presque tous ensemble les mêmes choses au même moment. Les actes des individus se distinguent mal, ne parviennent pas à s'entrelacer pour faire histoire ou mémoire, ils n'enclenchent sur aucune bifurcation irréversible. L'individu est noyé dans la masse des supporters, dans le bruit de fond de la foule. Or l'intelligence de cette masse (capacité d'apprentissage, d'imagination, de raisonnement) est notoirement plutôt faible, qu'elle se manifeste dans le stade ou à la sortie.

Regardons maintenant sur le terrain. Chaque joueur accomplit des actions nettement distinctes de celles des autres. Néanmoins, toutes les actions visent la coordination, tentent de se répondre, veulent faire sens les unes par rapport aux autres. Les actes des joueurs, contrairement à ceux des supporters, interviennent dans une histoire collective, orientent chacun différemment le cours d'une partie indice. Les équipes mettent en oeuvre des stratégies, improvisent, risquent. Chacun des joueurs doit être attentif non seulement à ce que font ses adversaires mais également à ce qui se trame dans son camp, pour que les mouvements accomplis par ceux de son équipe n'aient pas été tentés en vain. Le jeu se "construit".

Les spectateurs n'ont pas d'action possible sur le spectacle qui les réunit, ils ont tous la même fonction face au point haut, ou au point bas, de toutes manières hors d'atteinte, que représente le terrain. Le lien (le spectacle du jeu) est transcendant par rapport aux personnes qui composent le collectif. Sur les gradins, faire société, c'est être pour et contre, être dans un camp, aimer les siens, huer les autres.

Sur le terrain, en revanche, il ne suffit pas de détester le camp d'en face. Il faut l'étudier, le deviner, le prévoir, le comprendre. Il faut surtout se coordonner entre soi en temps réel, réagir finement et rapidement "comme un seul homme", quoique l'on soit plusieurs. Or cette mise en synergie spontanée des compétences et des actions n'est possible que grâce au ballon. Sur le terrain, la médiation sociale abandonne sa transcendance. Le lien entre les individus cesse d'être hors d'atteinte, il revient au contraire entre les mains (ou bien aux pieds) de tous. La vivante unité des joueurs s'organise autour d'un objet-lien immanent. Passant par le détour d'un être circulant, d'un centre mobile qui désigne chacun tour à tour comme transitoire pivot du groupe, le groupe intelligent des footballeurs est à lui-même sa propre référence. Les spectateurs ont besoin de joueurs, les équipes n'ont pas besoin de spectateurs. Demi-habile, un proverbe chinois dit que le doigt montre la lune et que l'idiot regarde le doigt. Habiles, les joueurs font du ballon à la fois un index tournant entre les sujets individuels, un vecteur qui permet à chacun de désigner chacun, et l'objet principal, le lien dynamique du sujet collectif. On considérera le ballon comme un prototype de l'objet-lien, de l'objet catalyseur d'intelligence collective. Je fais l'hypothèse qu'un tel objet, que j'appellerai dorénavant et par convention l'objet tout court, est inconnu des animaux.

Proies, territoires, chefs et sujets
Les mammifères supérieurs, et plus particulièrement les primates sociaux dont nous sommes issus, n'ont pas d'objets. Certes, ils connaissent les proies, comme tous les animaux. En un sens, la proie est un proto-objet. La chasse peut donner lieu à coopération. La proie capturée suscite des rivalités ou des combats. C'est donc bien un opérateur primitif de socialisation. Mais la proie est destinée à être dévorée, incorporée, résorbée finalement dans un sujet. Voit-on les joueurs lacérer, se partager puis manger le ballon qu'ils ont attrapé ?

Les animaux connaissent aussi des relations fortes avec les territoires, chaque société défendant le sien contre l'invasion des autres. La société animale définit notamment son identité par sa relation avec un territoire particulier. Les chiens, les chats et de nombreux autres animaux marquent leur territoire de leur odeur corporelle. Les oiseaux l'occupent par leur chant. Pourquoi le territoire n'est-t-il pas encore un objet ? Parce qu'il fonctionne sur le mode de l'appropriation ou de l'identification exclusive. Vous ne verrez jamais un joueur plantant son drapeau sur un ballon et prétendre à sa possession exclusive. Le vrai fondateur de la société civile fut celui qui renonça à enclore une portion de l'univers physique et déclara pour la première fois : ceci est un objet. Pour jouer son rôle anthropologique, l'objet doit passer de main en main, de sujet à sujet, et se soustraire à l'appropriation territoriale, à l'identification à un nom, à l'exclusivité ou à l'exclusion.

Les primates sociaux, enfin, connaissent aussi les relations de dominance, qui jouent un rôle essentiel dans la régulation de leurs interactions. Notons d'ailleurs que les rapports stables de domination, avec des gradations de rangs et des hiérarchies subtiles, n'existent que chez les vertébrés. On n'en trouve pas chez les insectes sociaux qui, en revanche, connaissent la polyethie (comportements très types selon les castes) et la polymorphie (différences anatomiques en fonction de la division sociale du travail). Les relations sociales hiérarchiques, échappant à la programmation génétique, se décident souvent à l'issue de combats ouverts. Elles doivent sans doute être mises en rapport avec les aptitudes à l'autonomie individuelle plus marquées des mammifères par rapport aux insectes. Les ethnologues les considèrent également comme un mode de régulation de l'agressivité entre membres du même groupe social, ce type d'agressivité étant très rare chez les insectes. L'individu dominant exerce une fonction d'unification et de coordination de la société en inhibant l'agressivité des individus entre eux, en polarisant l'attention des autres membres, en imposant les grandes orientations (chasse, migration). De nouveau, ni le sujet dominant, ni le sujet soumis ne sont des objets. Pourtant, le ballon a quelque affinité avec la relation de dominance puisqu'il est à la fois soumis et centré de l'attention. En un sens, il se substitue au chef, au subordonné ou à la victime, mais en les virtualisant. Loin de fixer quelque rapport stable de dominance, le ballon maintient au contraire une relation coopérative (dans la même équipe) et compétitive (entre les équipes) égalitaire et toujours ouverte. Certes, le jeu sacre des champions et laisse des vaincus, mais ces statuts ne durent qu'entre les parties. Aucune hiérarchie instituée ne pèse pendant le jeu : la circulation du ballon les suspend.

Le rapport à l'objet résulte d'une virtualisation des relations de prédation, de dominance ou d'occupation exclusive. Le doigt désigne la victime, montre le sujet dominant, indique la proie ou circonscrit le territoire. L'idiot regarde le doigt et invente l'objet.

Outils, récits, cadavres
Le ballon illustre merveilleusement le concept d'objet. Il est typique de sa fonction d'hominisation puisqu'une aptitude marquée pour le jeu est une des caractéristiques majeures de notre espèce. Aucun animal ne joue au ballon ni à quoique ce soit d'analogue. Les jeux animaux sont la plupart du temps des simulations de combat, de prédation, de domination ou de relations sexuelles qui mettent directement les corps aux prises sans passer par un intermédiaire objectif. Mais il est évidemment d'autres types d'objets, correspondant plus ou moins au type idéal si bien représenté par le ballon. Citons notamment : l'outil,

le matériau ou l'artefact qui passent de main en main durant les travaux collectifs ; les récits immémoriaux que l'on se transmet en les transformant de bouche à oreille et de génération en génération, chaque maillon écoutant et racontant tour à tour ; le cadavre pendant et après les rites funéraires.

On reconnaît l'objet à sa puissance de catalyse du rapport social et d'induction de l'intelligence collective. L'intelligence technique et la coopération pour les outils ; l'inventivité collective des mythes, des légendes et du folklore pour la circulation des récits. Ces deux cas évidents n'appellent pas de commentaire particulier. L'exemple du cadavre est moins immédiat. La dépouille mortelle renvoie au rituel et à ce que nous appelons maintenant la religion, formes archaïques mais puissantes de l'intelligence collective. Pendant les funérailles, le groupe tourne autour de son mort, l'entoure, le lave, l'habille, le pleure, le reconstruit par les éloges, le touche par fleurs ou poignées de terre interposée, l'enterre ou le brûle. Même impur ou intouchable, le mort ritualise, objective, reste un opérateur de socialisation. A contrario, que le cadavre ne soit pas entraîné dans le jeu funèbre qui en fait l'objet d'un collectif, qu'il soit traité comme une simple chose, que la chair en décomposition ne soit pas victuailles en corps du mort, c'est le signe certain de la désintégration d'un groupe, de sa déshumanisation. Il est tentant de voir dans le rapport au cadavre la virtualisation originelle, la transition du sujet de la dominance à l'objet : corps momifié du chef ou crâne de vaincu ramené en trophée. La tête réduite des Jivaros, qui joue effectivement un rôle complexe de refonte du collectif, serait-elle une sorte de précurseur monstrueux du ballon ?

L'argent, le capital

La monnaie en régime capitaliste constitue sans doute un des objets les plus efficaces. Si chacun gardait son argent dans un coffre personnel, le jeu économique contemporain s'effondrerait brusquement et complètement. En revanche, que chaque propriétaire garde sa terre et aucune conséquence catastrophique ne s'en suit pour l'agriculture. Fluide, partageable, anonyme, la monnaie est l'antithèse du territoire. C'est ce qu'exprime de manière imagée le fameux adage selon lequel l'argent n'a pas d'odeur. Aucun individu, aussi puant soit-il, ne peut marquer l'argent de son identité ou de ses actes. La monnaie n'existe en tant que telle et n'a de fonction économique positive que par sa circulation. C'est le traceur, le vecteur et le régulateur des relations économiques.

L'argent n'est pas la richesse, mais sa virtualité. Aussi paradoxal que cela puisse paraître, il est inappropriable, ou plutôt, par son incessante circulation, il retourne le public en privé et le privé en public, faisant participer chacun, et chacun différemment, à l'intelligence collective du marché capitaliste. L'argent peut être évidemment un levier pour le pouvoir et la domination, mais il catalyse également des forces sociales déterritorialisantes qui ne respectent aucune hiérarchie instituée. À travers les frontières, malgré les antagonismes, l'argent contribue, pour le meilleur et pour le pire, à coordonner, à réguler sans autorité centrale d'innombrables activités. Entraînant à sa suite les moyens de transport et de communication, c'est bel et bien l'argent du marché capitaliste, entre les mains de milliards d'humains, qui tisse aujourd'hui la société mondiale. Inutile d'insister sur ce point : s'il y a comme de vagues esquisses d'outils, de langages ou de rites funéraires dans certaines sociétés animales, rien n'y ressemble à la monnaie et encore moins au capital.

La communauté scientifique et ses objets

La communauté scientifique est un autre exemple de collectif intelligent uni par la circulation d'objets. Ces objets sont, en principe, "étudiés pour eux-mêmes", sur un mode désintéressé : cela revient à dire qu'ils ne sont ni des territoires, ni des proies, ni des sujets soumis ou révérés. De tels objets émergent d'une dynamique d'intelligence collective qui virtualise certaines manifestations particulières (fruits de l'observation, de l'expérience, de la simulation) pour faire exister des problèmes consistants : l'électron, le trou noir, tel virus.

La circulation est constitutive à la fois de l'objet et de la communauté : un phénomène mis en évidence dans un laboratoire ne devient "scientifique" que s'il est reproduit (ou, à la limite, reproductible) dans d'autres laboratoires. Un laboratoire qui n'accueille plus - et ne renvoie plus aux autres centres de recherche - les instruments, les protocoles expérimentaux et finalement les "objets" de la communauté (astres, particules élémentaires, molécules, phénomènes physiques ou biologiques, simulations) n'en n'est plus un membre actif. L'inventivité scientifique consiste à faire surgir de véritables objets, c'est-à-dire des vecteurs de communautés intelligentes, capables d'intéresser d'autres groupes qui mettront en circulation, enrichiront, transformeront, voire feront proliférer l'objet initial et transformeront ainsi leur identité dans la communauté. Comme dans le cas du football, le rôle de chacun est singulier et doit l'être (un article scientifique est tenu à l'originalité), le jeu est à la fois coopératif et compétitif, les actions se "construisent" les unes sur les autres, contribuant à instaurer une historicité, une irréversibilité complexe. Les disciplines figent en territoires la dialectique ouverte des objets et des collectifs scientifiques. Certes, le jeu scientifique est soumis à des contraintes économiques, sociales, politiques et notamment du côté des "moyens" nécessaires et des "retombées" escomptées ou effectives. On pourrait en dire autant du football professionnel. Mais si la technoscience se réduisait à des contraintes, à des rapports de forces et à des jeux d'alliances, fut-ce dans le milieu hybride des collectifs hommes-choses, sa créativité singulière, comme sa prise sur le monde, ne feraient pas long feu. Ce serait un peu comme si l'on décidait de ne rendre compte de l'amour qu'avec les conceptions de la marquise de Merteuil. On critique moins ici les théories de la nouvelle école d'anthropologie des sciences et des techniques que les caricatures auxquelles certaines de ses formulations ont parfois donné prise.

Ni simple relation entre des humains, ni prédation ou appropriation des choses, l'entreprise scientifique met en boucle la constitution réciproque de collectifs intelligents et d'objets de connaissance. Loin de préexister à leurs "découvertes", ou de constituer des référents transcendants pour des vérités absolues, les objets de la science sont immanents aux procédures techniques qui les construisent, aux collectifs qui les font circuler. Mais ils ne sont pas pour autant arbitraires ou purement relatifs. Car ils se risquent dans des processus de sélection qui les qualifient et qu'ils jugent en retour. De toutes les propositions d'objets qui sont émises, bien peu sont finalement capables d'imposer la pertinence des épreuves qui leur permettront de "faire objet".

Le cyberespace nouvel objet de l'intelligence collective

L'extension du cyberespace représente sans doute le dernier en date des grands surgissements d'objets inducteurs d'intelligence collective. Qu'est-ce qui rend Internet si intéressant? Dire qu'il est "anarchiste" est une manière beaucoup trop grossière de présenter les choses. C'est un objet commun, dynamique, construit, ou tout au moins alimenté, par tous ceux qui s'en servent. Il a sans doute acquis ce caractère de non-séparation d'avoir été fabriqué, étendu, amélioré par les informaticiens qui en étaient au début les principaux utilisateurs. Il fait lien d'être à la fois l'objet commun de ses producteurs et de ses explorateurs.

Le cyberespace offre des objets roulant parmi les groupes, des mémoires partagées, des hypertextes communautaires pour la constitution de collectifs intelligents. On doit le distinguer, d'abord, de la télévision, qui ne cesse de désigner des puissants ou des victimes à des masses d'individus séparés et impuissants. Il ne faut surtout pas le confondre, ensuite, avec son double pervers, l'autoroute électronique, qui met en scène un territoire (les réseaux physiques, les services à péage) en lieu et place d'objets communs. L'autoroute électronique dégrade en chose appropriable ce qui était un objet circulant. Si le cyberespace résulte d'une virtualisation des ordinateurs, l'autoroute électronique réifie ce virtuel. L'âpreté des débats autour du caractère marchand ou non marchand d'Internet a de profondes implications anthropologiques. Une des fiertés de la communauté qui a fait croître le Net est d'avoir inventé, en même temps qu'un nouvel objet, une manière inédite de faire intelligemment société. La question n'est donc pas de bannir le commerce d'Internet (pourquoi l'interdire ?) mais de préserver une manière originale de constituer des collectifs intelligents, différente de celle qu'induit le marché capitaliste. Les cybernautes n'ont pas besoin d'argent puisque leur communauté dispose déjà d'un objet constitutif, virtuel, détérritorialisé, producteur de lien et cognitif par sa nature même. Mais, par ailleurs, le cyberespace est parfaitement compatible avec l'argent ou d'autres médiateurs immanents, il accroît même considérablement la puissance virtualisante et la vitesse de circulation des objets monétaires et scientifiques. Accueillant aux liens circulants des collectifs intelligents, le Net est un accélérateur d'objets, un virtualisateur de virtuels. En la matière, on n'a probablement encore rien vu.

Grâce aux produits de l'activité économique et scientifique, en s'appuyant sur les moyens du cyberespace, les rapports de prédation, d'appropriation et de pouvoir reprennent de plus belle, sur une plus grande échelle encore. De tout le règne animal, c'est l'homme qui pratique au plus haut degré l'impérialisme territorial, la chasse impitoyable et l'implacable domination. Mais, chez lui, ces types de relation sont momentanément suspendus par la grâce du rapport à l'objet. Certes, la technoscience, l'argent et le cyberespace font de l'homme un chasseur, un propriétaire, un dominateur plus terrifiant que jamais. Mais les grands objets contemporains ne lui confèrent ces pouvoirs qu'en le forçant à faire l'expérience proprement humaine du renoncement à la proie, de la désertion du pouvoir et de l'abandon de la propriété. L'expérience de la virtualisation.

Le fonctionnement d'un objet comme médiateur d'intelligence collective implique toujours un contrat, une règle du jeu, une convention. Mais il faut souligner que, d'une part, la plupart des contrats ne concernent pas la circulation des objets et que, d'autre part, un contrat (respectivement : une règle, une convention, une loi) ne suffit jamais à lui tout seul pour faire émerger de l'intelligence collective. L'événement rare n'est pas la passation d'un contrat ou l'établissement d'une règle, mais l'éclosion d'un objet. À titre d'exemple, il n'y a évidemment pas d'objets scientifiques sans conventions ni règles de méthodes, mais il est beaucoup plus facile de proclamer des recettes épistémologiques que de faire une découverte!

On pourrait raconter l'histoire de l'humanité, à commencer par sa naissance, comme une succession de surgissements d'objets, chacun d'eux indissociable d'une forme particulière de dynamique sociale. On verrait alors que tout nouveau type d'objet induit un style particulier d'intelligence collective et que tout changement social conséquent implique une invention d'objet. Dans la durée anthropologique, les collectifs et leurs objets se créent du même mouvement. À la mesure de la circulation et de la taille de ses objets (ceux du cyberespace, de l'économie et de la technoscience) et seule dans ce cas de tout le règne animal, l'espèce humaine tend à ne plus constituer qu'une seule société. Les collectifs n'ayant que l'intelligence de leurs objets, l'humanité devra perfectionner les siens, voire en inventer de nouveaux afin de faire face à la nouvelle échelle des problèmes. Ces objets-monde à venir, vecteurs d'intelligence collective, devront rendre sensible à chaque individu les effets collectifs de ses actions. Capables de faire vivre l'immensité âpre de l'individu, ils devront surtout impliquer chacun, prendre en compte chaque localité singulière dans l'intotalisable dynamique de l'ensemble. L'objectivité à l'échelle du monde ne surgira que d'être entretenue par tous, de circuler parmi les nations et de faire croître en culture l'humanité.

La terre météorologique, la terre des tremblements, la terre des éléphants et des baleines, la terre de l'Amazone et de l'Arctique, la terre survolée des satellites, la terre énorme et pacifique, la Terre est bleue comme un ballon.

Bibliographie de l'auteur

- *L'intelligence collective, pour une anthropologie du cyberspace*, La Découverte, 1994.

- *Les arbres de connaissances*, (en collab. avec Michel Authier), La Découverte, 1992.

- *De la programmation considérée comme un des beaux-arts*, La Découverte, 1992.

- *L'idéographie dynamique. Vers une imagination artificielle?* La Découverte, 1991.

- *Les technologies de l'intelligence. L'avenir de la pensée à l'ère informatique*, La Découverte, Paris, 1990. Réédité en livre de poche dans la collection "Points" au Seuil en mars 1993.

- *La Machine Univers. Création, cognition et culture informatique.* La Découverte, Paris, 1987. Réédité en livre de poche dans la collection "Points-Sciences", en 1992. Prix de l'association française des informaticiens.

COMPOSING WITH CHAOS;
APPLICATIONS
OF A NEW SCIENCE FOR MUSIC

By David Clark Little

I n this paper the author shows where concepts and mathematical models derived from the developing field of Chaos Science can be applied to electroacoustic and instrumental composition. Examples of non-linear dynamics include Lorenz's model of fluid behaviour, Verhulst's model of population growth, Hénon's analysis of the multiple celestial body problem, Barry Martin's Algorithm which produces quasi-organic forms, and the 'Baker' mixing function. Besides broadening the numerical techniques available for electronic music generation, concepts such as fractal structure, feedback process and iterative function can be applied to 'ordinary' composition as well. For example, in designing melodic curve, defining meter, planning instrumentation, manipulating symbols, creating ornamentation and elaboration, etc. Some suggestions as to mapping are made, the critical boundary between science and art. Musical examples are used from the following works by the author: Harpsi-Kord for harpsichordist and tape, Fractal Piano for computer-guided pianola, The Five Seasons for 6 percussionists and tape, Brain-Wave for recorder-players, Modi-Fications for marimba & tape, and Hyperion's Tumble for tape.

300 years ago Newton formulated the laws of motion which laid the ground-work for a clockwork view of the universe. By the late 18th century the French astronomer Laplace optimistically stated that intelligent creatures could know any past or future state of the universe, if they only knew well enough its present state, what direction it was heading towards, and had powerful enough calculating methods. This deterministic world view has proved to need revision. Scientific and mathematical developments of the last 30 years have led to new insights into subjects, which because of their complexity, had previously been swept under the rug by the scientific establishment. Intractable problems in weather forecasting, the modelling of wildlife populations, the geometry of nature, the understanding of turbulent flow and bio-rhythms gave startling new results when revolutionary methods of analysis were applied. As a result, words such as "chaos", "order", "simple" and "complex" have been redefined; and a new concept formed: "fractal".

Ironically, it took the advent of the deterministic tool *par excellence* namely the computer, to cause many contemporary scientists to rethink the whole matter. With mathematical models they had been able to make accurate predictions of planetary motions and tides, for example. Everyone had thought that long-range weather prediction should also be possible; you just had to make much more calculations. In 1961 the meteorologist

Edward Lorenz managed to model the Earth's weather on a computer; one could follow recurrent "rain storms", or "cyclones", etc. Only there was a problem: if he started the program with slightly different initial conditions of wind speed and temperature, the artificial weather would be the same as in a previous run only in the beginning. After a while, the "weather" would diverge from the previous run, and eventually end up completely different! (See fig. 1.) To appreciate what this means, one must remember that the computer model was using proven physical laws of gas and water behaviour; and the computer ran completely deterministically with no additional input after it was started. With Lorenz dawned the idea that long-range forecasting was impossible. Small errors in measurements would multiply, cascading upwards in the scale of turbulence: from a puff of wind to continent-sized spirals. Lorenz called it the "Butterfly Effect"- theoretically, a butterfly stirring its wings in Peking could start a storm over New York the next month!

Lorenz later developed a more general mathematical model of fluid behaviour. It describes the flow of heated fluid, called convection. For example, when a pan of water is heated, the hotter water at the bottom tends to rise, because it is less dense. At the top of the pan it comes into contact with air which cools it off somewhat. Then the cooled denser water sinks back to the bottom of the pan. This circulation of fluid is called a convection cell, and remains smooth and orderly as long as the heat under the pan is moderate. However, if the heat is high, the water moves to fast to cool off very much; the convection cell breaks up and flow is turbulent, as portions of the water compete with each other to get to the top. Lorenz took the Navier-Stokes equation which describes fluid flow, and simplified it to get an equation to model convection, using three variables in non-linear relationship. (A linear relationship is where a change in one variable is mirrored by a proportional change in another variable: its graph is a straight line. A graph of a non-linear relationship, on the other hand, might show breaks, reversals, bends, etc.)

$$x_{new}=x+d*a*(y-x)$$
$$y_{new}=y+d*(x*(c-z)-y)$$
$$z_{new}=z+d*(x*y-b*z)$$

a, b, c and d are constants with the values 10, 8/3, 28, and .003 respectively. A new value is calculated for each variable, dependent on its previous value and the other variables in various proportions. A loop is set up by plugging the new values from a calculation into the variables for the previous state (e.g. $x=x_{new}$). Then we can run the calculations all over again. The change in values of the variables with time can be traced out in what's called a phase diagram (See fig. 2.) A point on the diagram represents the physical state of a system, actually in three dimensions. If a system heads toward a stable final state, its phase diagram would tend to localise to a point, called the attractor. For a periodic system, the phase diagram would tend to be a closed loop of some kind. Lorenz's model appears to be

chaotic, with a kind of infinite complexity; it has a *strange* attractor! The trace of the model loops endlessly without repeating or crossing itself, flipping unpredictably from one side to the other. It does remain within bounds, however, and is not random; a pattern emerges resembling butterfly wings. Indeed, a new kind of order was discovered which was to reveal itself in analysis of many different natural phenomena; order within chaos. Lorenz's work started the revolution which was, like his "Butterfly Effect" to spread to many fields outside of meteorology.

At this point I'd like to describe pieces of mine which use some of the ideas just described. **Harpsi-kord** for tape and harpsichordist was composed in 1988. In this piece the central idea is order within chaos. Compositionally, it swings between the poles: regular/irregular, loud/soft, atonal/harmonic, the use of timbre from an ancient instrument or electronically generated. The middle ground is sought for by transformations sometimes possible only through new techniques: 'samples' of harpsichord sounds were adapted electronically. Sometimes techniques were turned on themselves; having sampled a tone-cluster, it was available on each note of a synthesizer. Clusters of clusters were made. Similarly, rhythmic or melodic structures were nested in several layers at times. For example, one samples not a single tone, but a melodic motive, and loops it. By holding several keys with the same sample, one generates a polymetric texture, because the same loop at higher pitch plays faster, hence is shorter. One can sample this whole texture, and repeat the process, achieving very soon the limits of human perception regarding detail! The harpsichordist relates to the tape in a quasi-improvisational manner. Although the timing and pitch material is exactly notated, he/she is given considerable freedom in performance. For example, only the pitches were notated in a square, with the rhythm and ordering "randomly" improvised. (See fig. 3.) In this way a "feedback loop" is created; the improviser must use his/her ears and think fast in order to create a proper "dialogue" with the tape.

The next two pieces, **Shuffle** and **Fractal Piano 6** (both from 1988) were realised with the help of the "Vorsetzer". The Vorsetzer is a new form of pianola developed by the technicians of the Electronic Studio of the Sweelinck Conservatory, Amsterdam. It has 88 electromagnets mounted over the keys, which can be triggered with varied degrees of force by a computer. The obvious advantage of this system over the old method of punching out rolls of paper is the inherent flexibility and compactness of data storage with computers. In addition, the use of the computer offers new compositional possibilities.

To make **Shuffle**, an 88-note chromatic scale was produced and manipulated by a computer. The scale accelerates smoothly from relative note values of quarters in the lowest register to 32nds in the highest. It has a dynamic curve of p<f>p with the loudest part occurring in the middle of the piano. MIDI-data for each note is stored in three separate memory-allocations: for pitch, timing/length, and loudness. The data for some notes are

then "shuffled" around a bit by a computer program I made: the contents of two randomly chosen (but nearby) memory units for pitch, for example, are exchanged. Likewise, length or loudness data for a few other different pairs are exchanged. Then the memory-allocations are combined, and "performed" by the Vorsetzer: one hears a slightly flawed chromatic scale. The memory-allocations of this flawed scale are then subjected to the same process; data pairs are exchanged. Output is used for input for many cycles in a kind of feedback process. With each cycle, the scale becomes audibly more diffuse and irregular: notes migrate slowly away from their original position in the scale. The original perfectly ordered chromatic scale slowly "degenerates" into a "super-serial" shuffled mix. The final state is complex, and much dependent on the cumulative effect of many small random choices. In chaos theory, one would say that there is sensitive dependence to initial conditions. As such, **Shuffle** is a musical model of the butterfly effect. Here it should be added that it also resembles a 2-voiced canon in contrary motion: a descending chromatic scale enters with the 1st "shuffled" version of the ascending scale, and receives similar treatment.

Fractal Piano 6 is one of a series of studies in which a computer program I developed was used in combination with the Vorsetzer. The heart of this program is a mathematical model of population growth, first derived in 1845 by P. F. Verhulst. (It is often referred to as the logistic equation.) I'd like to describe it in some detail because although simple, it contains profound implications.

The Malthusian Model describes the unbounded growth of a population (of fruit flies, for example) with $x_{new}=a^*x$. This formula tells us that we can find the population of a new generation by multiplying the number in the last generation with a productivity factor. Suppose the population doubles each generation; then a=2, and starting with 2 parents, we'd get the series: 4 children, 8 grandchildren, 16 great-grand children, etc. It's easy to see that before many generations have been bred, we have a gigantic number. By the 10th generation that is 1024 siblings!

In order to make a more realistic model, Verhulst considered that in nature, the larger a population grows, the less productive it becomes, perhaps because of lack of food or other overpopulation problems. So in creating his (abstract) model, he says, let's set the upper limit of a population at 1. (Think of it as 100% of the room available for growth). Then the room left over by the environment for a new generation is 1-x. This can be seen as a correction factor to unbounded growth. The Verhulst Model for limited population growth then becomes: $x_{new}=a^*x^*(1-x)$. The population of a new generation is equal to the malthusian growth factor times the old population, and scaled down by the amount of room available for growth. In spite of its simplicity, it proves to be a fair model of what happens in nature. If the productivity factor a is 2, then starting the formula with a low seed value like 0.001, we see the population x rise and level off at 0.5. This is what we might expect in na-

ture with animals with a healthy productivity. After an initial period of fast growth, the population stabilizes.

If we set the productivity factor a to higher values, strange things happen. If a is 3.2, x grows rapidly at first, but then doesn't stabilize to one value; rather it alternates between two values endlessly. (See fig. 4a.) It doesn't matter what the seed value was, x ends up alternating between the same two values. If a is set a little bit larger than 3.4495, we find the values for x orbiting between four values eventually. Carefully increasing the value of a for still more trials, we find that the number of values that x seems to land on keeps bifurcating (to 8, and 16) until there is a value for a, 3.569946, just beyond which x fluctuates chaotically from one value to the next. Sometimes it bounces back and forth between a couple of values for a while, only to spin off again. (See fig. 4b.)

This type of chaotic behaviour is also observed in nature, for example by an animal with a productivity so high that it overreaches the ability of the environment to support it. The population crashes, only to build up again. The interesting thing about the model is that it does show a kind of regularity, with x-values jumping up and down, but it *never repeats itself exactly*. This simple, deterministic mathematical formula can be just as erratic as measurements of real populations in nature!

There are more mysteries lurking here. While searching for the exact values of a where the behaviour of the model changed-where x values would settle down eventually to one, two, four or eight values-the physicist Mitchell Feigenbaum recently discovered a constant ratio between the a values. Still more astonishing was the discovery that other quite different mathematical formulas (still using an output-input loop to calculate a new value from an old value), and also experimental data exploring the onset of turbulent flow, also showed the doublings, *and the same ratio between them*, 4.6692... In short, a new universal constant was discovered by Feigenbaum, like the constant of gravity, the speed of light, or the weight of an electron.

We're not yet finished with Verhulst's model. If a is increased to 3.83, the chaotic behaviour eventually stops, and x circles eventually between only three values. (See fig. 4c.) Increasing a in small amounts for new trials results in period doubling of the values where x eventually settles down to- 6,12; and again chaotic behaviour sets in, up to a=4. (See fig. 4d.) (We cannot set a to a number greater than 4, because that would produce x values greater than 1, or exceeding our original definition of the maximum population). With the help of a computer, a graph can be made of how Verhulst's formula behaves for all settings of the a value. (See fig. 4e.) We see the doublings of x at so called bifurcation points, followed by chaotic regions, then windows, where x again has a low number of stable values. We get a shock of recognition when we magnify the region where x splits up again; the whole pattern reveals itself in miniature! (See fig. 4f.) Indeed, it seems that the pattern contains

nested within itself, its own replica! This kind of nested pattern is now called a "fractal". The Polish-born mathematician Benoit Mandelbrot derived the term from the Latin adjective *fractus*, meaning irregular or broken. Fractals are characterised by intricately nested patterns within patterns, with self-similarity on any scale. Fractals can be recognised in a wide range of natural phenomena and shapes, such as trees and clouds. Analysis of Indonesian Gamelan music reveals fractal structure. (See fig. 5). The rhythmic punctuation fits a pattern based on the series 2,4,8,16, etc.; and the nuclear melody is performed simultaneously on several instruments at different speeds.

To compose **Fractal Piano 6,** values obtained from iteration of the Verhulst formula where encoded using non-linear mapping (with a partially "shuffled" scale, or with a selected or weighted element set) into pitches, lengths and loudnesses. This MIDI-data was edited with the help of a commercial sequencer program; stretched and squeezed time-wise, and layered in various ways, using "fractal" structures. For example, the on/off pattern shown in fig. 6 was used as a mask to create fragmented density in one part of the piece. Say the upper register of the piano turns on and off at intervals of 2 sec. When this register is "on", material is audible within this register. When it is "off", it is silent. In a register just under the highest one, the mask turns

with feedback processes. A neuron cell has a main body, an axon from which it receives signals, and treelike extensions called dendrites which branch off in hundreds to make contact with other cells. Connections between axons and dendrites are effected across gaps, called synapses. Neurons send out impulses spontaneously at a rate of about 10 per second. However, the rate of firing changes, and depends on the sum total number and strength of the impulses it receives. There are both excitatory and inhibitory synapses: signals from the former tend to increase the firing rate of a cell, while the latter tend to reduce the firing rate of a cell. The picture of ceaseless electrical activity; signals amplifying, muting, modulating, crossing each other, and returning in loops; all in incredibly complex and indecipherable wave-like patterns: this picture gives us an idea how thought and memory are possible. Recent investigation of the physiology of perception has led to the discovery of chaos in the brain: complex behaviour which seems random, but has a hidden order. Vast collections of neurons shift quickly from one complex pattern to another, in response to the smallest of inputs (remember the butterfly effect). An organism as a whole acts in its environment with feedback mechanisms. The brain seeks information, and sends signals to muscles to place sensory organs in position, and to sensitize parts of the brain which will process signals. A burst of collective patterned activity from all sensory

FIGURE 6 Combinational Scheme for Fractal Piano 6

on and off every 4 sec.; in a register just under it, every 8 sec.; and so on. By applying such a mask over the (potentially endless) chaotic material, I find a kind of musical tension is generated. Notice that the whole mask pattern produces all possible on/off combinations for the chosen number of registers. It is related to the I Ching, with its 64 possible combinations of 6 solid or broken lines.

Flocking animals co-ordinate in a remarkable and still incompletely understood fashion. The reaction time of a group in danger, or in making turns is considerably faster than the reaction time measured of isolated individuals. In order to maintain the proper distances between neighbours without collision, some sort of multi-sensory positive-negative feedback mechanism is in operation. Neural physiology has revealed that the massively interconnected neural network in the individual brain operates

organs is combined to form a gestalt. Then a fraction of a second later, another search for information is demanded.

It seems that chaos in the brain is not pathological, as one might expect; but instead is the basis of healthy functioning, indeed explains how the brain can respond quickly and flexibly to an ever-changing outside world. Even what we experience as a original idea (brain-storm) may be derived from a chaotic neural firing pattern triggered in an ever-widening cascade from a small initial impulse.

In my piece **Brain-Wave** for at least 3 recorders of any kind, (1989), I wanted to set up a self-regulating musical situation. All musicians improvise on the same basic material, which is arranged in four cycles, each with four events. (See fig. 7). Performers should stand or sit spread out around the hall, possi-

bly on different levels. Each player should face an arbitrarily chosen direction. Emphasis is placed on influences which performers take from their neighbours. Players(s) in front of an individual give positive influence, and player(s) in back give negative influence. Here is a table summarizing these influences:

Positive influence		Negative influence
If:	player(s) in front are playing,	player(s) in back are playing.
one may:	start to play.	stop playing.
	play louder.	play softer.
	play more repeats of an event.	stop, or go to next event.
	imitate style of other player(s).	play in a style opposite to other player(s).
	try to match the speed(s) of other player(s).	play fast when other player(s) are slow, and vice versa.

The object is not to synchronize exactly with the other players, but to correlate what a player does with what the others do. Since there is no conductor, each player must partly assume that function, being attentive to the ensemble sound, and taking initiative to lead that sound were he/she thinks it should go. The aim is to create an interactive situation such as is found in nature, among flocks of birds, or in brain neurons, for example.

In 1989 I completed **The Five Seasons** for 6 percussionists and tape. My inspiration source was an ancient Chinese theory, in which the Seasons, Emotions, Colors, Elements and Directions were grouped as follows:

Spring	Anger	Green	Wood	East
Summer	Joy	Red	Fire	South
Aftersummer	Sympathy	Yellow	Earth	Center
Fall	Grief	White	Metal	West
Winter	Fear	Black	Water	North

This piece incorporates several techniques which were derived from Chaos Science. My adaptation of the Verhulst Model was used to derive some of the rhythmic material for the piece, as in **Fractal Piano 6.** Fractal structures define the form of several sections. Some of the electronic sounds on the tape were made using feedback loops for frequency modulation. The performers are called on to improvise in one section. I'd like to go into more detail with this piece to show how these techniques work.

The first part, **Spring,** begins with accelerandos of accelerandos. First a pulse plan was worked out; the distance between pulses starts large, with successive pulses scaled by a ratio such as 2/3rds down to small (fast) intervals. Then an accelerating figure was fitted to each of the pulses. (A similar slowly accelerating roll is found in Chinese opera and Korean ceremonial music.) There are three layers, played by wood blocks, temple blocks, and log drum. (See fig. 8). Later on, a 16-note theme in quarter-notes is introduced in the bass marimba. The melodic curve of this theme is a projection of a fractal graphic design I made. Here a 4-note melodic motive is fitted or transposed into a blown-up version of itself (See fig. 9). Such nested patterns with scaled elements are characterdescribed. There follows a metric canon; the theme enters in eighth notes, then triplet eighths, and finally sixteenths. (See fig. 10). One can consider the whole construction as a fractal of a fractal, since the theme pattern (itself a fractal) occurs simultaneously at different speeds and octaves. After another metric canon and a section with controlled improvisation, this theme returns with a different treatment. It is split up into 4-note fragments, and given a peculiar "doubling": not parallelism, but an exaggeration of the melodic curve, using multiplication. Again, such "scaling" is a common method of constructing geometrical fractals (See fig. 11).

In the second part, **Summer,** a wiring scheme which includes two feedback loops was used for electronic FM synthesis: the output of any generator provides input control voltages for two other generators. In one loop, when the voltage output of a Low-Frequency-Oscillator (LFO) is high, it causes its neighbour LFO to oscillate at a higher rate. In the other loop, inverted signals are sent out: in this case a high output voltage of a LFO causes a lower rate of oscillation in a cross-connected LFO. The output of all LFO's was used to control other electronic devices, to synthesize a sound. Because of the interconnectedness, and the complex interaction of positive and negative feedback loops, the results of such a circuit can be unpredictable and chaotic.

The Summer is divided into four sections, each with a clearly defined instrumentation. Each section and all instruments have similar material rhythmically, generated from the Verhulst Model. There are different scaling factors applied to the material for different instruments playing together in an ensemble, controlling the relative densities of attack.

The third part, **Aftersummer**, uses an on/off masking scheme like that used in **Fractal Piano 6**. Here, not registers on the piano, but six different percussion timbres (all with a sharp decay) are "turned on or off". As in **Fractal Piano 6**, we get all 64 possible combinations of the six elements, and a kind of fractured crescendo. Rolls and repeated notes of various tempi, but always in decrescendo, provide "thematic" self-similarity. (See fig. 6 again.)

The fourth part, **Fall**, depicts musically the "Butterfly Effect", previously described. In the last measures of **Aftersummer**, all six players have finally come together. In the first measure of **Fall**, they play all together again (this time on metal instruments); and then disperse. Sometimes 2 or 3 players synchronize for a while, but small deviations lead to larger separations, and this part ends fragmented and scattered. Loosely spoken, this part is an inversion of how **Spring** begins: **Fall** contains a ritardando of ritardandos.

For the fifth and last part, **Winter**, I used a technique I call "nested repeats" to create the metric structure. Difficult for a human, perhaps, but a computer can easily carry out the following set of commands:

j+[h+[f+[d+[b+[a]+c]+e]+ g]+ i]+k
=jfhdbacbaebacbagfhdbacbaebacbak

Here, the [ ] signs indicate a simple repetition. [a]=aa, for example. The nesting of the repeats makes that a gets printed 32 times, **b** and **c** 16 times, **d** and **e** 8 times, **f** and **g** 4 times, **h** and **i** 2 times; and **j** and **k** get printed only once each. Whether you look at a small or large part of the list above, it displays the self-similarity typical of a fractal. For **Winter**, I desired a metrical structure with many changes but internally consistent. First I decided what was going to happen in each measure, in terms of instrumentation and so on, and then let the length in eighth-notes of a measure be determined by substituting the numbers 2-12 for a-k in the fractal pattern.

Modi-fications for large marimba and tape (1990) makes use of what I call "transposing modes". These are constructed like fractals, with an interval structure repeated indefinitely. For example, take the interval cell [1,4,2] (a semitone=1). Starting with a low E and repeating the cell, we get E,F,A,B,C,E,F#. Notice that because the elements of the cell add up to 7, two cells don't complete an octave, but overreach it. Indeed, we must repeat the cell 12 times before we get the same pitch-names. Playing "scales" up and down through this mode, we get continuous transposition through the cycle of fifths.

The ordering of much of the material in this piece was achieved with a computer program I worked out called "statistical feedback". A weighted random choice between a string of elements; only the order of preference among the elements is always changing, depending on previous choices. What it does is make a "chaotisation" of serialism. I have used this program on several different element sets in composing the marimba part as well as the tape part of this piece. Pitch, note length and dynamics; as well as larger structures: mode, section length, and electronic timbre; all material and forms are subject to *modification*.

In 1993 I made **Hyperion's Tumble** for tape, using computer algorithms. Observations of Hyperion, a small, irregularly-shaped moon of Saturn, provided some of the first evidence that celestial motion is not merely giant clockwork. With an eccentric orbit phase-locked in 3/4 ratio with Titan (Saturn's largest moon), Hyperion tumbles end-over-end in sometimes periodic, sometimes chaotic fashion, subtly influenced by gravitational forces.

Newton had solved the problem of 2 bodies interacting gravitationally: depending on their energy and mass, they move in perfect curves: a circle, ellipse, parabola or hyperbola. The problem of 3 bodies interacting gravitationally has proved to be surprisingly difficult, and mathematician Henri Poincaré has shown that in the long term, their motion can only be approximated, and is in essence unpredictable. He invented a method to visualise the complicated behaviour of such a system, now called a Poincaré map. A 2-dimensional slice of a three-dimensional phase space will show either one or a few points if the system is periodic, and a complicated figure if it is chaotic. An object with a chaotic phase space might have a degenerate or unstable orbit, causing it to crash into another body, or fly off into infinite space. Close examination of these figures, called strange attractors, proves that they are fractals. Curves are folded into themselves, with infinite regress: increasing magnification shows evermore detail, but with recurring proportional patterns (see fig. 12).

French astronomer Michel Hénon has also demonstrated the theoretical possibility of chaos in the cosmos, when he modelled stellar orbits in galaxies, with the computer. Depending on how the model was set up, stellar orbits would show different behaviours: at low energy levels, orbits were regular ellipses. Higher energy levels gave more complicated orbits, which never exactly repeated themselves, and beyond a certain energy level, the orbits became unstable and unpredictable. He wrote a simple equation to explore the folding and remapping of an oval onto itself, which produces an archetype of strange attractors (see fig. 13).

$$x_{new}=y+1-1.4*x^2$$
$$y_{new}=0.3*x$$

Blowing up a strand of the attractor reveals tiny strands within it, spaced from each other in the same ratios as the parent strands.

Two computer programs I wrote based on chaos theory enabled me to generate volt-age fluctuations for synthesis. A formula discovered by Barry Martin generates chaotic orbits, two-dimensional plots of which resemble organic structures such as cells under a microscope (see fig. 14).

$$x_{new}=y-SQRT(ABS(b*x-c))*SIGN(x)$$
$$y_{new}=a-x$$

Different initial values for the constants a,b, & c result in different patterns and periodicities.

I call the second program the "Baker function". A string of integers is folded into itself recursively, mixing the integers completely. However there are strange periodicities occurring, and eventually the original string mysteriously re-occurs. For example, imagine picking up the integer-string in the first row, below, by the middle. You have the '5' between your fingers, and two ends dangle below. Read off the numbers, starting at your fingers and alternating between the string ends as you move down, to get the second row. Repeat the process to generate the other rows. This process is similar to the one a baker uses to mix dough: flatten with a rolling pin, fold over a half, flatten again, fold again, etc.

1	2	3	4	5	6	7	8	9
5	6	4	7	3	8	2	9	1
3	8	7	2	4	9	6	1	5
4	9	2	6	7	1	8	5	3
7	1	6	8	2	5	9	3	4
2	5	8	9	6	3	1	4	7
6	3	9	1	8	4	5	7	2
8	4	1	5	9	7	3	2	6
9	7	5	3	1	2	4	6	8
1	2	3	4	5	6	7	8	9

Irregular motoric sounds resulted from the transcription of the output of these algorithms. A chaotic sound lies in a spectrum between a sinus-tone, which is perfectly periodic, and white noise, which is perfectly aperiodic. It can have a maximum of complexity, always producing more detail, or information, within certain limits. In principle, computer chaos can be used to model on any level, from musical structure to musical sound.

What holds our attention in listening to music? Music from Bach to Bartók, Josquin to Xenakis, from Bali to Bolivia has some special kind of pattern which hovers in a phase space between repetition and randomness, between association and breaking-away, between order and chaos. Does a *strange attractor* underlie a piece which gives us a feeling of anticipation & resolution, of simplicity within complexity? Do its patterns show resemblance to the fractal geometry identified in nature? Does the new definition of chaos- that dynamics can be paradoxically both deterministic and unpredictable- help us understand how a particular sequence of sounds gives us the feeling both of inevitability and surprise? Perhaps composers as well as scientists may do well to take a new look at Chaos.

© David Clark Little 1995
(June 2)
C. Springerstr. 14-2
LJ 1073 Amsterdam
Netherlands

References

Dewdney, A. K.: Wallpaper for the Mind; Computer Recreations, September 1986 Scientific American
Freeman, Walter J.: The Physiology of Perception, February 1991 Scientific American
Gleich, James: Chaos, Making a New Science; 1987 Viking
Hawking, Stephen W.: A Brief History of Time; 1988 Bantam Books
Hofstadter, Douglas R.: Godel, Escher, Bach; 1980 Vintage Books
Hofstadter, Douglas R.: Metamagical Themas (Mathematical Chaos and Strange Attractors); November 1981 Scientific American, and 1987 Penguin Books
Jones, Jesse: Fractals for the Macintosh; 1993 the Waite Group, Inc.
Lauwerier, Hans: Fractals; 1987 Aramith
Mandelbrot, Benoit: The Fractal Geometry Of Nature; 1983 W. H. Freeman and Company
Manzolli, Jonatas: FracWave Sound Synthesis; (unpublished paper)
Peterson, Ivars: Newton's Clock, Chaos in the Solar System; 1993 W. H. Freeman and Company
Prigogine, Ilya: Order out of Chaos; 1985 Fontana Paperbacks
Russell, Peter: The Brain Book; 1979 Routledge
Stewert, Ian: Does God Play Dice? The Mathematics of Chaos; 1989 Basil Blackwell Ltd.
Watson, Lyall: The Dreams of Dragons; 1987 Morrow, New York

MACHINES À PEINDRE ET INFORMATIQUE PICTURALE

IRONIE DE L'ART DIGITAL ?

Par Jean Paul Longavesne

In all the arts there is a physical component.
Paul Valery, Aesthetics, 1934

R ésumé

Après un rappel historique de l'idée de l' art par ordinateur, l'auteur envisage le retour du signe plastique au travers des immatériaux (oeuvres numériques, principalement).

Le développement des réseaux de communications, l'hypermédiatisation de notre société, ainsi que l' envahissement de l'espace électromagnétique par les images, sons, fax, vidéos, données de toutes sortes, l'hybridation du numérique et de l'analogique, génère des espaces virtuels où les artistes se trouvent investi du pouvoir de l'ommniprésence.

L'auteur pose alors la question de la représentation: Espaces mémoires, espaces écrans, espaces de représentations, comme supports des images, rejoignant les préoccupations du groupe Supports/Surfaces des années 70, débouchant sur le concept de simulacre, entendu comme construction artificielle dépourvue de modèle original.

L'art a perdu son caractère d'évidence, il est évident que tout ce qui concerne l'art, tant en lui même que dans sa relation au tout, ne va plus de soi, même son droit à l'existence
- Adorno T.W

Et le peintre en somme ne dit rien, il se tait, et je préfère encore cela
- Vincent Van Gogh

INTRODUCTION

Il ne va pas de soi dans une manifestation portant sur les arts électroniques de parler peinture, le terme nous apparaissant tant désuet, à telle enseigne que la revue Art Presse consacre en Octobre 95 un numéro spécial sur la peinture sous le titre générique : "Où est passée la Peinture ? "

Cette interrogation est-elle pertinente à ce point, pour que des artistes et critiques contemporains interpellent la nature de l'art ?. Le sociologue et artiste Hervé Fischer affirme que l'art est mort, nous préférons penser que l'art se régénère au bain de jouvence que lui offrent toutes ces nouvelles technologies en recherche d'accouplements prolifiques. Il me semble que si l'art a beaucoup à gagner à se consacrer à l' étude des formes(ce qui
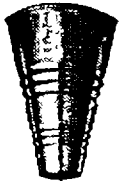
a été le cas des années avant 1970) il devrait profondément s'enrichir en faisant porter son questionnement sur le geste, attitudes, écritures, espaces de représentations et langages comme l'exposition : *"Quand les attitudes deviennent formes "* produite en 1969 a préfiguré des développements auxquels nous assistons dans les domaines de la création numérique par l'usage et le contrôle des robots.

HISTORIQUE

Si l'idée de l'art par ordinateur est apparue en Europe et aux U.S.A dans les années 60. Le terme est général, il couvre l'utilisation créative d'ordinateurs dans les formes artistiques, allant de la sculpture interactive à l'art des télécommunications en passant par les travaux vidéos graphiques et conceptuels.On peut situer la prise de conscience de l'impact des nouvelles technologies sur les arts à l'occasion du festival SIGMA de Bordeaux en 1965, festival où les interventions de Michel Philippot sur les musiques expérimentales, de Nicolas Schoeffer sur l'art et la cybernétique, les travaux de Michel Ragon sur " *Prospective et Architecture* " ainsi que les réflexions théoriques et conceptuelles d'Abraham Moles sur " *l'impact de la technologie sur l'art et la pensée contemporaine* " (1) ont marqué toute une génération d'artistes intéressés à l'expérimentation.La même année eut lieu la première exposition de Mec ART (Art Mécanique) à la Galerie J.,sous le titre : "Hommage à Nicéphore Niépce, réunissant NIKOS, Bertini, Béguier, Pol Bury, Rotella et Jacquet.Cette tendance prenant les technologies comme outils d'aide à la création, supports de création ou encore sujets de la création, utilisant le report photographique sur la toile comme A.Warhol, s'inscrit dans la lignée des Muybridge, Balla, Delaunay, Eggeling, Richter, Noholy ou EAT (Experiments in Art and Technology) fondé par Robert Rauschenberg, Billy Klüver et le M.I.T.

Depuis les années 70, le développement de la création artistique numérique par les objets qu'elle initie nous plonge dans une problématique quelque peu différente, puisqu'elle élargit le champ de la création aux télécommunications. A cet égard la *"machine à gazouiller"* de Paul KLEE toile peinte en 1922 donne toute la mesure de la sensibilité de l'artiste mais aussi de son détachement ironique face à un monde dont il préssent déjà les changements profonds.

L'apparition des immatériaux dans les années 80 a pris une multitude de formes nouvelles, altérant progressivement la notion de réalité, les modèles conceptuels remplaçant les modèles physiques et cela n'est pas sans rapport avec la reconnaissance de l'art vidéo comme forme d'expression et de création, car l'image même de l'art vidéo est douteuse, ne serait-ce-que matériellement et comme issue de la télévision, elle se trouve en situation de reprise, de transformation et de mise en circulation par rapport à tous les autres arts : peinture, sculpture, architecture, musique, cinéma, littérature.

Cette disparition progressive de la matière avec la diffusion de plus en plus large du support vidéo, qui fournit non seulement une, mais des images mobiles, colorées, institue la suprématie du code audio-visuel sur les autres codes sensuels comme celui du tactile et de l'odorat. Déjà Marshall McLuhan en présentait l'importance, privilégiant le tactile par rapport au visuel, il rêve de la création par la technologie. Visionnaire, il écrit à une époque ou l'effet de vastes changements commence à se faire sentir. À l'heure actuelle nous avons une idée beaucoup plus claire de la direction dans laquelle mène ces technologies médiatiques au fur et à mesure que les technologies numériques de la production et de la reproduction de l'image commencent à émerger. L'ordinateur avec sa capacité de manipulation, de simulation, de communication, devient partie d'un ensemble, un mixte de vieilles et nouvelles technologies, de cybernétique et d'informatique, de synthèse et de virtualité. L'image calculée, l'image de synthèse ou la nouvelle image s'infiltre au sein de l'image captée par la caméra. Le calcul, la logique mathématique, le concept scientifique pénètrent imperceptiblement l'image optique, l'informatique fusionne avec la vidéo.

Ainsi si l'histoire des arts électroniques dans sa phase initiale infographique montre que le support vidéo comme espace de représentation a engagé la création plastique sur des chemins où le concept *"immatériaux "* des années 80 a pris une multitude de formes nouvelles, altérant progressivement la notion de réalité en instituant la suprématie du langage, il n'en demeure pas moins vrai que la problématique du rapport de l'oeuvre à la matière, au support se pose de plus en plus.

LE RETOUR DU SIGNE PLASTIQUE

Jusqu'à présent, hormis des exceptions mineures, les travaux de Ken GOLDBERG de l'UCS, les recherches plastiques de Harold COHEN à San Diego, de Roman VEROSTKO ou ceux que nous développons en France au sein du GRIP, la problématique de la traduction des composantes plastiques d'une oeuvre à été largement ignorée dans l'art numérique.Il s'ensuit que bien souvent l'art informatique est plus proche de la photographie ou de la vidéo que de la peinture ou de la sculpture où la variable tactile est dominante, d'autant que l'hybridation de l' art vidéo avec le numérique et les télécommunications renforce le processus de dématérialisation de l'oeuvre par le développement de l'art médiatique. Ce n'est pas un simple épiphénomène si les plasticiens se tournent vers l'utilisation de supports facilement reproductibles comme la photo, la vidéo et l'image numérique, car plus aisément diffusables et consommables. Cette insertion de l'artiste dans le champ de la communication préfigure d'un art médiatique dans lequel l'ambivalence du caractère immatériel et matériel de leurs oeuvres (dématérialisation de l'objet par la numérisation), matérialisation par l'usage des interfaces robotiques, l'abolition des contraintes d'assignation de lieu par sa mise en réseaux, leur permettent d'utiliser une multitude de canaux de circulation et de productions d'oeuvres plastiques .

Les images qui défilent sur l'écran de TV, toutes ces images enregistrées dans des mémoires abstraites, les disquettes, les bandes vidéos, les banques de données, définissent de plus en plus largement le champ de la réalité...Les développements dans ce domaine annoncent plus que des changements de surface ou des réaménagements partiels. Les formes d'arts parallèles, la peinture ou la sculpture entre autres sont inexorablement amenées à se redéfinir et éventuellement, à prendre d'autres directions en fonction des déplacements qu'occasionnent ces nouvelles expériences artistiques. Certains comme Bruce Fergusson parlent de l'insuffisance de l'étiquette art visuel pour qualifier ces pratiques qui engagent de plus en plus fréquemment le spectateur participant, à intervenir.

L'histoire de la peinture a été marquée par des innovations techniques tant au niveau des pigments que des techniques d'application et de préparation des supports. On a beaucoup parlé de la peinture à l'huile en tube et de son influence sur le travail des impressionnistes, de l'acrylique, des différents medium, du rôle des supports, toiles, bois, plâtre, brique, peau...des outils d'applications, de la main aux corps de Klein, aux batons de Pollock en passant par les brosses et le souffle. Ce n'est pas le hasard ni de simples considérations technologiques qui font de la toile un support privilégié pour l'expression picturale.Si le moniteur TV renvoie à l'univers technologique, la toile renvoie à l'univers des arts légitimes pour lesquels la texture, le grain,le support, la matière, et les traitements de surfaces sont autant de degrés de liberté laissés à la disposition du peintre. Les effets qui en résultent s'ordonnent autour de la matière, alors qu'à l'opposé, un résultat lisse (écran télé, icône sous verre, papier photo glacé, etc...) affirment la prééminence du plan support, donc de la bidimensionalité et l'absence de texture.

Le développement depuis le début des années 90 des systèmes de reproduction, production d'oeuvres numériques sur des supports matériels (imprimantes, photocopieurs, fax, machines à peindre, à sculpter) annonce le retour du signe plastique.

Dans ce nouveau contexte d'opposition et d'hybridation entre le visuel et le tactile, l'informatique picturale exprime les tensions liant l'analogique au numérique, la trace comme élément plastique, mémoire analogique à la mémoire numérique, l'espace pictural de la représentation aux espaces mémoires des bases de données, des réseaux multiprotéiformes, où l'image picturale oscille entre une substance langage et une substance forme et où le textural et le pictural reprennent toutes leurs forces expressives.J'aimerais à cette occasion faire une distinction entre le pictural et le textural. Le pictural concerne une image strictement à 2 dimensions et saisie visuellement,le textural concerne une image où est présente la 3ème dimension. La texture propose des impressions tactiles, ces impressions tactiles allant dans le sens de l'illusion réaliste comme approche du réel manipulable par la proprioception, ce qui caractérise le signe pastique ou iconique.

Avec les arts médiatiques, le fondement imaginaire de l'accès au réel est accentué à cause de ces supports mêmes sur lesquels aucune image ne saurait se fixer.Le développement de machines indépendantes aptes à l'apprentissage, pouvant négocier des stratégies de production, reproduction fonction des stimuli numériques reçus, réagissant aux créateurs délocalisés pose le problème de la nature et du sens donné à la représentation figurative ou non. Les machines et les images virtuelles, tout comme les espaces dans lesquels elles s'inscrivent, sont elles mêmes des acteurs, des agents de création car dotés de mémoire, donc d'une histoire.Elles disposent de fonctions de traitement de l'information qui leur confère une autonomie.Chaque machine, réelle ou virtuelle, chacune des métaphores, hyper-images pour reprendre cette expression de P.Quéau assimilable à un système expert, possédant ses propres règles de comportement, les applique en les adaptant aux changements de l'environnement virtuel. *"Les images savent maintenant qu'on les regarde....elles sont responsables "*(Richard Bolt).

Dans ce nouvel espace riche de données picturales, stylistiques, de paramètres plastiques on peut imaginer la création d'une toile à partir des gestuelles des créateurs mis en réseau par analogie au projet d'un système de contrôle d'un orchestre électronique comme celui développé à l'université de Waseda au japon pour l'interprétation du concerto N°1 de Tchaïkovsky pour piano et Orchestre avec pianiste humain et orchestre de synthèse dirigé par le chef d'orchestre s'adaptant au tempo du soliste virtuel .L'hyper image généralise le concept d'image de même que l'hyper-texte introduite par T.Nelson généralisait celle de texte.L'hyper-image est multiforme puisqu'à la fois données brutes, structures, représentations.Dans l'art occidental, la structure ou la forme ont toujours été à la base de l'art pictural, le tableau est généralement conçu pour être vu dans un cadre ou par une fenêtre, et donc amené vers le spectateur, contrairement aux images orientales qui n'existent réellement que dans l'esprit ou dans l'âme, et par conséquent projetée ou réfléchie dans l'espace...L'icône indienne ou d'extrême-Orient, sculptée ou peinte, n'est ni une image mémoire ni une idéalisation mais un symbolisme visuel, idéal au sens mathématique...Là où l'art européen dépeint naturellement un moment, une action déterminée ou un effet de lumière, l'art oriental représente la continuité.En termes européens traditionnels, on dirait que l'art moderne européen tente de représenter les choses comme elles sont en elles-mêmes, l'art asiatique et l'art chrétien de les représenter plus près de ce qu'elles sont en Dieu, ou plus près de leur source " (A.K Coomaraswamy). Dans l'image informatique picturale, le réalisme , la réalité de l'image perd son sens car le numérique et la technologie software sont holistiques; ils se pensent en termes de structure globale.L'espace des données est fluide et temporel, la hardcopy (copie d'écran) tout ce qu'il y a de plus réel. La peinture issue de l'informatique picturale devient alors une expérience d'espaces changeants, espaces de représentation, espaces mémoires ou des données, espaces de communication..Il n'y a pas un espace de représentations, mais deux, trois, une

multitude d'espaces, comme le montrent Van Gogh dans ses deux autoportraits à l'oreille coupée vers la fin du mois de janvier 1889: les tableaux de Londres et de Chicago, les toiles de Cézanne (cathédrales de Chartres), les toiles de Turner sur Venise.De même la numérisation de l'information comme dans les objets plus de Pierre Restany et leurs présentations informationnelles par B.Demiaux met en évidence les deux espaces, celui de la représentation et celui de la mémoire circulante. L'information de base (le document photographique descriptif) est numérisée en entrée du logiciel, puis elle est stockée en mémoire, et enfin imprimée à partir de son état de mémoire. La numérisation de l'information s'effectue dans la mémoire image de l'ordinateur, espace des données numériques, de façon directe, brute, sans ajouts ni retraits, à la manière de Warhol traitant le report photographique sur toile.Les présentations informationnelles de B.Demiaux nous restituent l'image mémorisée à travers les alternances de trame numérique 0/1 . L'alphabet binaire pour reprendre P. Restany *permet ainsi de dégager une mémoire seconde dans la mémoire de l'objet et c'est cette mémoire seconde qui est l'authentique contenu de l'objet -plus informationnel -* " Nu couché les bras ouverts ", toile informatique de 3m x 2m créé à partir de 1cm² de toile autour du nombril du "Nu couché, les bras ouverts " 1917 - 60 x 92 cm de A. Modigliani est la projection sur support toile par l'intermédiaire de la machine à peindre de l'espace des données ou espace mémoire dans l'espace figuratif ou espace de représentation.Les deux images fixes, celle originelle de A.Modigliani et celle produite par les Quarks ne sont pas du même ordre. La peinture relève de l'icône alors que la photo qui relève de l'indice est sujet, prétexte à la création picturale. C'est plus exactement un compromis entre création et re-production, ré-création, mise en forme d'empreintes quasi immatérielles, sans épaisseur, déposées régulièrement sur un support.

L'informatique picturale par les nouveaux espaces d'expression, de participation et de créations qu'elle met à disposition des artistes permet d'élargir le champ de la création, le situant entre Réel, Virtuel et Imaginaire.

Ce nouvel espace d'actualisation du virtuel numérique liant le caché au visible est l' équivalent de l' espace analogique du Groupe "Supports Surfaces" où Buraglio et son travail sur les calques agrafés nous montre la duplicité de l'image, ce recto verso de l'image, de l'image et de son double.De même, le travail de Y.Klein, artiste du nouveau réalisme, nous montre l'importance de l'empreinte comme élément de création, mémoire du geste qui affirme la volonté de l'artiste à " peindre l'immatériel ". Ces empreintes toujours identiques chez Viallat sont autant de couper / coller, de va et vient dans cet espace hybride qui est celui de la représentation numérique, car cette réalité là, celle que l'on voit a son corollaire dans l'espace des données, riche de réalités potentielles.

Les préoccupations des artistes du GRIP sont celles certes du Groupe Supports Surfaces, préoccupations que le groupe tente de réactualiser, mais aussi celles de TINGUELY, B.VIOLA et N.June PAÎK pour lequel ils reprennent le terme de *"quincaillerie numérique"* appliquée à leur machine à peindre développée en 1987. Ils s'associent ainsi aux travaux d'artistes et ingénieurs américains, Harold COHEN et son système Aaron de simulation picturale, Kenneth GOLDBERG de l'USC, Timothy ANDERSON du M.I.T avec Van GO GO I et Van GO GO II et Roman VEROSTKO.

La machine à peindre du GRIP fut présentée pour la première fois durant 3 mois en 1992 au Québec à Montréal pour Images du Futur à la cité des arts et nouvelles technologies à l'occasion d'une exposition collective sur le thème : Californie Mythe ou Réalité !. A cette occasion, elle produisit un grand nombre de toiles à partir d'une installation Vidéo audio visuelle *Vidéos Vagues.* plage de sable de 100 m² parsemée de moniteurs vidéos à partir desquels les images mouvements de la mer sont figées par acquisition numérique puis reprises par la machine à peindre qui les expriment sur un support de grandes dimensions (3m x 4m) à raison d'une production de toile en 10 heures de projection de peintures dont tous les paramètres teintes, valeurs, densités, impacts, traces sont contrôlés par le robot."*De l'informatique Picturale à la mer, il n'y a qu'un pas, celui qui nous permet de fouler la plage de sable où naissent et meurent les vagues sans cesse renouvelées, instants fugitifs que la machine à peindre dans la régularité logicielle, inexorable de son mouvement tend à figer par des projections de peintures qui sont autant d'éléments d'informations distribuées gouttes à gouttes dans un environnement de rytmes et pulsations sonores.La toile plage où se cristallisent toutes les données informationnelles est ici le lieu d'expression des QUARKS, clin d'oeil donné aux iconoclastes, les invitant à une redécouverte de l'image et de sa représentation par sa mise en Peinture " en direct "à partir des créations originales d'artistes ".*

Cet événement fut repris en france le 31 octobre 1992 lors de TELENOIA : création picturale en réseau à l'occasion de l'halloween.Toutes ces expériences de créations de peintures en direct nous montrent que ces machines répondent à une demande pressante de plasticiens pour s'approprier de nouveaux espaces, non seulement conceptuels, ceux des immatériaux des années 85 mais aussi ceux multiformes des espaces virtuels des années 90 issus de l'informatique.Ces nouvelles machines poursuivant leurs mutations, dans la lignée des machines mécaniques de Léonard de Vinci,Pascal, Balla, Akira Kanayama, celles électromécaniques de Takis et Tinguely ou celles vidéo-électroniques de Nam June Paik, s'inscrivent dans l'histoire de l'art.

Néanmoins si toutes ces machines à peindre faites de mécanique et de numérique véhiculent leur propre dérision et ironie face à l'acte créateur, le digital véhicule également sa propre ironie par l'emprunt qu'il fait quotidiennement aux in-

terfaces sensorielles, cherchant à s'incorporer pour retrouver sa plasticité formelle initiale issue de l'analogique empreinte de gestualités.

Comme pour Michel Serres pour qui l'histoire des sciences et des techniques avance en reculant vers ses origines, plus le digital se répand et mieux il cherche à s'exprimer par incarnation.Loin de se débarasser des mythes, des archaïsmes, des désirs et des pulsions, le digital les reconduit en s'insérant au plus profond de la chair, reconstituant les mémoires des corps au plus près des sens, celui de la tactilité par où il commença sa genèse tout enfant qu'il fut sur les bancs de l'école lors de l' apprentissage du calcul car des doigts il naquit au plus près du toucher.

S'approprier les sens par le biais des réseaux pourrait être l'un des enjeux du 21éme siècle comme la dernière exposition des Quarks du GRIP en août 1995 lors du Siggraph de Los Angelès où en collaboration de Mrs G.SMOOT et Jon AYMON du Laboratoire Lawrence de l'Université Californienne de Berkeley (San Francisco), les QUARKS du GRIP réalisèrent en directe à partir des données transmises par le satellite COBE et véhiculées par le réseau Internet: BIG BANG I, toile informatique de grandes dimensions.

Désormais la genèse des espaces virtuels, cyberspaces associés à la télévirtualité, permet de partager non seulement les métaphores individuelles ou collectives, mais également de partager de nouveaux espaces de création, véritable espaces de ré-création où les machines à peindre, datas gloves, casques, exo-squelettes, toutes ces interfaces, prothèsiques réinjectent du sens, les sens par la maîtrise du tactile source et finalité d'expression.

Manifeste du GRIP

The limits of my language are the limits of my world.
-Ludwig Wittgenstein

Le GRIP revendique l'autonomie de la création, en pratiquant une peinture collective en direct, sur les lieux d'expositions, délocalisée ou non par l'intermédiaire des réseaux numériques tel les réseaux Earn, fax, numéris, visiophone, minitel, Picturetel.........
Leur signature des " Quarks " (particules colorées élémentaires de la physique des particules) est collective comme l'était celle de COBRA.
Leurs pratiques s'expriment par une remise en question :

1°) Des moyens picturaux traditionnels:
Diversité des techniques d'applications de la Couleur et du geste: Application des colorants savamment dosée par l'outil informatique, uniformité gestuelle et régularité logicielle de la projection, délocalisation de la création par l'usage des réseaux de communication type Numéris ou autres).Ces pratiques sous-tendent la prise en compte des rapports qu'entretient l'espace mémoire informatique des données/Espace Pictural de la représentation où les champs, formats, supports, limites, environnement, sont autant de paramètres laissés à notre disposition.

2°) Du support:
Travail sur la toile libre, hors champ d'expression, par l'insertion de la " quincaillerie informatique" dans l'espace des galeries, des musées par la création d'une peinture en direct dans un esprit proche de Nam June Païk de Tinguely et du groupe Supports / Surfaces

3°) De l'artiste en tant qu'individu:
Cristallisation d'une époque, d'une culture, d'un ensemble de composantes sociales, économiques et technologiques où la création délocalisée par l'usage des réseaux de communication permet d'envisager une création collective.

QUARKS signataire des oeuvres produites est un individu à part entière participant de la création.

Fait à Paris le 10 Novembre 1986

ORGANIZED INNOCENCE AND WAR IN THE NEW EUROPE:

ON ELECTRONIC SOLITUDE AND INDEPENDENT MEDIA

Adilkno's analysis of late 20th century European Media Culture

By Geert Lovink

geert@xs4all.nl

N ietzsche would be laughing about Europe. He wouldn't be complaining about the impending loss of national identity or the power of the Brussels bureaucracy. He would look down disdainfully at the bumbling, pompous Euro-citizens who, confused and without Witz or Idea, are trying to side-step their own history. Europeans have the greatest difficulty putting into words the current dialectic of construction and demolition which manifests itself around them. The last intellectuals are still doing their best to characterize the post-1989 juncture, but they are not succeeding. The amalgam of the war in former Yugoslavia, the strange new media, capitalism without an enemy, the Tigers in Asia, grassroots neo-liberalism, the Shell's oil platform The Brent Spar and French nuclear tests, foreigners and refugees, the devastation of Chechnya — it's all impossible to grasp anymore. One group believes it's arrived in the 21st century, as others are catapulted back a couple of centuries. What one sees as progress spells sheer destruction for another. We observe developments with worry, but can no longer associate them with conclusions. But that's no longer necessary, for what occupies Europeans. most of all is the development of one's own lifestyle. And no one is laughing at the little worries of the middle classes.

In my talk at ISEA 94 I introduced the work of "Adilkno," the Dutch group I belong to. Adilkno, the Foundation for the Advancement of Illegal Knowledge, is an association of non-academic theorists who bumped into each other in the early eighties, in what were then the autonomist movements. In 1994 a first English translation appeared: Cracking the Movement (Autonomedia, New York 1994) — a book about the Amsterdam squatters' movement and their dealings with the media. Although Adilkno has been writing about the media since 1984, this theme has become increasingly important since 1989. The result is the book whose working title is The Media Archive. After five years of devoting ourselves with great pleasure and abandon to speculative media theory and potential media figures such as the data dandy, lately we act as if the media have lost their dynamism. To begin with, the introductory phase, "the short summer of the media", now lies behind us. The commercialization of the new

media brings with it a relapse into old, familiar patterns. The rapid expansion of the info-universe leads to an implosion of the power of imagination. The media are once again "the others."

While hordes of young business people lap up the "digital revolution" and chase visions of a utopian world full of communication, the cultural situation in fact looks very different. Apart from the aggressive information elite (Arthur Kroker's "virtual class"), the intellectual climate has taken on a defensive character. People are preparing for "Cold War II," (or Jeltzin's "Cold Peace") and secretly looking forward to a new period of stability. They are prepared to accept its accompanying stagnation as part of the bargain. In retrospect, 1989 turns out not to have been a moment of liberation. For Westerners, Glasnost ultimately became synonymous with the deadly radioactive cloud of Chernobyl, solely out to destroy the health of Western Europeans. At the fall of the Berlin Wall, emotions were conspicuously scarce. Skepticism and disbelief prevailed, and the Eastern neighbors met with a cool reception. Romanians' certainty in early 1990 that everything would stay the same could not be refuted, and is now generally accepted, even in the West. The old officers returned to the political stage as neo-communists, nationalists or Thatcherites. Their transformation caused decreased income, the breakdown of social services, unemployment, radical privatization to the point of simple robbery, war, genocide and hatred. What is going on in the East in an extreme form (and at an increased speed) is happening on a similar scale in Western Europe too. But it is not resulting in resistance or protest. An anti-war movement, as in the Vietnam era, a solidarity movement like the one for Nicaragua, or a peace movement like the one against nuclear weapons in the early eighties, once again seem light-years removed from us, thus unimaginable. In a strictly medial sense, Western citizens remain observers, letting in information from the Wild East according to a varacious ecological media appetite, so as not to be further numbed. Even the viewers see themselves as victims— if not of events, of information, which has been set before them every day for years. Everyone is in the race for the most-favored-victim status.

In Adilkno's recent writings, the concept of media is no longer used as a dumpster where all fantasies are deposited and retrieved. We now see media more as a part of broader cultural phenomena, like tourism, shopping, sport, commerce and sex. For Europeans the abstract media sphere is not merely a consumable product. Though the ideology of the market is raging, the media remain part of a metaphysical terrain, where Western 'culture' is thought to be located. However, in contrast to the (still?) open concept of 'media', which (if we follow Kittler) has mainly a technical connotation, the concept of "culture" plays a crucial role in the dominant ideology of the West, which is gaining in importance, and in which rightist-elitist notions are mainstreamed into a collision of tele-evangelism and tele-communion. The West German pop theorist Mark Terkessidis,

formerly of the monthly SPEX, shows in his book Kulturkampf (Cultural Struggles, Cologne 1995) that the oft-cited "swing to the right" is playing out mainly in the sphere of "culture." According to media-makers and intellectuals, social conflicts are determined no longer economically or ideologically, but culturally. As in American conservative Samuel Huntington's The Clash of Civilizations (1993), the West must defend itself as a "minority." The supposed "cultural hegemony" of the left-liberal '68 generation in the media, in schools and in universities must be broken, especially in the area of (national) culture. There is a harkening back, says Terkessidis, to the late 18th century German romantic Herder, who defined culture in defensive terms, as an ethnic identity which only really fulfills itself in the exclusion of others. As blacks rediscover their own culture, Europeans must rediscover their "Eurocentrism." "The ideology of culture," with its "blend of symbolization, lifestyle and ethnicity, offers the perfect paradigm for exclusion." And that is what "purified ethnocentrism" seeks: protection from Third World refugees, immigrants, Islam, and last but not least, the first full-scale war in Europe since 1945, in which everything revolves around the definition of ethnicity. Terkessides sees it as a mistake to consider culture as an issue of power, as was done in the seventies and eighties. He even suspects a "deal" between the establishment and its erstwhile critics: "If you'll let us govern in peace and stop bringing up the power question, then you can have culture." The result of this transformation of politics into cultural lifestyles was that "cultures" were no longer seen in their social context.

Even "subversion" and "autonomy" ran aground in the early nineties. The strategy of "confusion, ambiguity and spectacle" still works, but political content is no longer discernible in it, as is the case with techno, ambient and jungle. "Independent" thought has ended in "self-satisfaction, stripped of any consequence." Postmodern strategies of difference, heterogeneity and complexity resulted in a "transformation of culture, of which one no longer knows what direction it is taking."

Behind slogans like "Not right, not left, just culture," Terkessides sees a very nearly fascist weltanschauung lurking, and reconstructs its intellectual history. He considers it necessary to place contemporary media culture in a "materialistic perspective," so that struggles on the terrain of culture, in music, multimedia, computer networks, and so on, are again placed in a social, political and economic context, without relinquishing culture's autonomy. What is happening is clear: with no successors to Guattari and Foucault, and with Parisian intellectuals getting more conservative c.q. simplistic by the day, there is a retrieval of neo-marxism and its attempts in the seventies to foreground "ideology critique." Since the mid-eighties, we have been seeing a return to precisely the kind of leftist theorizing which the "Parisians" tried to leave behind. Foucault's "non-fascistic practice" is no longer discussed. Derrida's project to save philosophy has run aground in an interminable defense of Heidegger. Virilio is seen as an anti-media, worried deacon, who

has ended up in his own "raging stillness". People find his radical critique of cyberspace and the Net merely excessive. They see the Net as an enrichment and can only imagine what Virilio meant by a "disturbance in the perception of what is reality." And if the Gulf War did not take place, then Jean Baudrillard no longer exists either (After B.'s "No reprieve with Sarajevo", there is "No reprieve with Paris"). Terkessides identifies a "void in which people seem to consent to everything." It is precisely this empty space which Adilkno wishes to investigate. It is tempting to suspect an extreme-right, reactionary body of thought behind this void, in which "culture" has replaced "race." Terkessides dwells at elaborate length on the anti-parliamentarist legal philosopher Carl Schmitt and his influence on the contemporary conservative elite in Germany. Adilkno makes do for the moment without such a constructed, imaginary enemy, such as "new right" thinkers. We concern ourselves at present with the following artifacts: almost-engagement, advanced disinterest, touching vagueness, cold passions, the fun of meaninglessness, advanced confusion, the colors of boredom, the out-of-context, electronic solitude, IKEA as cultural ideal and collective forms of disappointment. We see an ascending ideal of a society without ideas, with a "Net without qualities." Here, "comfort" has become a human right and one delegates as much as possible to professionals in order to be rid of bother. There was amateurism enough in the twentieth century! The split between success and failure has arrived in the social sciences and cultural criticism, as is apparent in the following fragment from Adilkno's ode to the Parisian media theorist Guy Debord.

The Society of the Debacle

After a fascination with Evil in the 1980s, we are now in the midst of an interest in Failure. We no longer read about Seduction, Simulation, Perfection, Glamour and Passion as pure self-expression. Evil had to snuff out all the Good of the 1960s, and it succeeded smashingly (cf. the breakthroughs of 1989). But then something else happened. The triumph of the dialectic, the historical synthesis of market and democracy, did not occur, and not even a new anti-thesis could be found. Good Socialism rightly gave way to the Capitalism of Failure. The system and its slaves underwent a revaluation of all values, and meanwhile nothing has changed. An indefinable situation in which nobody bothers any longer to put into words the World or the own Ego (or anything related to these). Chaos rules, and this does not lend itself to unlawful visualization. Timeless struggle takes place in the form of destructive private enterprise amid rotting cement and bankrupt government structures. The heroic radiance of the declaimed end of history is missing. The society of the spectacle has plunged us unexpectedly into the Society of the Debacle. We can learn from Guy Debord.

A heathen faith in new media, project management, surveillance, flexible scheduling, retraining, improvisation, image, and identity is the tried and true method of introducing new technologies. In the beginning there is amazement that all the strange machines and concepts function. But once they start to become widespread and really work, attention shifts to the moments at which the technologies fail, and they are written off. Once grounded in the realm of normalcy, any cybertechnology loses its sparkle and has to be routinely usable. Once hard- and software begin to fail, the consumer's rage turns against the Machine and its makers. How lovely to unleash your Rage and throw all the malfunctioning machines out the window into the street en masse! Grunge and generation X have mobilized the authenticity of elementary failure against the lycra sheen of revoked success. The breakthrough of stagnation is the surprising turn history has taken since 1989. As long as the end of progress was being announced, nothing happened. But Fukuyama the liberation philosopher couldn't foresee that bungling would get the upper hand. To be sure, self-organizing principles like chaos, artificial life, fractals, the Internet, complexity, Biosphere II, and turbulence are moving optimistically forward, but they will get stuck in their advertising hype. No consequential cancerous metastasis will be achieved — these things will remain models. Failure, on the contrary, is in principle not a model, nor a strategy. In this respect it distinguishes itself from everything that the 80s provided in the way of ideas. Failure is not a fate: fate approaches from outside, while fiasco comes from within, impossible to program in advance. The inherent disappointment which unfolds is not a bug that can be removed from the program. In the age of overorganization and a social surplus of experience, success-thinking has got bogged down in flop prevention. They tried to redefine failure as an educative moment, but Intel's Pentium chip, Microsoft Windows 5.1, the Philips CD-i, nuclear power, the hasty reunification of Germany, peace in Europe... they were all strong concepts, lacking nothing in persuasive power, and yet they went nowhere.

In order to survive one dons a mental armor. No longer a sexual armor, as described by Klaus Theweleit in "Male Fantasies", but an inconspicuous set of behaviors and precepts bent on avoiding all warm passions; a refined method and technique for dealing with "reality overload." In a recent Adilkno essay we call this "organized innocence": a phenomenon mirroring "organized crime," and one which just as invisibly embodies modern-day Evil.

Organized Innocence

With the emergence of the privileged middle class, innocent existence came within everyone's reach. The middle was no longer a class which strove for an historic goal, such as revolution or fascism; it had arrived in a cold period, henceforth to be without passions. While outside it stormed and change followed change with alarming speed, one put one's own life in "park." Without regard to history, fashion, politics, sex and the media, time could take its course. The innocent caused no problems, indeed they hated problems. "Just let things take their course." Regular folks considered themselves cogs in a larger whole, and all in all they were unashamed of it. They made sure the trains ran on time and turned homeward in the evening for a hot meal. In place of old barriers like caste, sex and religion,

179

innocence brought in conversation-killers* like tolerance, openness and harmony. Positivism became a way of life. Positive criticism served the reconstruction of politics and culture. One enjoyed oneself, was dynamically busy and had plenty of work to do. The picture of reality was simple and clear. The innocents did not embody the Good, they simply had no plan, but nor did they lack a sense of values. They never got around to crime either. And so they unintentionally became the object for strategies of Good and Evil. We speak here of a life without drama, urgency, *Entscheidung. There will never be a close race. There need never be a decision. You needn't break away just to be yourself. As the Dutch say: act normal, that's crazy enough. Innocents thrive on the rituals of everyday; these make them happy. A broken washing machine can drive a person crazy: the thing should just work. The complaint against things is that they break down, falter, fall apart, act strange, and cannot be unobtrusively replaced. The promise of undisturbed consumption is that nothing will ever happen again. In this unproblematic existence comfort is so taken for granted that it goes unnoticed. The innocent consciousness is characterized by a narrow, small-scale thinking which calls forth a universe where personal irritations erupt at the least little thing: stoplights, traffic jams, late trains, red tape, bad weather, construction noise, illness, accidents, unexpected guests and events are a repeated assault on the innocent existence. One becomes involved nonetheless in matters which one had not been expecting. This disturbance-hating mentality, which devotes itself to work and career, shuts out all risk and has elevated practicality as its sole criterion. The ideal of a wrinkle-free, spotless life presumes, touchingly, that literally everyone is pursuing it. Innocence is under continuous treatment by the doctor, the therapist, the beauty specialist, the acupuncturist, the garage manager. Innocence likes to be tinkered with. It sees it as a duty to develop itself, and retrain itself if need be. One takes a course, attends a lecture, visits the theatre, concert hall and exhibition, reads a book, follows the arrows on a walk in the woods, engages in muscle sports. Innocence is a universal human right which extends to animals, plants, buildings, landscapes and cultures. This is the condition under which the planet can finally still be saved: neither utopian nor fatalistic, but functioning normally. You can lose your innocence by committing murder, indulging in a little S/M, joining a motorcycle club, choosing art, or going undercover, but the entertainment underworld offers no solace. Only the crossing over to war and genocide is still an option that we hear much about. Yet there's no escaping the agglomeration and its dictates. Mountain bikes, cool t-shirts, clever children's clothes, computer games, graffiti, bumper stickers, sloppy sportswear, brightly colored backpacks, hair gel: these are the "objets nomades" of Jacques Attali's Europe, on its way to a stylized uniformity. Innocence cannot be neutralized or counterbalanced by its opposite. The only thing it cannot stand is the spoiling of the atmosphere. This rotting process within normalcy offers no alternative, commits no resistance and performs no act. And innocence finds it exhausting. One can't always be fresh and cheerful and sweep away the fog with constructive thinking.

Innocence is in no danger of being wiped out by revolution or reaction. It can only decline, sink into poverty and slowly disappear from the picture. In a stagnating relationship one drags up a trash container, dumps the accumulated innocence in it, rebuilds the interior and makes a fresh, wild new start. The politicization of the private a generation ago managed to clear out some of the innocence, but it has regrouped stronger than before, grungies, generation X'ers, trancers and other young people search in vain for a footing that sets themselves apart in a format other than fashion or media, the new organizational forms of innocence. The Dutch government itself seems the most anti-racist, anti-sexist, anti-fascist, anti-housing-shortage, anti-everything that a well-intentioned rebel could be against. The only thing innocent new generations can unleash their rage upon is organized innocence itself, in all its forms. Material enough to start a massive social movement and get to work in countless spheres, and then discover that all those disparate groups have something in common. "Boycott all forms of insurance, storm the stores full of obnoxious baby clothes, set fire to all those superfluous cute gift shops—there's a whole consumer paradise to destroy!" But let's not get excited. We will let innocence ebb away, grow silent, we won't talk about it anymore.

Innocent Europe and the Third Balkan War

So this is the Europe of Bosnian genocide. Even in Zagreb, Sarajevo, Tuzla and Belgrade people bravely try to join in and desperately keep believing that they are part of "Europe." "Bosnians imagined that the fact they were Europeans would protect them from the horrors of war," writes David Rieff in his book "Slaughterhouse: Bosnia and the Failure of the West" (New York, 1995). For the Bosnians, Europe "was a continent on which the cosmopolitan values they stood for had become the norm." The Bosnians believed the end of communism would be succeeded by a "dull and pacifying age of consumerism." According to Rieff this led to a "cognitive dissonance", a "misunderstanding of their historical situation", a mental state that obtained for Sarajevo in 1992 and that still goes for the rest of Europe. The citizens of former Yugoslavia could not believe that the "CNN effect" would not occur in their case. They waited in vain for a live broadcast of the arrival of a rapid intervention force, come to set them free. Rieff: "People routinely speak of information and knowledge as if they were the same thing. Worse, they console themselves with the thought that once they have relevant information, they will act." Instead, "the sound bites and 'visual bites' culled bred casuistry and indifference." Rieff acknowledges that the debate is long over now. "The West chose to do anything but intervene." It chose, on the contrary, "to contain the crisis," anticipating the Cold War II paradigm that an imposed stagnation produces some positive effect. The West did not want to save the Bosnian Muslims. After he has witnessed a genocide, Europe is for Rieff no longer a "civilized place." "The defeat is total, the disgrace complete." The question is, why does even this message fail to get through, 50 years after Hiroshima and Auschwitz? For the first time the mental armor of the Europeans triumphed over the daily bombardment

of information. According to Slavoj Zizek, the Balkans are "a new projection for Western phantasies," based on the "nature of the Balkans." They are an imaginary glacis for the defense of a culture, full of communication and global dreams. They* reveal the end of the age of the media, the accompanying games of perception included.

With whom could the average Westerner identify? With no broad anti-war movement, oppositional culture in former Yugoslavia is completely left to itself. The only thing that counts anymore is survival. In the long absence of political confrontations, the rage against the war machine expresses itself in a vital, ironic, high-grade cynicism. Not a nonchalant indifference; rather a form of stylized despair. The survival artists in Belgrade, Sarajevo and Zagreb are averse to purism and every expression of political correctness comes across as foolish pettiness. It is not a protest which begs for sympathy or solidarity. The help offered by international organizations causes consolidation rather than breakthrough, and offers no prospect of liberation from oppressive and dismal nationalism. In a situation in which all parties define themselves as victims, it makes no sense to identify with this or that group. Once involved one automatically arrives in a gray zone. One becomes part of the black market, smokes homegrown pot, sells relief goods, is ruined by cheap heroin, or finally manage to escape to Paris, London, New York or Amsterdam. On the scene we become acquainted with the techno-existentialism of the few who have stayed behind. They no longer need bid farewell to modernism, as Western postmodernism has believed for decades it must do. The dominant discourse is indifferent to attempts at deconstruction and merely leaves the intellectuals to muddle on. Their supposed power is a ancient history. The minuscule opposition, which maintains itself under the yoke of repressive tolerance in the shadow of power, expresses itself in a number of so-called "independent media." By this is meant merely that they are not property of the state or under direct influence of the governing party, which in the former Eastern Bloc is already quite a feat. Just as in Western Europe, the subculture has its own radio stations and weeklies, organizes techno parties, makes videos, posters, rock and roll and theater, and communicates via faxes and computer networks. Technologically speaking, the lag behind the West is remarkably small. New hard- and software get around with lightning speed, and in this respect there is scarcely a difference anymore in Europe between a Western center and a periphery in the South and East. An example of the is the Zamir computer network, with almost 2000 users, which has been providing e-mail contact between cities like Prestina, Belgrade, Zagreb, Tuzla and Ljubljana since 1992. Mail is sent and received several times a day. Network traffic runs through Germany. Five hundred users reach nearby capitals and the rest of the world from Sarajevo by e-mail, and anti-war groups from Zagreb and Belgrade maintain contact through the network.

The underground magazine ARKZIN is published in Zagreb; there are several free radio stations in Skopje; the weekly VREME and the radio station B-92 are based in Belgrade; Radio ZID broadcasts the sounds of the opposition in Sarajevo (and criticizes the Bosnian government); and the independent Albanian weekly KOHA is published in Prestina, despite heavy Serbian repression of the Albanian majority in the province of Kosovo. Here, in "Old Serbia", President Milosevic's media campaign began in 1989 — a stroke of propaganda many see as the fatal beginning of the war. Milosevic still controls the state media and manipulates them to stay in power. These include several influential newspapers and the national radio and TV channels, which can be received everywhere, especially in the backward countryside, in contrast to the independent media with their inadequate distribution. In Croatia the situation is the same, and in Bosnia-Herzegovina, too, the party of Izetbegovic has authority over radio and television. Even the heroic daily paper Oslobodenje cannot be spoken of as independent. The war will only be over when the warlords and their small armies have laid down their weapons and the war profiteers who are now in power are voted out in a democratic manner. But the anti-nationalist, non-communist opposition is still too weak to take the helm (as is the case in other Eastern European countries). To support such an opposition from the West, it is first of all necessary, as Zizek says, to make one's own power analysis of the Balkans, one which is based on history and which views the role of the media in correct proportions. It will also be necessary to make a clean sweep of the UN's quasi-neutrality and the Europeans' humanitarian aid, the slow non-intervention force. One would also have to ridicule the 19th-century diplomacy and the half-hearted support of one of the warring sides.

Now that the war has acquired its own dynamic, we must not overestimate the power of the media. The so-called "independent media" cannot bring down the ruling tribe. At most, they are the germs of a democratic movement which has had enough of hatred, robbery and genocide. But they are no longer breeding grounds for dissidents with clear-cut principles. European innocence must be conquered, the crippling identity of victimhood pushed aside. If, as Kroker maintains, in the new Europe, with its new, invisible, electronic War, everything is about "the bitter division of the world into virtual flesh and surplus flesh," then it is up to the independent media like Zamir, B-92 and ARKZIN to ridicule this split, and in an ironic, existential manner, to give shape to the universal technological desire, cyberspace.

A SEISMIC MOMENT: SOUND AS WEAPON,

FROM JERICHO TO WACO

By Virginia Madsen

T oday I want to retrieve for audit, the soundtrack of one event that existed for a time on that critical and fragile border between what we term virtuality and actuality.

I want to take your memories back - a memory formed through media images - to the siege of 1993 at Waco, Texas. I want to try and recover the overlooked and repressed sound track. I don't imagine this memory jogging will be too difficult a task, considering how Waco has been **re-cited** and **re-sounded** through the Oklahoma City bombing which can be understood as an aftershock of the Waco conflagration.

In the limited time available here, I want to re-perform a listening, a listening that depends upon a weak point in the system, a listening that has allowed me a way-in to what was to become, **WACO - the media/military Show, WACO, the tragedy, WACO, the melodrama, WACO, the 'freak occurrence', the 'pulp fiction'.**

My radiophonic practice involved taking a profile of this seismic moment and retrieving from the chaos of noise, (the shock waves still trapped in the system) some sense, some direction. In scoring *Cantata of Fire,* a radio 'play' on the ancient idea of sound as weapon, I sought to track sonic fault lines, recording the tremors and murmurs, diagnosing the ratio of attack to decay.

Inspired by a reading of urbanist/philosopher Paul Virilio's work on how speed and the accidents of speed re-organize both real and virtually real (VR) spaces (this is the space, in effect, that we inhabit), I decided to investigate the events at Waco with the sonographic tools of my trade. What interested me was the curious way in which **son-et-lumière** performed together to in fact determine the course of events. For the T.V. cameras, hungry for 'lights, action, exposure,' there was little to develop here, little to be seen on the outside, except the boarded up white building (the compound) on a treeless Texas plain.

In this **auscultation,** in this listening to the tremor of the heart, I was drawn into the interior of events - sound offers such a passage - into the resonant speed-spaces of sound, precisely because Waco brought into play, the ancient power of sound as a weapon, to herald the coming 'apocalypse', to inspire fear and disorientation, and to penetrate where all else had failed.
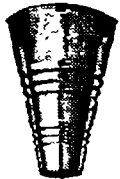
For 51 days the eyes of millions of spectators were upon Waco. For 51 days, the international news media waited. Exposure led to overexposure. Amidst this 24 hour-a-day 'over-exposure' of Waco by FBI and media surveillance cameras- the light of real-time media - technologically channelled and processed sound, (what the FBI called a 'sonic assault') was used to literally bring the walls down on David Koresh and his followers - an echo coming back to haunt us of Joshua and the trumpets of Jericho.

Sound here should be heard 'in excess' of metaphor. Sound here is paradoxical, fusing and confusing matter and energy. It is not simply material or medium, carrier of information, or expression of time; it can be thought of (and felt) as an energy. What's more, in its virtualised but potent form, a looming and invisible virtual presence, it becomes radio-active; highly charged, energetic, a matter of attack and decay.

Waco, the media/military VR extravaganza, fueled by the narrative of biblical apocalypse and competing Gods, found itself laying foundations directly onto the terra-infirma of America's great foundational myths- myths of exile, apocalypse and redemption in the promised land, God's chosen in the New Eden.

The site the Branch Davidians decided to build their bunker was the promised land all over again. They called it Mt Carmel. [remember this was a flat prairie] It was to be a refuge from the forces of evil now turning America back into a profane wilderness. The Pharisees, the heretics now in charge were trumpeting the coming Revelation - they were the Centralised Government; their footsoldiers were the FBI and their Devil's Advocates were of course, the Media.

In their paranoia, the Branch Davidians were not to know however, how time had caught up with them, they were not to know that the End, the Apocalypse, would come at such speed, and so soon. But they were prepared for the approaching critical mass. They were on the faultline, out of synch, out of gear, playing the discs on the wrong speed. They were digging-in for the duration - no matter how short or long it was to be.

In one sense, *Cantata of Fire*, aims to explore the interior and exterior spaces brought into inflammatory contact through the friction of information. Sound and light, two interconnected but here incompatible speeds, battle it out on the faultlines between virtuality and actuality, sparking off a chain of events that at first glance appears to be the fault of no-one, an accident turning tragedy into farce, theatre into circus.

Amidst this sound and light thaumaturgy or information pyrotechnics, the relationship between presence and absence becomes critical. Who is inside, who is outside, who possessed, who possessing? The interior must be seen, but to enact a seeing one needs to go in, one needs to violate walls, implant 'listening devices', and thus 'resolve' definitively the Waco eruption, interruption.

We could call the media's presence or intervention, in this instance, the 'resolving power' of Real-Time tele-vision. Its ability to resolve definitively the reality of the moment, and by so doing lay claim to it. It is here surveillance, penetration through interface, the Gods playing with fire.

But to begin my sounding out of these interior spaces, I want bring the interior to the exterior through the technics of auscultation. This is a listening to the heart's murmur, a listening for signals of tremor or anything out of the ordinary, and things were extraordinary in Waco, Texas in those days leading to the fire that killed 71 people, 25 of them children.

Now, before I replay some of this 'soundtrack' you'll need to know a bit more about the topography of Waco, in other words you'll need to recognize some of the 'attack signals' (very odd indeed) that were largely overlooked by media coverage. This 'overlooking' and lack of listening, I'll call, taking Paul Virilio's term, 'image-block'.

Waco, is an example I think, of 'image block', a kind of blindness that comes from an overexposure of information. Too many images, overlit, travelling too fast, no time for reflection, no time to see things in relief: no time delay in which to receive even an echo. So fast is 'real-time' in fact that the ground against which - in relief - a landscape is defined, this ground, loses all stability; with 'high definition' we just keep 'improving' our resolution until it seems that there can be no profile at all.

The media/military machines need (or desire) to see immediately, to make transparent/trans-apparent, to illuminate, through the light of speed, to possess through virtual sight - this desire led to what Virilio calls 'image block'. The urgent need for visible action - and for a long time at Waco, there was none - meant that the Media and the FBI exchanged 'development time' for overexposure, bombarding the site with light and white noise, fashioning in that peculiar time we call 'Real-Time' a new relief that bore less and less resemblance to the actual place inhabited by a bunch of wacko outcasts calling themselves 'The Branch Davidians'.

The real-time image pick-up of Waco, 1993, in effect, blocked other information, other evidence of sense; it blocked access to knowledge, to understanding, to diffusion - instead we were presented with fusion, with confusion. This insistence on 'real time' coverage blocked access to the 'Other' that a 'sounding out' might have provided. What, in the end, we got, was more light more fire, a fascinating spectacle in which we could discern only the reflection of ourselves. This was a feedback loop, (images and sounds repeating over and over, going nowhere, creating friction without release until fusion/confusion burned even our images away). This was the tragedy of Joshua and his tribe by the God of seismic Word. The walls of Jericho and Waco, in this closed circuit narrative, would come

tumbling down, God had willed it to be and besides, this was no subtext to the story, it was the key text.

Seismic activity here is discerned by **attending to what is invisible, to what cannot and could never be 'brought to light'.** The seismic activity I'm referring to here has its sonic profile and carries with it another type of energy, **radio-activity** which even now in the light of Oklahoma, has not totally decayed.

But enough speculation; the sounds of sonic attack (FBI's words) what were they?: During the long nights of featureless waiting, the FBI directed at the compound, an arsenal of amplified sounds using loudspeakers; the sound of babies crying, small animals (baby rabbits?) being killed, telephones off the hook, or ringing, dentists drills (more than metaphor, don't you think?), and adding a touch of bathos to the show, the music of *The Carpenters* (I'll let you work out that particular choice).

While reporters kept vigil, and talked, and talked and talked, making up for what was seen as the absence of action, the FBI launched this 'counter attack', at the **speed of sound,** headed by a man stationed hundreds of miles away (the nerve centre of operations) who watched and listened to everything from his 'bunker' in Washington, popularly referred to as **'the Submarine'.**

Cantata of Fire, is a radiophonic performance for 6 voices. It is designed for the intimacy of the medium of radio. Here I am exploring a particular radiophonic 'space-speed' and a certain type of listening and durée that might attend to that. Much of the text, I derived from media accounts of the siege, incorporating words from participants, survivors, journalists, the FBI. Fragments of radio news reports are heard, including Koresh and his grandmother - these are the traces of sonic inscription I talked about earlier, inscriptions that still resonate perversely in the system, in the main frame of the media VR machine.

In this **dromospheric** realm (Virilio's 'speed-space') the sounds of warning, of prophecy, of impending war, can be heard to come to us, delayed.- an aftershock of the initial seismic event. These sounds (another way-in that gives us a reading, gives us resonances rather than resolutions) these sounds 'appear' to be out-of-synch with the memory images they now must occupy and metamorphose. Even though some of these sounds are sampled at high speeds and are 'digital' they in no way are 'high definition' - they do not have high resolution.

The sounds of sonic assault, babies cries, phones, drills etc echo with the memory traces of other sonic 'weaponry' - the trumpets of Jericho, the sound of bagpipes coming over the hill which once inspired terror in the enemy clan, the buzz bombs, the scream of flying bombs, and that whole class of weapon now being developed in the 'smart bomb' category, the ammunition that uses subsonic frequencies, to induce nausea, and thus literally puts the enemy off balance.

With these echoes in mind, I will play now an excerpt of *Cantata of Fire,* (the last 'scene' where the chorus begins to break up like ashes) you of course already know the end, the image of flames, black clouds, dis-integration, the fire that erupted/interrupted the stasis of action, that final release of energy in light which made everything totally **transparent,** that final release generated by the rapid and continual flow of data through this single dense 'fault' in the informational landscape. You had this vision, but what do you remember hearing?

Cantata of Fire, for soprano, chorus of three female voices, two males and of course, the sonic assault.

NEHIYAWEWIN AND VIRTUAL REALITY

By Ahasiw Maskegon-Iskwew

F orces of Allusion

Post modernism is the inevitable outcome of the fragmentation of the non-transformative fixity of European languages. The prevailing nihilistic, empty set semiotics of post-modern theory is now imposed on tribal cultures as the current form of cultural re-colonization. In Cree language, Nehiyawewin, metaphor and metonymy are not simply pointers to similarity. They describe the threshold of transformation and shifting states of being. They are artifacts of the awareness of the describer, indicating the knowledge of the potential in the comparisons and the actuality present in the description.

Nehiyawewin represents the world in nouns and verb phrases that are animate and inanimate. The animate classification is present in the language among representations of both human and non-human beings, animal and non-animal beings, and biological and non-biological beings. The concepts of time and space are also significantly different from European languages in the sense that they are also potentially animate and personalized rather than quantified and and subjected to repetitious measurement. The codification system present in Nehiyawewin therefore also implicates any other form of Cree cultural and artistic representation beyond language acts themselves.

Wisahkecahk Regurgitating the Macabre Organ

The invisible but laser-focused collision of cultural concepts of metaphor and metonymy are splitting the atoms of the solidity of our world view. This explosion is invisible because the power of the Euro-American ethnocentricity contained in the notions of metaphor and metonymy has imposed them as universal. It sharpens them as surgical tools to dissect the torn corpses that have been crushed and mangled by a war machine dressed in shrieking, frenzied, carnival drag.

The slicing is the impossibility of translation. It is the inevitable construction of the bomb that consists f assuming the transparency and ubiquity of non-tribal European language, assuming that a metaphor is as empty and conflated for everyone as it is in the vacuum-world of hysterical post-modern detritus. Any act of saying , any act of representation, of constructing experience screams out with the painful, puffing, spitting and bloody energy of birth, yet is beaten down and consumed in the relentless gut of a zero state monstrosity. Voracious hungers inhabit the landscape of the gaze, stroking and massaging, then finally tearing and devouring the rich meat of the organs of perception.

Wihtikow brought you here and now uses you to live and feed. Wihtikow's tracks show themselves when you say something is like something else but you don't really mean it, when you don't care for the interpretation that you knew in the reality of your dreams, when you applied yourself to the surgical slicing machine and abstracted that part of yourself to death; logos, rationale. Say it like you mean it, say it like when horror fills you to bursting and the explosive orgasm goes on and on in flailing, wiggling laughter that is true terror.

Saying something is like something else, or saying that something is something else is an act of magic. Using the word "magic" with all its English language baggage displays right there the dangerous fatality of translation. Cree language, Nehiyawewin, works on the borders between animate and inanimate, those things that have body and being and those that do not. For some Nehiyawak peoples in the North, those that have been re-colonized by the other great force of Euro-America, Christian fundamentalist evangelism, even using their first language is an overwhelming psychic crisis because the foundational concepts that form Nehiyawewin cannot abide the speciocentric human-based philosophy of the re-colonizers. Even to use our own language becomes a self-violation. Imagine the virtual reality version of that.

In Cree, the representational acts of metaphor and metonymy carry with them a weight of responsibility that is anchored in a vast network in which the human is only a small and sometimes questionable part - those who need to, please shift or squirm uncomfortably and hide it with a nudge or a smirk. At least this part will be marked in your memory when later you return to the scars where it was cut off. In Nehiyawewin, when you say something is like something else,you are representing an awareness, a gift that was given you to visualize another mesh in the web, to see and hear the transforming. The acts that result from this seeing have been called, in literature, magic realism. This is such a benign term to describe a world of images torn by lust and terror, yet linked by prayer and founded on spirits that flow through the rocks and grind up the earth in surging waves, the ones who place each child in a womb and follow the subsequent absurdity. For tribal peoples, magic realism is the predominant theory of media art, especially time-based interactive work.

Stop thinking of the future - any future. Remember, if you have a safe place to store this, that it is only the same day visiting you as many times as it finds interesting. Beware those feelings of superiority, of contributing to the cutting edge and the brave new world. These cliches mean nothing to the many, many more of us who don't have electricity, never mind access to electronic technology. Too much of what you do is already an insult that is already unbearable and explosive. Safe ground becomes a sink-hole and a swallower.

Watch out for the ancient and enduring consumers, the real audience. Everyone squirm now; we are all being watched, felt and tasted.

My gifts are meagre and stingy little things to me - I am no elder. I can see only two things that I am driven to give you. Both flow in magic realism yet have found no rooting among you. In non-tribal languages, antiseptic violence pervades against the establishment of an organism and kills the wolf spider woman.

> Representation of the world,
> Representation of time,
> Metaphor and metonymy,
> Nuclear fusion and surgery.
> Spirits of the land and the living spirit of time,
> Everyone learning to talk Indian, everyone learning to
> feed on dream-life, learning to tell stories stitched
> across the web of memoryand a body bounded by in-
> finity and uncertainty, not skin.

Magic realism has no place here yet. Who speaks - where does it arise? The literature and orature of it flows and intersects in a manner that stings and corrodes the monolith of re-colonization. But even on a static page or in a still image, works in this genre surge and swirl. Regurgitate and examine the discourses of time-based, interactive media art. How are metaphor and metonymy constructed? How does time visit, how does space welcome you and what does it say? In terms of viewing the virtual reality experience as a form of magic realism, the relationship of events, those that involve significant transformations for the viewer / participant, becomes a critical consideration.

Magic realism as a cultural force that inhabits and creates literature, visual art and performance has, in virtual reality, a new vital mode of expression, one that can accommodate Nehiyawewin and the expression of its visions. But this is denied to it because of the exclusionary nature of V.R. practitioners. Cultures out of which magic realism arises are excluded from the sphere of virtual reality by its economics and its ownership by an inaccessible, developed world, academically focused hierarchy. The forces of academia may be the most culpable agent in this since they hold the reins of critical discourses that have failed and refused to recognize the crucial relevance of magic realism theory and practice to the most obvious parameters of virtual reality, never mind the more subtle potentialities.

Magic realism is that place where colonized cultures fight eurocentric language oppression with that same set of etymologies. Tribal cultures speak and transform these definitions through their reinvention of metaphor and metonymy as history and prophesy, woven into solid and living present, sung by many voices, most of whom are not people. You can talk to an Indian

in many languages, but almost always only through subversion, satire, irony, and allusion. The acts of creation and expression through metaphor and metonymy extend outward, as they do for everyone, to define and modulate all other acts of creation and expression. It is through magic realism however, that the unique space is cleared for the performance of values anathema to the killing force that doesn't mean itself, the force that is relentlessly suiciding.

Tools-to-go; shopping for the hysterical frenzy. Earwear, eyewear, timewear (earweary, eyeweary, timeweary). Weary and wary, an exhausted and suspicious body flinching from the deliriously rabid cruelty of its own transplanted organs. Shopping habits: beads and electronics, deception and seduction. Playing on need by selling false vacant dream life to panting, violent johns. Pretending to suck the macabre organ - stifling the gag reflex.

When it feels and sounds like a heart-beat, maybe it should be; maybe it is.

INTERFACE AND ACTIVE SPACE

HUMAN MACHINE-DESIGN

By Brian Massumi

73140.3206@compuserve.com

❝ Early in the next millennium your left and right cuff links or earrings may communicate with each other by low-orbiting satellites and have more power than your PC."

Have you ever wondered what your earrings would say to each other if they could have a confidential conversation? I have to confess I hadn't. One of the endearing things about Nicholas Negroponte, who conjured up this image, is that he hasn't either. What fascinates him, in *Being Digital* (1), is the possibility of the connection. Why bother with gossipy cuff-links? Because they would connect. The titillation is less in the gadget itself, or in the goal of the gadgeting, than in the joy of connection. Negroponte is animated by a connection fetish that is refreshing in its lack of moralizing about what we should do in the future Negroponte's Media Lab is so busy manufacturing for us. For Negroponte, it is never really a question of goals or utility. *Being Digital* is all about interface, for interface's sake. Why?

Because the future, as Negroponte sees it, is information overload. The human body will be flooded with an impossible richness of information, to a degree far beyond the ability of its perceptual apparatus and nervous system to receive and sort. Delivery on demand is already passi before it has become a reality. In Negroponte's future, information will be delivered in parallel, at all times, rather serially and on demand: "anything, anytime, anywhere" (174). All the world will be rolled up in data, its now digitized mass threatening to suffocate the unprotected body, swamped by a downpour of pure availability. The role of the interface is to filter the bombardment. "Personalization" is the watchword. The filtering interface Negroponte evokes would simulate human-to-human contact as much as possible, favoring voice command and integrating recognition capability for non-verbal cues. Each human body would surround itself in a custom-tailored double, a machine bubble composed of an intelligent network of "digital butlers" (152) attuned to all the particularities of its "master's" moods and movements. I will program myself into my "butlers." The "butlers" will act for me. They will be my delegates in the infosphere. They will brave the chaotic waters of availability to search, sort, select, and process for me. They will be intelligent, self-adapting, "learning and developing over time" (155).

Negroponte dreams of an externalization, in a technological double-bubble, not only of intelligence, but also of person-

ality and choice, made infinite, and infinitely fast. Could the transfer of properties be one-way? "Your face is your display device," he tellingly informs us (129). You human, "me" machine. *Make "me" redundant*, the prophet cries (150). Make me redundant, for the infinity of selection. "Redundancy is good" (98). The transfer of properties would go both ways, blurring the boundaries between master and servant, human inside and machine outside, in a continuous feedback loop. "Being digital is almost genetic" (231). Choice and processing might indeed become infinite. But they would also be circular, and automatic. Who is in control in a redundancy of doubles second-guessing each other? The "inter-" of gossipy earrings in confidential conversation bypasses the "-face" (not to mention the brain behind it). *Being Digital*'s "personalization" of interfacing ends in de-facing. Post-humanization through "personalization." Human machine design. The dream of an interface with "the ability to model you" (155). The human-designed machine designing the human.
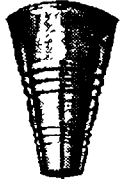
Design for what? For profit. In the future information economy, Negroponte implies, the products will be primarily "immaterial."(2) The interface will cull from the infinity of available information, distinguishing the noteworthy from the banal, and detecting exploitable patterns. Product development will be a matter of organizing raw information material, repackaging it, and reselling it as a finished product. The most profitable "finished" products will not really be finished at all. They will be information repackages that allow consumers to repackage their own information—information products for information production. Information squared. What will be sold will be capabilities for producing rather than utilities or use-values (end-use objects for consuming). The product will be a dissemination of the capability to produce information by means of information, and in the producing, to profit. In other words, the interface will cull information in order to intensify and transform it, from a commodity to a form of capital. Information circulation will directly generate surplus-value, blurring the distinction between circulation and production, and supplementing, if not supplanting, Marx's labor-value with information-value.(3) The fetish for connection connects to a fetish for circulation—of a kind that appropriates to itself the properties of value- production that in earlier capitalist formations was reserved for human labor. The "motor" of profit is encapsulated in the flow of information and its transformations, which become the focus of joyful fascination, in and of themselves. It is not so clear that profit, encapsulated, can be said any longer to be a motive, or the "end" of the process. It is now in the middle, between information repackagings. It is more like a propulsive moment in the perpetual, intensifying, self-turnover of information—a metamorphic stage in its life-cycle. The interface matters to the extent that it forms a node in a self- motivating circulation producing a backwash of profit, as *a by-product of its own intensification and perpetuation*. The interface is pure means responding to pure availability: pure process. Machining. Negroponte is silent on what we should do in his future because

use-value and goal-orientation (in this case, profit) are lost in the swirl. They take backstage to a self-organization of unfettered process: to a machining of human activity.

Implicit in Negroponte's musings is a particular figuration of the self in its surrounding space. Space figures as a formless mass of data points (bits) in parallel motion. These points may have made sense in the particular contexts from which they were digitally extracted. But as a mass, in electronic profusion, they lose all meaningful orientation, arriving everywhere together. Information is freed from its anchorage in meaning, much as means are unfettered from their subordination to ends. The space of the infosphere is a homogeneous space of aimless, instantaneous delivery of everything in all directions simultaneously. It has one dimension: raw data, the matter filling cyberspace, a matter that is inert by virtue of overactivity. The human body risks drowning in the unformed sea, if it does not select from the incoming flow, process the selected material (square the information), and direct a transformed flow back out into space in a calculated way (a way calculated to produce profit). The body must transform raw data-matter into profit-by-information squared. It must order and organize, it must form the formless, but to do so, it must shield itself from immersion in it. The materiality of the body recedes behind a digital bubble of servo-mechanisms which reembody its ordering activity, externalized; which rematerialize human thought, as programmed. The activity of the body externalizes its self in the mediating materiality and coded protocols of the adaptive interface. From there, its orderings transmit into the infosphere. The interface is a relay point in the dissemination of human ordering activity into space. Homogeneous space, at first invasive and threatening, is transformed into a realm of expansion onto which human projects its self, in coded-thought form. The abstracted activity of the human body and the matter within which it acts become isomorphic—formal repetitions of each other. All the weight of their former materiality is taken on by their mutual transformer, the interface. The body disappears behind a technological shield, becoming a backstage director, an organizing desire, or will, in self-protective hiding—a defensive self informing inert matter in homogeneous space, forming it in its own likeness. Except that it loses its likeness. When it looks at its face in the mirror, it sees the interface, the display device. The materiality of its body and the body's organizing capacity (its desire, expressed as a will to mastery, coded as a thought-form)—are neutralized in the transmission of ordering back into that space. The human sows its self in formation. (In)formation for (in)formation's sake, in perpetual self-turnover. Pure, controlled and controlling, externalized form, mirrored in the displaced matter of mediation, interacting with itself. Pure availability + pure means = interactive form - matter (lost in the shimmer of self-mirroring).

All of this is tiresomely Cartesian: a directorial self ensconced in a problematic body which it overcomes with the aid of programming and technology in a way that spiritualizes matter, and all of space, by conforming them to its will. A familiar

Cartesianism, underpinning many a discussion of cyberspace. What distinguishes Negroponte's from run-of-the-mill versions is the lustiness with which he looks upon his creation, and pronounces its "redundancy" "good." The "goodness" of redundancy places a tacit seal of approval on the machinic conversion—the viciously circular point at which mastery of one's space converts to automatic pilot, and control converts to compulsion, in the sweep of a process that has run away with itself. It is a recognition that human activity cannot stamp its form on lost matter without losing itself; that it cannot spiritualize matter without spiriting itself into matter. Me human, me machine. "Good." At the Negropontean interface, the human merges into the hard materiality and adaptive programming of the techno-connection, the interface at which it materializes as insistently as it self-abstracts, in an unresolvable dialectic. Human-machine, without "me"? "Good." What distinguishes Negroponte's Cartesianism is the cheerfulness with which it communicates its redundant future as repeated failure.

When the question of profit motive was raised above, it was not to make a point about greed. It was to make a point about a desire for the future that starts by taking profit as its end, and ends with information as a means; that starts by personalizing its machines, and ends up machining its personality; that encapsulates its motive force, and the form of its self, in an auto-productive process greater than itself. The point is that a futurological desire, like that expressed by Negroponte in *Being Digital*, is not just about gadgets. An expressed desire for the future envelops a possible world: a potential space of a particular kind, inhabited by a particular self-form, whose ostensibly goal- oriented activities take on a specific spin. In other words, it is effectively ontological—a mode of being in germinal form (a becoming). Likewise, when the question of defacing and dehumanization was raised it was not to teach a moral lesson about human integrity in the face of its own chatterbox inventions. The point was that when human desire invests connection and circulation without renouncing control, it falls into a double bind. A body that succeeds in controlling connective and circulation by externalizing itself in it, loses control in exact proportion to which it gains it. In doubling and bubbling, the more controlled the process, the more the process controls. In other words, a techno-desire for the future envelops a potential politics—a (self-defeating) system of power in germinal form.

The computer-assisted design practice of New York-based architect Greg Lynn also envelops an ontology and a politics, but in very different ways from both Negroponte's reluctantly hyperactive Cartesianism, and from the more classical Cartesianism of traditional graphics and design software. In computer-assisted design, the screen space is most often thought of as a virtual sheet of paper. Its two dimensions stretch to three, with the addition of perspective. The screen space is treated as a preexisting three-dimensional matrix into which figures can be plopped. Pre-plop, the space is empty. Filling it doesn't change its spatial characteristics. It is inert. Its three dimensions are invariant axes against which the figure can be plotted and measured. This is a Euclidean space of geometric projection. A figure is projected into it, then is varied against the constant backdrop of the axial matrix until a pre-conceived result is achieved. The self inhabiting this space is once again a directing will, imposing a formation, the development of a figure, on inert space. The result of the design process is a simulation of the object to be constructed in a separate, but similar, "real" world space, also concieved as an inert three-dimensional matrix. For example, the result might be a simulated house that a client can be "walked through" on screen. The simulation works because it *resembles* the ultimate product. The relation between the on-screen and off- screen objects is one of formal analogy. As customarily practiced, "digital" design is entirely in the thrall of the analogic.

Greg Lynn starts from a different space. He tactically misapplies to architectural design animation software developed for generating special effects for Hollywood movies. The interest of the program he uses (Metaballs, by Wavefront Technologies) is that it allows the designer to program a non-Euclidean screen space. Lynn starts with "blobs."(4) The blobs are active elements or "primitives" which combine to *generate their own space*. Each blob is internally differentiated. It is assigned a circumference, a mass, and a corresponding force of attraction. The force of attraction defines a field of influence outside the perimeter of the blob, and that field is in turn differentiated into zones. Closest the perimeter is a zone of fusion. Any blob entering it will combine with the first blob to form a larger blob. Beyond the fusion zone is a zone of inflection, the area within which the attractive force of the blob will alter the shape, and therefore the field of influence, of a neighboring blob. Put a number of blobs together, and their differential influences on each other produce unpredictable reciprocal deformations. Each blob is a differentiated subfield with a larger field of blob combos. The larger field is not an invariant, containing matrix. It is a space of reciprocal variation, whose characteristics shift as the blobs move about, combine, and inflect, the complexity of their interactions preventing them from settling into an equilibrium. This is an *active space* composed by *forces of interaction* between dynamic elements. The variations that occur within it are variations *of* it. The global characteristics of the space express the collective effects of the local components, without exhausting their dynamism. The space as a "whole" is not reducible to its blob-"parts," which retain their local properties in and through their agglomeration. The blobs are *enfolded* in their globality, rather than being contained by it or reduced to it. The global is an overall *effect* of an irreducible heterogeneity. That overall effect is in continual variation as its components tirelessly interact. The "whole" is not a whole at all, but an infolding-expressive field of variation. The self-activity and heterogeneity of this space is in stark contrast to the inertness and homogeneity of the Euclidean matrix, whose invariant axes act as a container for whole figures that are the

sum of their parts and are varied, as wholes, through the intervention of a force that enters its space from outside and projects transformations into it. The forces of the blob space are endogenous; those of Euclidean space are exogenous. The blob is also a space of higher dimensionality. If each independent variable constitutes a dimension, the blob space has five (circumference, mass, force of attraction, zone of fusion, zone of inflection). If each blob is considered an independent variable, the overall space has as many dimensions as there are blobs (*n*), times five. Add to that the fact that the Euclidean matrix can still be projected into the blob space, and its dimensionality rises to *n* x 5 + 3. Now plop into the blob space a Euclidean matrix that contains a three- dimensional geometrical figure. *The figure —and its matrix—are deformed* by the dynamic interaction of the subfields composing the overall space. The variation of the externally supplied Euclidean figure *registers the global effect* of the endogenous variations. Rather than imposing a form on the blob-space, the transformation of the figure registers the singular dynamic of the self-differentiating field. The deformation of the figure expresses geometrically *a* global effect of the blob space (which envelops an infinity of potential global effects of this nature). The figure expresses the many-dimensionality of blob space in three dimensions, without eliminating that many- dimensionality. And it expresses the self-differentiation of the field as a transformation of a figure that remains the same figure across its transformation. It translates the irreducible self-difference of the field in continual variation, into a change in the same. Three- dimensional geometrical form and its attendant laws of identity are retained by the blob space, but with a difference: they are retained on the level of *variable effect*, rather than as a conditioning matrix standing as an eternal formal cause. In relation to the blob space, the figure and its matrix are dependent variables. The independent variables of the blob space are expressed, on the "whole," in their collective effect, in a dependent variation. Their independence translate into a dependency, in the same movement that links them, without reducing them, to a lower dimensionality and laws of identity that are not their own. The simplicity of the figure co-exists with the complexity of a field, of which it is a derivative and limited expression. The limitation of the Euclidean matrix and the figures it contains is no longer founding or grounding. They are derived. Their closure has been made a dependent variable of a dynamic openness; their relative (deformed) constancy, an effect of continual variation.

Into the constitutive openness of the blob space, forces as well as figures can be plopped. Take for example a view from window. Normally, a view is thought of in geometric terms, as a perspective defined by a breadth and depth of vision: a viewpoint for a Cartesian subject. Think of it instead as a force of attraction: for a libidinal self. A good view attracts clients, and therefore their money, and when the money changes hands, it attracts use-values and indulgences. Now, by analogy, translate that force of attraction of the view into the interacting forces of attraction of a population of blobs. Of course, the attractions of

blobs for each other bears *no resemblance* to the attraction of a client for a view. The "analogy" is fraught with indeterminacy. The reprogramming of the blobs to repeat the force of a view is not just a "translation" of the view into a different medium. It isn't a projection, and the result is not strictly speaking a simulation. It is a reinvention of a view as something qualitatively different: a blob mob. The analogic reinvention leaps across a dissimilarity, to connect two disparate situations—that of the digital design-space on the one hand, and on the other the shared space of the client's and architect's attractions, as converging toward the built-space-to-be of a room with a view. It is disjunctively connective. In its connective aspect, the act of reinvention forms a bridge. What crosses the bridge is a force, not a form. Since force is by nature invisible and dynamic rather figural, the reinvention could not obey laws of resemblance and identity if it tried to. It is at once arbitrary (unregulated by constant laws of formal relation) and astute (calculated to generate a usable effect). The pragmatism of the connection cannot erase the fact the "bridging" is a relation of non-relation, a disjunctive linkage between levels that retain their heterogeneity: a built-in view and a self-varying blob space. But neither is it bothered by that fact. The whole point is that the "analogy" is part of a pragmatic process of *creation*.

Now that the force of attraction of a window has been reinvented as a blob mob, plop in a figure agian: the floor-plan of a house. The outline of the house will be deformed by the multidimensional blob-double of the Cartesian view. The house will deform to the force of the blobbed view. If the view is considered a desired "quality" of the house, then what the designer has done is to make quality visible, in the form of a geometric transformation. This making-visible is not a representation according to general conditions of formal analogy. The analogy is between forces, and the making-visible is an unfolding of a singular dynamic that, while it is pragmatic, is not entirely predictable. Now take the result of this force-fed qualitative deformation, play with it, and come up with a blue-print. It is clear that another gap opens between the result of the computerized design procedure and the final design. The deformed figure cannot be directly used as a design element, marked as it is by the singularity of its forced deformation. It has to move back across the gap from the blob space of which it is a derivative to the building space in which it will have its generic existence as a house. It has to be translated back into a recognizable variation on generally acceptable living space, or it won't sell. This translation is achieved, once again, by analogy—leaving room, once again, for arbitrariness. For creativity. The digital design procedure is bracketted by analog gaps bridged with invention.

The interaction with technology, and the overall process that the digital design is a part of, is radically different in Lynn's practice than in Negroponte's futuristic gadget- dreaming. Interface is not obsessed over, because every aspect of the process is a transformative variation on every other aspect of it, so there is no privileged site of mediation—*there is no media-

tion*, only mutual transformation. The transformations cross gaps that transmit or express force, rather than repeating form. The human doesn't get caught in the double bind of control, because the space with which it works is entirely different. It is highly differentiated, and that heterogeneity is respected. There is no either/or. No: either mastery or control. No: either me, human, or you machine (or was it the other way around?). No: either homogeneous or isomorphic. No: either immersion or imposition. No: either formlessness or form. No failed imperialism of the human over the machine. What there is instead is *co-adaptation*. All of the different levels in play are retained— including reductive Euclidean space and Cartesian control. But everything is retained *together*, in a way that plays everything off against everything else, so that what is retained is retained only as it reciprocally differs. Human-directed constraint and imposition are retained in the programming of the blobs. But human creativity is also retained, in the gaps across which the analogical doubling of forces must leap. Constraint and creativity are not in contradiction, but in cohabitation. One does not ground or contradict the other. Rather, they relay one another. Constraint is no longer a threat from the outside, or in response to that threat the willful imposition of a self-same *form* onto that outside. Instead, constraint is the programming of interactions between *forces*; from those interactions, differentiations unfold. Creativity is no longer a property internal to the self. It is an event that is not entirely decidable, a tactical bridging of an unbridgeable gap between qualitatively different spaces that stand in relation to each other as mutual outsides. The human is not a bubble, an interiority facing its outside, seen as an other to be remade in human likeness. It is the interval, a relay, between outsides. As for the profit motive, it is not encapsulated in a vicious circling of (in)formation for (in)formation's sake. It is no longer assumed, but neither is it moralized about. It is acknowledged as an enabling constraint on the process, and as a necessity of survival. It relays back into the creative process and out into use-values. It is allowed content. For content is no longer in opposition to form, any more than form is in opposition to force. And digitality is no longer in opposition to analogy. And means are no longer in opposition to ends. And closure to openness. And interiority to exteriority. And resemblance to difference. And face to interface. And human to machine. And use-value to information-value. And simplicity to complexity. And production to circulation. They are all in transformative co-adaptation to one another, in a space of non-exclusion. They are all stases in a continual variation that transformatively links their differences. Everything is in relay, and every relay expresses, retains, and varies a difference in nature. There is no purity. Even space itself differs in nature, its primary differentiation being between extensive (inert, matricial/ containing) Euclidean space, and intensive (active, infolding/ expressive) blob-space.(5)

This is completely different kind of connectionism, featuring a different kind of circulation, producing a different becoming. Lynn's design process fosters a reciprocal becoming

of a heterogeneity of elements whose heterogeneity is affirmed. Negroponte's salesmanship-for-mastery is a reductive double becoming, of one thing in the likeness of another, and vice versa, until all that is left is the resemblance, abstracted and materialized. Negropontean becoming is a dialectic of expansion caught in the double bind of control. Lynnian blob-becoming is non dialectical, openly continued. The modes of being and power it germinates are worth exploring, on the eve of the age of interface.

Notes

1. Nicholas Negroponte, *Being Digital* (New York: Alfred A. Knopf, 1995).
2. Maurizio Lazzaratto, "Le cycle de la production immatérielle," Futur-antérieur, no. 16 (1993), pp. 111-120.
3. Marx summed up early capitalism, in which the flow of money was subordinated to use-value, in the equation C-M-C'—the replacement of an old commodity (C) by a new commodity (C'), mediated by an exchange of money (M). In mature capitalism, commodity use-value is subordinated to capital accumulation: M-C-M'. The aim is profit, the production of a new and greater sum of capital through the sale of commodities. In the information economy, the profit-producing exchange of money for commodities is again subordinated, this time by information as a higher-order form of capital: I-(M-C- M')-I. The aim is still profit, but profit is encapsulated in capital's information-form.
4. Greg Lynn, *Blobs: The Measure of Complexity* [[get cite]]
5. Greg Lynn, "Introduction." *Folding in Architecture* [[get cite]]

SOUNDING OUT
GENDERS
COME OUT AND PLAY!
WHY ARE GENDER AND FEMINIST STUDIES SO LATE TO COME TO MUSIC?

By Andra McCartney

andramcc@vm1.yorku.ca

Feminist and gender studies in music began much later than similar discussions in other disciplines. Susan McClary, who authored one of the first texts to systematically explore the intersections of gender, music and sexuality—and this text was published in 1991— says that for a woman musicologist to discuss these issues prior to the late '80s would have been professional suicide, because there were so few women musicologists at that time that they were granted, in her words, only "tentative toe-holds." (1991: 5). Indeed, prior to McClary's 1991 publication, it was a book authored by someone who identified herself as a literary critic that perhaps had most influence on many feminist musicians: *Opera, Or the Undoing of Women,* published in France in 1979, translated into English in 1988, and written by Catherine Clément.

What is it about music that has kept it so resistant to feminist and gender studies? Several theorists point to music's association with the body and with subjectivity. Music makes us dance, we listen to it for sensuous pleasure. It is the least visual of the arts—an audience can have a direct bodily experience of music with our eyes closed. Music moves through us without boundaries: it cannot be framed, pinned down, or shut out by ears that can only be open. Music is linked to the rhythms of the body, of sexuality.

Because of its ephemerality and visceral power, music has been classified as dangerous. Philip Brett, in a recently published volume of queer musicology, says:

Music has often been considered a dangerous substance, an agent of moral ambiguity always in danger of bestowing deviant status upon its practitioners. Both Plato and Aristotle saw it in these terms. Theirs was a legacy of moral doubt that infected much of the writing about music in the West, from St. Augustine's anguish about being moved more by the voice than by the words to the attacks of the Calvinists...Nonverbal even when linked to words, physically arousing in its function as initiator of dance, and resisting attempts to endow it with, or discern in it, precise meaning, it represents that part of our culture which is constructed as feminine and therefore dangerous. (994:11-12)

Other aspects of music besides its association with the body and with sexuality also make it dangerous. One of these is the fact that music is not confined to a space, but rather extends space. The contexts for listening to music, as ethnomusicologist Beverley Diamond pointed out to me, are much more extreme than those for viewing theatre, art or film. A rock concert extends to thousands at once, whereas a portable Walkman encloses the listener in a personal bubble of sound. This means that the social experience of music is hard to control.

Music's meaning is also hard to pin down. Unlike many images, and almost all verbal expression, music is connotative rather than denotative: it is not explicitly referential. Its meaning is sometimes socially shared, but more often individually interpreted or evaluated. We all know that music means something to us, that it often means a great deal. But the symbolic or culturally-shared meanings of music are hard to control because they are so slippery, so changeable and ephemeral, like the sound itself.

Faced with these dangers in music of effeminacy, escape from boundaries, and resistance to symbolic definition, musical practitioners have responded in a number of ways. McClary lists these as: "defining music as the most ideal (that is the least physical) of the arts;...insisting emphatically on its "rational" dimension;...laying claim to such presumably masculine virtues as objectivity, universality, and transcendence;...prohibiting actual female participation altogether" (1991: 17). Insistence on the rational dimension of music is reflected in Western music's development of intricate harmonic rules and notation. The *sound* of music cannot be pinned down, but the written score can be analyzed, quantified, and explained. Faced with a multitude of meanings, music analysts defined music as having no social meaning whatsoever, and elevated to the highest rank what is known as "absolute" music: music without a program, with no supposed reference to anything outside itself.

Electroacoustic music, in its movement away from the written score and towards the sounds of the world around us, liberates composers from this masculinization of their profession, this concern with rationalization, and control of the dangerous feminine. Or does it? Computers allow composers to quantify and analyze not only pitch and velocity, but also, through Fourier transform graphs, to analyze timbre—the quality of sound that sociologist John Shepherd (1987) describes as the most physical. The language of the studio tells us that we can master sound, control it, bang it, punch it, or even kill it. The recording process, as McClary points out, allows us to experience the pleasure of sound "without the troubling reminder of the bodies producing it" (1991: 136), and with synthesis, we can produce symphonies without human performers, using timbres produced by algorithms. This continuing masculinization of musical composition using new technologies is reflected in the demographics of electroacoustic composition, in which women remain a minority.

This is not to say that there is no room in electroacoustic music for questioning gender roles and dualistic divisions. John Cage proposed in 1937 that music produced with the aid of electrical instruments would change what we perceive as music, because all sounds, not just instrumental sounds, could be considered musical material (1961: 3). In the move away from the rules of instrumental composition, fissures have opened in the soundscape that allow experimentation with accepted ideas of what music is, and how-why-when-where-who performs it. The panelists today are all Canadian composers whose work I have become familiar with. They all experiment with these questions.

Introductions:
Kathy Kennedy has an approach to radio that I find transgressive, powerful, and exuberant. She has built a one-watt radio transmitter and uses it for pieces that she calls "sonic choreographies," and "musical interventions." She leads a thirty voice women's choir, transmitting a sound track that the singers receive on boom boxes and that accompanies their singing. On International Women's Day, 1993, the choir did a musical intervention at Montréal City Hall. As well as wreaking havoc with the security guards, the uninvited concert brought joy to the hearts, and smiles to the faces, of the office workers. This kind of musical intervention brings into question where music should—or can—be performed, at the same time that it empowers the choir members who take part and the office workers who enjoy the show. Kathy will be talking today about the dissipation of the human voice through technologies such as radio.

Hildegard Westerkamp is concerned, both in her compositional practice and in her acoustic research, with listening environments. She says that she wants to transport her listeners, to create a place that will allow people to breathe. When she thinks about listening environments, she is concerned both about the physical location, and the metaphorical space she creates. This environment can also be a place where technology can balance sounds differently, drawing attention to the small sounds that are often almost inaudible: making, for instance, crickets louder than airplanes, or barnacles louder than city noise. But she does not do this to fool the listener into believing in an idealistic paradise: in *Kit's Beach Soundwalk*, for instance, she draws the listener's attention to the technological processes that shift the balance between sounds. Hildegard will be talking today about listening and technology.

Susan Frykberg's works often develop themes of motherhood, technology, and agency. *MachineWoman*, a performance piece, employs the cyborg character of MachineWoman to tell parables about the relationships between people and technology. *Mother Too*, a vocal work, uses electronics to extend the possibilities of the voice in an exploration of the sounds of motherhood. *Woman and House*, a work of electroacoustic music theatre, ascribes agency to household appliances and the house itself, as these beings and the two human characters learn about their relationships with each other. Susan will be talking about

her ways of combining electroacoustic music, theatre, and conceptual ideas from the point of view of a woman and mother. In particular, she draws parallels between the blurring of media boundaries and the subsequent cross-fertilization of ideas, and the blurring of physical and psychic boundaries in pregnancy, childbirth and motherhood.

Wende Bartley has written several electroacoustic works that explore the creative, erotic and spiritual potential of the female voice. Operatic convention allows the female voice to be the most beautiful. to soar to the greatest heights and with the most freedom, but the price for this is high—often the death of the character. Unlike the opera heroines who transgress musical and social boundaries, and therefore must be destroyed, Wende's characters are never tamed. They move from silence through fragmentation to speech with a clarity of vision, in her piece *Rising Tides of Generations Lost,*. In another work, *A Silence Full of Sound*, the protagonist moves from repressed sexuality to joyful wildness. In *Ellipsis,* the textless vocal part employs a wide palette of vocables to express an emotional range of remarkable intensity. Wende will be talking today about her work with the potentialities of the female voice.

© Andra McCartney 1995

References

Brett, Philip. "Musicality, Essentialism, and the Closet." *Queering the Pitch: The New Gay and Lesbian Musicology.* Philip Brett, Elizabeth Wood, and Gary C. Thomas, eds. New York: Routledge, 1994.
Cage, John. *Silence.* Cambridge, MA: MIT Press, 1961.
Clément, Catherine. *Opera, Or the Undoing of Women.* Foreword by Susan McClary. Minneapolis: University of Minnesota Press, 1988.
McClary, Susan. *Feminine Endings: Music, Gender and Sexuality.* Minnesota: University of Minnesota Press, 1991.
Shepherd, John. "Music and Male Hegemony." In *Music and Society,* ed. Richard Leppert and Susan McClary. Cambridge: Cambridge University Press, 1987.

Selected Discography

Musicworks 59: "Beyond Boundaries." 1994. Available from *Musicworks,* 179 Richmond St. W., Toronto, Ontario, M5V 1V3. Includes *Never/Always* and *Soundwalk I* by Kathy Kennedy.
Musicworks 48: "The Politics of Music/The Music of Politics." 1990. Includes "The Continuous" from Susan Frykberg's *Woman and House.*
Musicworks 31: "Women Voicing." 1985. Excerpts from *Rising Tides of Generations Lost,* Wende Bartley; *Saxarbra, Machine Woman,* Susan Frykberg; Collage *of Desert Plant Sounds, Cricket Nightsong, His Master's Voice,* Hildegard Westerkamp. Toronto: Musicworks. Cassette MW 31.
Musicworks 28: "Electroacoustic Music in Canada." 1984. Excerpt from Susan Frykberg's *Machine Woman.* Toronto: Musicworks. Cassette MW 28.
Musicworks 26: "A Walk Through the City." 1984. Excerpts from *Cool Drool, A Walk Through the City, When There Is No Sound,* all by Hildegard Westerkamp. Toronto: Musicworks. Cassette MW 26.
"Électroclips." 1990. Montréal: empreintes DIGITALes, 4487 rue Adam. Montréal, Québec, H1V 1T9. CD. Includes *Breathing Room,* Hildegard Westerkamp.
Bartley, Wende. "Claire-voie." 1994. Montréal: empreintes DIGITALes, 4487 rue Adam, Montréal, Québec, H1V 1T9. IMED 9414-CD.
Frykberg, Susan. "Transonances." 1985. Toronto: Underwhich Audiographic. Cassette.
Westerkamp, Hildegard, & Norbert Ruebsaat. "Inside the Soundscape." 1986. 685 W. 19th. Ave., Vancouver, B.C., V5Z 1W9.
    1. *Fantasie For Horns I and II; 2. A Walk Through the City, Whisper Study, Street Music; 3. Cordillera, Zone of Silence Story; 4. Voices for the Wilderness; 5. Harbour Symphony.* Vancouver: Inside the Soundscape. Cassettes 1-5.
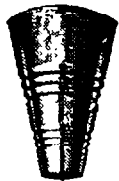
EIDEA

AN EMERGENT INTERACTIVE INSTALLATION

ENVIRONMENT
FOR THE INTERACTIVE DESIGN
OF EMERGENT ART

By John D. Mitchell
iejdm@asuvm.inre.asu.edu
&
Robb E. Lovell
lovell@isa.fa.asu.edu

A bstract

The EIDEA project evolved out of the movement sensing research conducted at Arizona State University's Institute for Studies in the Arts. Described is a system that combines the emergent phenomena associated with artificial life and real-time local weather input to create an autonomous interactive installation. A multi-channel sound environment provides a direct link between the movement of the life forms in the artificial world and current local weather information. A visual mural is produced by the artificial life world representing a composite of the creatures movements and interactions. Current plans will link these elements enabling the viewer to interact directly with the aural and visual elements of the work.

The EIDEA installation is created to explore emergent phenomena commonly associated with artificial life systems by means of an interactive sound and image installation. The work occupies a space of approximately 20 feet square, completely enclosing viewers. It is possible to visually navigate through the artificial world and its associated soundscape or choose to "travel" through a three dimensional image of life form paths that trace the movement history of the cyber-entities over time. The A-life aspect of the work is created to explore the possible interactions between life forms in the artificial world and between external influences such as local weather and viewers. The local weather has a subtle influence on the life forms, affecting their on-going life processes, while current plans allow for the viewers to navigate through this artificial world by means of a movement-sensing system designed by Lovell and Mitchell[1]. The life forms can be sensitized to the viewers presence, and ultimately fashion a response to the presence of people in their world. The work will be described in its four parts; the artificial life world itself, the sound generation mechanism, the weather station, and the role of the viewers or interactors.

Description
A–LIFE

The artificial life world at the core of EIDEA exists as a mathematical plane floating in a vast space. Three artificial en-

tities exist on this plane (referred to as birds, wolves, and trees) and interact to form a closed ecosystem[2]. Trees, formed by a simple L-system[3], grow slowly and over time bear fruit for the birds and wolves to eat. The L-system grammar consists of branch lengths and angles out to a limited length creating a "fractal" shape. Birds consume the fruit of the trees, move in a flocking fashion, and breed to create offspring that then join the flock. The cyberspace predator, a wolf-like creature called a turoid (after computer scientist Allen Turing), feeds on the birds and has its own breeding and life cycle.

Breeding is accomplished in a cycle of mating, gestation, and birth. The two creatures involved in mating must be willing participants. If one of the creatures is pregnant already or if an excitation factor (which grows over time) is too low, they will not mate. (Thus the excitation factor is reduced upon completion of the mating ritual.) Once two creatures have mated, one or both of the creatures can become pregnant. This is determined as a probability based upon the creatures fertility and constitution. Length of pregnancy varies also according to a "chromosome" and at birth a new creature is created which represents a composite of the parents. A crossover point is generated combining both parent's genes and during the process, some genes may be randomly mutated in order to maintain diversity. Occuring at a very low probability, (on the order of one in 100 births) gene mutation is used as part of the genetic world model to maintain adequate genetic diversity. Without this mutation all the animals would tend toward a single genetic makeup.

Artificial life is a study into the inner workings of nature through the use of technology. The earliest tool technologies allowed man to manipulate the world around him to alter the natural order to suit his purposes. However, some things about nature can't be modified, only tested, observed, and modeled, allowing predictions to be made about the outcomes of particular events such as the advent of floods, or the change of seasons. In the past, artists used simple technologies to recreate nature, using music, painting, dance, and sculpture to capture the static or semi-static forms of living things.

Early technology, including pneumatic devices such as floats, siphons, and the water-wheel, were used by the early Egyptians in Alexandria to model time and create gadgets in the shape of animals. Later, with the invention of the mechanical escapement and the pendulum, artifacts consisting of complex behaviors allowed for a more precise modeling of time. As technology improved, man's models of nature progressed and became more complicated. Over time, more and more complicated mechanical systems were devised such as levers which converted circular motion of a cam into linear motions. This provided the means for the creation of complicated mechanical automata which looked and acted like real animals or humans. An example of such an animal is Jacques de Vaucanson's duck, circa 1735, which was described as "an artificial duck made of gilded copper that drinks, eats, quacks, splashes about on the

water, and digests his food like a living duck".[4] One wing of the duck contained over 400 articulated pieces.

Finally, with the invention of the multipurpose modeler, the computer, and the formulation of the notion of an algorithm being the logic underlying a model, regardless of the model's physical manifestation, (Church, Kleen, Gödel, Turing, and Post), allowed the blooming of the modern incarnation of Artificial Life. John von Neumann was on of the first pioneers to formulate a computational approach to the generation of life-like behaviors. His idea was to formulate an automaton capable of reproducing itself and he proved that machines could be formulated with the capability of self-reproduction [5]. Many other experiments have been carried out since that time which recreate elements of life as computer models. Cellular automata, L-systems, and genetic automata are some of the technological tools of the artificial life modeler. This tremendous advancement in the technology used to observe nature has given the artist the capability to not only represent nature in static states, but to recreate it dynamically.

In EIDEA, life forms breed through a process of natural selection. Each form has a genetic make up which determines how well it survives in the environment. A set of behavior genes are assigned values to determine how well or to what extent each animal can accomplish living tasks. As animals mate and their genes are combined, their characteristics are passed on to future generations. Less fit animals tend to be unable to breed and die off because they do not have the tools to survive. Death can occur from aging or from being consumed by another animal, so that animal behaviors adapt over time to environmental conditions.

The behaviors, or in this case movement of the life forms, are modeled to give them unique characteristics. Animal motions are determined through two types of algorithms: a flocking algorithm for bird motion, and an inherited Turing program for wolf motion. Each bird has ten chromosomes which determine its movement capability: eyesight, dexterity, maximum number of other birds that can be tracked, fleeweight, veerweight, follow weight, maximum speed, and acceleration. The flocking is achieved by the bird's instinct to stay close to other birds and yet avoid objects. Birds are also bred to avoid predators (wolves), and fly close to the center of their group. Two global constraints are also imposed upon bird movement; the birds must stay within the boundaries of the world and stay above or on the ground. Because the birds are not given any instructions about where to fly but rather are given ways to behave, they develop a collective behavior of moving about the world as a flock. The algorithm used is similar to an algorithm invented by Craig Reynolds in 1989 that produces flocking type motions.[6] Specifically, each bird keeps track of where two to five birds in its immediate area are located. (The number of birds tracked depends upon the birds perception gene.) If a bird falls behind the center of its group of birds it accelerates; if it

gets ahead it decelerates. Each bird is always moving toward the center of a local group. But should some external object come to the birds attention, it modifies its motions by including a desire to move away (or toward, depending on whether the object is food) the external object. The two motion vectors, flocking and external object avoidance are added together to produce a composite motion.

Wolves, on the other hand, are much more independent, moving alone and in a pattern specified by their own genetic code. They move according to an inherited Turing program, which consists of a list of motions and an ordering of those motions. In 1936 the British mathematician Alen Turing created a theory describing the simplest type of computer [7]. In the theory this computer, although simple in construction, was able to produce any computation. The machine consists of a tape of memory cells and a processing unit called a head which can move up and down the tape storing or erasing a 0 or 1 on the tape according to a list of instructions called a program. Eidea uses this same concept for the motions of the wolf like life forms. A wolf's Turing program consists of a finite list of quintuples of the form <current state, read color, write color, new state, move direction>. Instead of a tape, a plane is used for the storage device and instead of only forward and backward motions, turns are allowed. In addition, the number of states possible is expanded from 0 and 1 to hunt, sleep, eat, mate, and explore. Each wolf has part of its genetic code dedicated to describing the possible motions for that wolf to use. Wolves are also required to stay away from the edges of the world, above ground, and wolves are not able to fly. Each generation of wolves produces new movement programs which are composites of the parent's programs so that the movement algorithms of wolves evolve through natural selection. As wolves breed over time and more fit algorithms are combined, their strategies for surviving adapt.

Sound

The sound generation mechanism consists of a pre-sampled palette of sounds used to create a sound space. This is done partially through the use of a non-linear chaotic function, $x_{i+1}=rx_i(1-x_i)$, which Mitchell Feigenbaum used to while formulating his theories on chaos while working at Los Alamos.[8] This function is interesting in the interval where r is in the range from 0 to 1 and chaotic when r is > 0.86. To generate a series of notes, an initial x value is fed into the equation and a new x is generated. This x value is then scaled to match an audible pitch in a 48 tone per octave tuning system and played. The new x value is then fed back into the equation generating a new note. The process continues at a certain metronomic rate creating a melodic line. During the feed back cycle, values for metronomic rate and the r constant can be changed forcing the function to travel into new chaotic fields and structures. In the EIDEA system, several chaotic functions playing various sample instruments are used to create a thick texture of complex interactions. These functions are made more complex by linking various sound parameters to real-time weather data as described below.

The music sound-space is controlled by both weather events and statistics from the artificial world. Specifically, the locations of one of the bird flocks controls the location and the balance of particular sounds in the multi-channel sound system. Thus, an observer can hear the sound moving from one side of the room to another following the birds around their environment. Population statistics of each of the colonies are used to add instruments to an on-going orchestration. As breeding outpaces dying, the sound score becomes increasingly more complex. If dying is greater than breeding the reverse is true. The remainder of the score is based upon current weather information including temperature, relative humidity, barometric pressure, wind speed and wind direction. These elements are mapped directly to the sound generation algorithms, created in MAX[9], and act as a looking glass by reflecting the cycles and patterns of the local weather then translating these cycles and patterns into aspects of the soundscape. It is possible for the viewer to literally hear changes in temperature, humidity or barometric pressure. The multi-channel soundscape, generated from a combination of external weather data and statistical information from the cyber-world, then becomes an intermediary or crossing point between cyber reality and the natural or outside world, placing the viewers at this nexus.

Weather

A weather station links the computer-generated life forms to local temperature, wind speed, wind velocity, barometric pressure and relative humidity. In the same way that cosmic forces influence the weather of the earth, and eventually our own day to day existence, local weather has an impact on the behavior of the cyber-entities and on the development or evolution of their world. It is possible to see our weather cycles, such as the regular temperature fluctuation in a 24 hour period, as epochs or eras of the artificial world's evolution. The weather of our outside world influences the behaviors and abilities of the creatures in the artificial world where wind velocity, for example, causes the birds to have some trouble flying, actually blowing them around at times. Creatures hunt and eat more during warm periods, and more breeding occurs during cold. These changes, of course, also provide a secondary effect upon the sound score.

Viewers

Viewers can interact with the installation in two very direct manners. A three dimensional electronic mural records the movement of the life forms in the world, providing a history of their activities. Constructed as a record of the motions of the animals math space, the mural results from recording the paths of the life forms and then sampling a set of images based upon their genetic makeup. This image, updated continuously, reflecting the evolution of the life forms, their genealogy, and showing how the different movement strategies develop. Viewers can move through this image by changing their position in the installation, or they can choose to explore the artificial world directly. The EIDEA artificial life environment is displayed in real-time, continually showing the movement, growth, birth, and

death of the creatures within. Current plans include using the Virtual Sensing Environment[1] to connect viewers to the artificial world. By displaying one half of the EIDEA world on each side of the viewer, we hope to provide the viewer with the experience of actually being a part of this artificial environment.
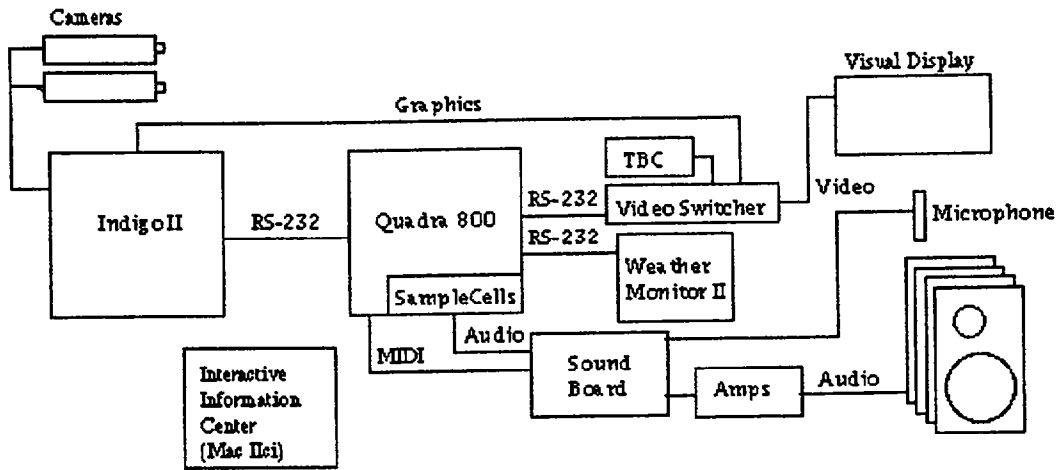
Figure 1. System Overview

The work's duration can be a minimum of several hours to a maximum of several weeks. Once the world is initiated, the score is self generating and will continue to run until the world is ended. Sound sources include two SampleCell cards in a Macintosh computer, an outboard analog synthesizer module, and a microphone. Sound generation and control are based on data obtained in real-time from two sources; a Davis Weather Monitor and the artificial world running on an Indigo II.
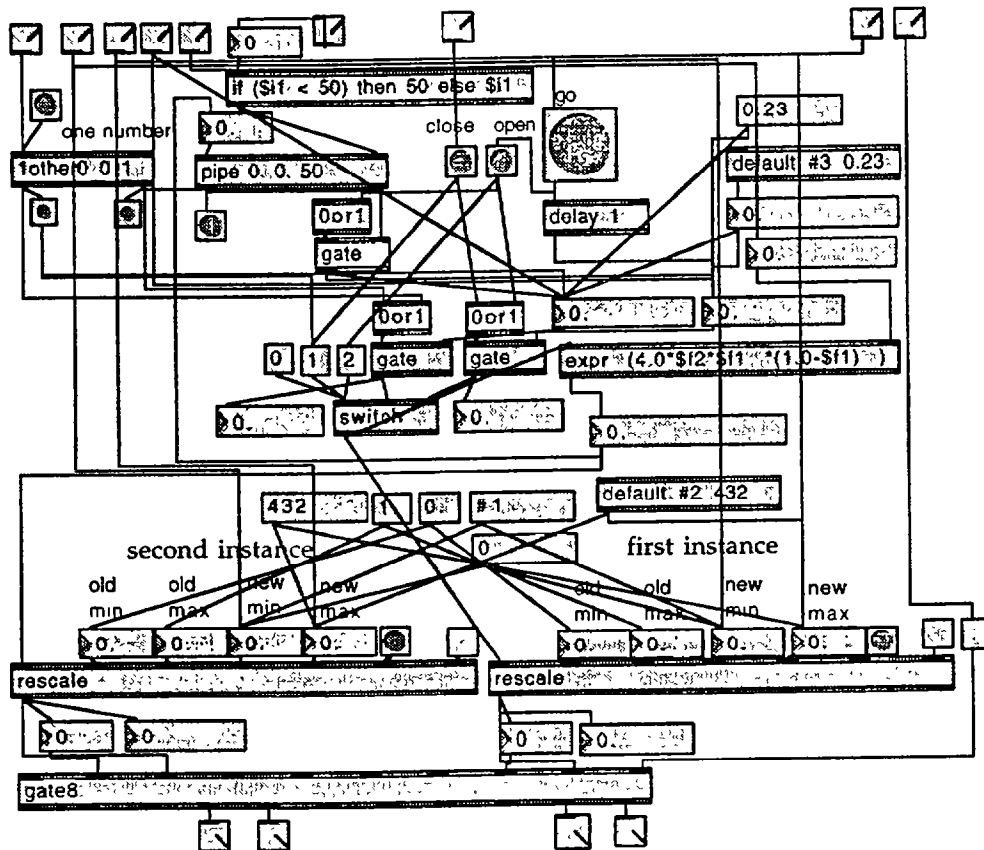
example of a chaos function realized in MAX

Conclusion

The concept of monitoring weather information stems from the artists' fascination with performance events based on real-time data input and an interest in exploring the rhythm of the natural world. The artists plan to continue working with artificial life as an aspect of a larger vision of contemporary installation art.

Notes

[1] Lovell, R. and Mitchell, J. (1995) "Using Human Movement to Control Activities in Theatrical Environments", The *Fifth Biennial Conference for Arts and Technology*, Connecticut College.

[2] The artificial world in EIDEA is not designed to model any specific biological ecosystem but has been created specifically to explore the interactions possible in the installation.

[3] Dutch biologist Arstid Lindenmeyer pointed out that with just one trivial rule you could describe the developments of a hypothetical plant from seedling to complex bush. And by adding just a few more rules, you could model the step-by-step development of branches, leaves, and flowers in three dimensions, as well as the steady spread of hormones and other regulatory compounds from one part of the plant to another. Called L- (for Lindenmeyer) systems, advanced graphics workstations can easily convert these symbolic expressions into realistic on-screen images of leaves, flowers, and stems. M. Mitchell Waldrop, "Artificial Life's Rich Harvest", *Science*, V257, pp. 1040, August 1992.

[4] Chapuis, A., and E. Droz (1958). "Automata: A Historical and Technological Study", trans. A. Reid (London: B.T. Batsford Ltd.).

[5] von Neumann, J. (1966) "Theory of Self-Reproducing Automata", edited and completed by A. W. Burks, (Urbana, IL: U. Illinois Press).

[6] Reynolds, Craig W., "Flocks, Herds, and Schools: A Distributed Behavioral Model", *Computer Graphics*. V21, N4, pp. 25-34, July 1987.

[7] Alan Turing, "On computable Numbers..." reprinted in Martin Davis, ed. The Undecidable, *Raven Press*, 1965.

[8] "Physicist Mitchell Feigenbaum, predicted that at the critical point when an ordered system begins to breakdown into chaos, a consistent sequence of period-doubling transitions would be observed. This so called 'period-doubling route to chaos' was thereafter observed experimentally by various investigators. Feigenbaum went on to calculate a numerical constant that governs the doubling process (Feigenbaum's number) and showed that his results were applicable to a wide range of chaotic systems. In fact, an infinite number of possible routes to chaos can be described, several of which are 'universal,' or broadly applicable, in the sense of obeying proportionality laws that do not depend on details of the physical system." Gollub, Jerry and Solomon, Thomas. "Chaos Theory", *The American Encyclopedia*. Grolier Electronic Publishing, Inc. 1992

[9] OPCODE Systems object-oriented programming language specifically designed to work with MIDI data is called MAX.

GENDER & TECHNOLOGY: THE EPISTEMOLOGICAL PROBLEM

GENDER AND TECHNOLOGY: WHAT PROBLEM?

By Mary Leigh Morbey

gmorbey@mach1.wlu.ca

O n August 25, 1995, the astute and profound newspaper USA Today in a front page lead story reported the launching of Windows 95 as the "geek event of the century"[1]. USA Today relates early in its commentary on Windows 95 that "it's a guy thing. Few women were among early buyers"[2]. These comments in the popular American newspaper point us to the topic we are here to seriously consider together: "Gender and Technology: What Problem?"

My response to this question is: "The Epistemological Problem." I am questioning the knowledge structure of computer science and its impact on males and females. Let us begin by considering the double pronged question: Does computer science in its theory, practice, and politics embody discrimination towards women, and if so, how does this embedded discrimination work *itself out in applications to the arts?* The difficulties for women in computing have been communicated over the last decade through a variety of major research institutions' reports on women and computing, in numerous computer science publications, through published critical studies on women and computing, and in sundry organizations for women in computing[3]. I will not rehearse the long list of contributors to the discussion. These studies, reports, and organizations confirm what we have come to recognize and experience: **There are biases, limitations, and obstacles to women's participation in computing.**

I will briefly suggest two ways to get at this question of discrimination and limitation with regards to women and computing, and invite audience and panel participants to expand the discussion. First, physicist Evelyn Fox Keller, in her social study analysis of modern science, argues that modern science is a male-shaped domain in the construction of its epistemological structure molded on the foundation of a male-shaped western philosophy. This philosophical base leads to a view of knowing privileging a linear, hierarchic, rational, and abstract approach to knowing. Further, she contends that this knowledge structure, from Plato forward, has systemically ignored or distorted everyday living contexts, thus remaining a male-shaped domain from the vantage point of both epistemological construction and sociological construction. I argue elsewhere that would take too long to elaborate here that the knowledge structure of computer

science is the offspring of the knowledge structure of modern science and also neglects living contexts, thus ignoring questions concerning gender ideology, ideas about ethnicity and class, and considerations affecting power constructs managing electronic-based information and equipment accessibility[4]. A philosophical tightening of the modern enlightenment view of science during the past century and a half, and consequently also of the younger field of computer science, has made this epistemological approach even more rigid and exclusive.

Second, to further investigate the epistemological structuring of computer science and subsequent socialization processes, I administered in 1994 and 1995 survey questionnaires and constructed interviews concerning computing and discrimination to almost 500 persons at two major United States research institutions with strong concentrations in computer science and related areas involving the arts. These instruments were designed to search out deeper understandings concerning biases, limitations, and obstacles in computing, locate discrimination, and initiate change with regards to women and minority persons in computing, and to computer-based applications in the arts. Let me briefly and summarily review the findings for you.

The findings overwhelming indicate that the major problem bringing forth bias, limitations, and obstacles for women in computing is situated in the knowledge structure of computer science. The data illuminates particular knowledge-base problems: females suffer intellectual intimidation from the "the old boys' network" which often stereotypes women as illogical and gives an assumed edge to males in knowledge comprehension and knowledge development. Males who have been "hacking" and experimenting with the computer often from the ages of four or five years gain computing prior-knowledge and prior-experience advantages over females of apparent similar intellectual aptitude and capability. Studies in educational computing consistently discuss the predicament of a lack of computing in elementary and secondary school, noting however, that when computing education is available, it is usually males that benefit.

These factors, accompanied by further substantiating data, call for strategies and developments within all levels of computer science education and the computing industry to alter the prior computer knowledge, prior computing experience advantages that favor males, to search out alternative approaches to computing other than just those based on western logic, to build a "critical mass factor" in education and industry that includes both female and male leaders and mentors, and to develop alternatives to the so-called "male geekdom" attitude and ambience that often pervades computing environments, as noted in the USA Today remarks. A surprise in the data was the lack of insightful commentary elaborating social beliefs and understandings about women in computing, and points to a need for further research to provide a more in depth analysis about socialization problems of women and minorities in computing.

Let us conclude this panel contribution by asking the question: If there exists, as argued, discrimination towards women and others in the epistemological structure of computer science, what does this have to do with computer-based applications in the arts? Applications of developing electronic technologies to the arts embody the underlying epistemological structure of computer science that forms the technologies. The application of a particular electronic technology is not an act of neutrality for it embraces the epistemological structure of the technology and passes on embedded discrimination. Looking particularly at applications of electronic technologies in the arts, we are faced with contemporary challenges raised by this hidden discrimination. We stand at a point where in a situation of little or no existing theory for the electronic arts, we can build theory, ethical in its forming, that takes into account analysis of biases, limitations, and obstacles in computing for women and minority persons, and theory that reconnects the modernistically partitioned concerns of arts discourse, electronic technologies, and our everyday living contexts.

Finally, let me emphasize that the changes I am suggesting for the theory, practice, and politics of computer science will require a communal effort to address social injustices to males, females, and minority persons who are involved with its knowledge structure and its many applications, including the arts. Perhaps, in a front page lead article in the August 25, 1998 edition of USA Today we will read about Windows 98 as an inclusive and friendly environment for women, men, and minority people.

© Mary Leigh Morbey 1995
Redeemer University College

Notes

[1]. James R. Healey, "What A Show" and "Eager Buyers Seeking More Than Software," USA Today 25-27 August 1995, A-1, B-1.

[2] Healey (25-27 August 1995) [1] p. B-2.

[3] Barriers to Equality in Academia: Women in Computer Science at MIT (Cambridge, Mass.: MIT, 1983); Women Undergraduate Enrolment in Electrical Engineering and Computer Science at MIT (Cambridge, Mass.: MIT, 1995); K. Frenkel, "Women and Computing," Communications of the ACM 33 (1990) pp. 35-46; A. Pearl, ed., "Women in Computing," Communications of the ACM 38 (1995) pp. 26-82; and E. Spertus, Why Are There So Few Female Computer Scientists? Technical Report 1315, Massachusetts Institute of Technology Artificial Intelligence Laboratory (Cambridge, Mass., 1991).

[4] M.L. Morbey, "Gendered Technology for Art Education: The Case Study of a Male Drawing Machine," Arts and Learning Research 10 (1992-1993) pp. 88-100; M.L. Morbey, "Aaron: Portrait of the Young Machine as a Male Artist," Revue d'art canadienne/Canadian Art Review XX (1993) pp. 130-139; and M.L. Morbey, "Women, Discriminating Computer Technology and Visual Arts Education: How Might It Be Different?" in D.C. Gregory, ed., Art Education and Technology Anthology (Reston, Va.: National Art Education, in press).

DUMMIES, DOLLS AND ROBOTIC SIMPLETONS INTERPRETING ARTIFICIAL STUPIDITY

BODY NARRATIVES

By Margaret Morse

mem@cats.ucsc.edu

"Although humanity has fashioned a system of powerful, immaculate machines and products, in their presence the human subject can only feel a sense of belittlement, incompleteness, lack—a feeling [Günter] Anders calls 'Promethean shame'. [....] It is the human body itself—comparatively unadaptable, vulnerable, mortal—that is felt to be the ultimate obstacle to the perfection of the machine environment."[1]

I n the age of smart houses, art that manipulates the perception of artificial intelligence downward gathers a critical importance. Why are divine or demonic powers of omniscience and immorality so often projected onto the bodies of machines in the popular imagination? If the Greeks had three levels of social interaction—between the divine, the human and the realm of the sub-human (in their eyes, the comic world of servants and slaves)—then, the mythology of machine-human interactions is tragically organized around divinity. "Cyborg envy" (cf. Allucquere Roseanne Stone) is another aspect of this tendency to attribute perfection and the aura of futurity onto our own artifacts. Meanwhile, our own everyday experience tells us that even the smartest machines are pretty dumb with their one-track literal-mindedness and their tendency to break down at every contingency. Why are we humans being inculcated with an inferiority complex or feelings of 'Promethean shame' about our own bodies in relation to machines? The pressure on artists to master the very latest software on the most advanced hardware is equally part of this endless and fruitless human quest to match purported machine progress and perfection. While pride in electronic craftsmanship should not be dismissed, the arts are not just a part of an electronic culture, they are also *about* it. An interactive art work that embodies a metaphor or meta-interaction about the relations between humans and their machines must be free to adopt any level of technology appropriate to the statement to be made. Art that demonstrates the dependency, solipsistic behavior, lapses of intelligence and the tendency toward fatigue and obsolescence and general overall stupidity of machines is welcome here.

What kind of statement is an artist who produces robots which limp and drag themselves ungracefully across the floor trying to make? That was the question I asked myself at an Alan Rath exhibition a number of years ago. Then, I met *Adelbrecht*

isea95@er.uqam.ca T : (514) 990-0229
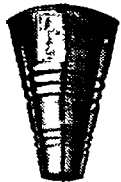
ISEA95 montréal

at the Machine Culture Exhibition at Siggraph 1993. This robotic ball with delusions of grandeur (thought he was god) rolled around an enclosed area full of tables, intruding and interrupting human conversations with his irrelevant mumbling. He was like a humping dog at my feet and every time I rolled this machine pest away, his gyroscope would flip him around and send him right back to me. (Of course, *Adelbrecht* eventually broke down, probably from rough handling.) I learned a lot from Martin Spanjaard's irritating piece of art: it exposes "interaction" with machines as a fallacy based on the assumption that events that occur simultaneously are causally related. Just because this "bachelor machine" is emitting language doesn't mean that it is talking to me; just because it keeps coming back doesn't mean it has lust or affection for me. Furthermore, the apparent onanistic self-sufficiency of its programmed mutterings to itself are not divine self-completeness but a kind of psychotic incapacity to relate to its immediate context.[2] (Rath's imperfect robots, on other hand, offer the appearance of suffering that is more like our own.)

At the same exhibition, Perry Hoberman's *Faraday's Garden* (1993) invited visitors to interact with obsolete consumer appliances and dated audio-visual technology by executing what amounted to dance steps on a mat spotted with sensors. Machines buzzed and whirred in a chorus together, depending on where human feet fell. Freed by fashion from their instrumentality and sense of benefit or menace, such purportedly immortal machines are reduced to junk and garage sale detritus, their will to power pared back to the desire of an electric cord for a power supply. The technological simplicity of this piece finds its counterpoint in the artist's *Bar Code Hotel* (1994), using the most advanced and expensive computer: images of teddy bears, Elvis and other objects are made to shake, rattle and roll depending on what bar-codes are stroked, responding to the relentless surveillance and pressure toward rationalization and consumption with pure silliness.

In my subsequent search for examples of intentional artificial stupidity, I made a number of discoveries of dumb and dysfunctional machines, including Milo Garcia's ludicrous wall painting machine ("Two motors working together to paint a room" 1994), his skipping machine or "Dog chasing tail"[3] and other works as well as Paul deMarinis' low-tech Rube Goldbergesque musical creations. However, I became particularly interested in empty headed dolls and dummies, electronic or not as creations that explore the "evacuated subjectivity" and the "overthrow of the will to power," that is particularly new to the male subject.[4] The cultural work to be done on masculinity is quite different than on femininity; for that reason, empty-headed and single-minded female fools, clowns and naives have an entirely different and usually backward if not obsolete resonance. (The female couple in *Absolutely Fabulous* is a notable exception.) Barbie doll art, including the Barbie Liberation Front's reverse shop-lifting and reversing of the voice-boxes of "GI Joe" and "Barbie" or Sharon Grace's recent piece putting guns in the hand of the new girl-sized (between 3 1/2 and 4' tall)

Barbie—the owner age 3 to 7 may put on Barbie's wedding dress—relies on shifting gender codes for its effectiveness. Note how girls and women are expected to inhabit the position of the evacuated doll, a point which Todd Haynes' use of a Barbie doll as stand-in Karen Carpenter in his documentary on the star and anorexia, *Superstar* also makes. Unlike the fashion mannequin, the Barbie doll dummy in essence wears the child, rather than vice-versa. Similarly, the prosthetic authorship and control of the ventriloquist and puppeteer is reversed in the electronic ventriloquism of Mitsubishi's *Kaori* program (demonstrated at Siggraph in 1993): the electronic persona wears the human voice, not vice versa. *Kaori* is one more example of the colonization and subordination of the human body to virtual technology that work like Catherine Richards, among others, sets in question.

It takes drastic measures, i.e. symbolic castration, to evacuate masculine subjectivity; Tony Oursler's early use of empty suits as dummies or this example of Stephen von Huene's upper-bodiless *Tischtänzer* ("table dancers" at the ZKM Multimediale, 1993,) are examples. The table dancers each have eight pneumatic joints that perform twenty-five different dance sequences programmed at random to tap to the beats of Bizet, Handel and "Great Speeches of the Twentieth Century." (The dancers move a 200th of a second in advance in order to achieve the uncanny yet so obviously fictitious sense of simultaneity.) Oursler went on give his dummies and dolls faces and to project the severed heads associated with television onto them. Like transitional objects, extreme psychic states of pain, anger, agony and other manias could be dramatized in a literal way that we would be unlikely as well as extremely discomfiting to confront in a "real" human being. The uncanny nearness, yet difference to ourselves allows for the distancing and recognition of repressed or gladly forgotten traumas. Oursler found that the scale of the doll or dummy also makes an enormous difference in the reaction of visitors to his work in exhibition; tiny dolls in great pain evoked the most pathos.[5] "Bodies" could be joined into a gigantic mass of one collective body or melted directly into significant objects, as in "System for Dramatic Feedback" (Portikus, Frankfurt 1994 and MOMA 1995); in this piece we are in the psychic space of primary process thinking on the other side of the fourth wall, as the flat projection of spectators in a movie theater onto the wall of the installation demonstrates. Oursler also projects facial features onto flowers, giant pills, and bodily organs preserved in formaldehyde—what is inside is projected outside. In "The Laugh of #12", the organ jars are having a conversation full of non sequiturs because it is out of synchronization, suggesting an underlying solipsism of machine-mediated interaction that is masked through simultaneity.

Ken Feingold's "Where I can see my house from here so we are" (1993-94, exhibited at the Interactive Media Festival 1995) seemed like put-on to me at first, (especially since I had been taken in by his "documentary," *Un chien délicieux,*): Charlie McCarthy style robot-scooters with cameras for eyes and microphones for ears roam a mirror world, operated

telematically by remote joysticks and a *Kaori*-style ventriloquism program: several members of the public hidden behind curtains like the wizard of Oz, can speak and move via their avatars in the "public" or exhibition space. However, it is incredibly difficult for the robot operator to orient her-or himself in the mirrored space using the monitor or to figure out whether one is seeing a "real" other dummy or a mirror reflection of "oneself". (I spent most of my time in this piece running my wheels up against my own mirror image.) Furthermore, the dummies can never "physically" meet, since each is held in its own sector by a barrier; and, the quality of the experience depended on the effort and ingenuity all the robot-masters were willing to put into open-ended play amidst such confusion. The frustrations I felt in the piece were revealing, as this piece is a metaphor that embodies many of the features of electronic exchanges on the Internet and elsewhere. Perhaps, like Don Quixote confronting the knight of mirrors, the piece was designed to confuse us out of a delusionary state.

Considering the growing importance of "enhanced reality" and the fantasy of ubiquitous computing in contemporary society, art that foregrounds and experiments with the projection of personality onto dumb objects is part of a project of demystification. While Heinrich von Kleist's empty-headed and graceful marionettes evoked the sublime, objects that seem stupid, clumsy and goofy are the humorous and pathetic exponents of our situation in the comedy of the slaves to mythologies of technology. Fools, simpletons and clowns have always been good for establishing an ironic relation to symbolic codes and conventions. It is interesting to speculate on why there is a vogue for such figures in contemporary popular and mass culture, from the regressive ideology of *Forrest Gump* and the delightful silliness of the clowns in *Dumb and Dumber* to the non-judgmental protagonist of *Ed Wood*, who mixes genders and plots and narrative codes in films so bad they are good. Historically, naive figures from *Don Quixote* to the "adventurous super simpleton" of the Thirty Years war in Germany (*Der abenteuerliche Simpliccisimus*) are marks of an age of transition, in which conventional codes are in flux and older mythologies still hold sway long after the societal forms they sustained have melted away. The meaningless presence of *Forrest Gump* in the audio-visual documents of historical events of a whole generation is a warning that naiveté can also be just pathetic emptyheadedness. A perfect cipher with magical powers who never changes or learns anything is in no way a cultural model. (Note that I do not believe this figure has much to do at all with mental disability or with the actual, very complex, extraordinary human beings who suffer from it; nor does the historical tradition associated with fools, simpletons, dummies and clowns have any direct relation to the cultural artifact of I.Q.) Artificial stupidity is an experiment that can enrich the range of our cultural imagination, just as it can serve regressive notions of the redemptive power of simplicity and foolishness. The dummy doesn't have to learn from the experience if we can.

© Margaret Morse 1995

Notes

[1]Christopher Phillips, "Desiring Machines: Notes on Commodity, Celebrity, and Death in the Early Work of Andy Warhol," in: *Public Information: Desire. Disaster. Document* (New York: Distributed Art Publishers and the San Francisco Museum of Modern Art, 1994), citing and commenting on Günther Anders ["other", birth surname Stern] notion of serial reproduction as immortality, *Die Antiquiertheit des Menschen: Über die Shicksal der Seele in den zweiten industriellen Zeitalter* ["the obsoleteness of humanity: on the fate of the soul in the second industrial age"] (München: H. Beck, 1956).

[2]Nell Tenhaaf describes the "willing machine" and the "bachelor machine" as exponents of a masculinist relation to technology in "On Monitors and Men and other Unsolved Feminine Mysteries: Video Technology and the Feminine," in: *Critical Issues in Electronic Media*, ed. Simon Penny (Albany: State University of New York Press, 1995), pp. 219-233.

[3]See Aladair Duncan's "Milo Garcia, i'M a Gorila c, i Micro Gala, i i a GlaM roc." *Mute 1* (Spring 1995), p. XII.

[4]See Tenhaaf, p. 227.

[5]Susan Stewart's *On Longing* is a sustained exploration of the cultural meaning of scale. Oursler's "System" explores both the gigantic body made of fragments and the enclosed toy worlds of the miniature.

THE ICUBE SYSTEM:
MOVING TOWARDS SENSOR TECHNOLOGY FOR ARTISTS

By Axel Mulder

amulder@sfu.ca
WWW http://www.sfu.ca/~amulder

A bstract

Art can be called interactive if an intelligent response (in terms of changing lights, sounds, images, moving objects etc.) to an action by a performer or visitor or to a changing environment occurs. To add such interactive capabilities to their art or performances artists have to engage in a costly and difficult dialogue with highly skilled technical persons. A data acquisition and processing system based on MIDI and Opcode's Max is proposed to facilitate, for artists, the design and creation of interactive art.

Many artists include some form of interaction in their creation (Atkins (1994), Crawford (1994), Demers (1993), Schiphorst (1992), Malina in Leopoldseder (1990)). An interactive art installation may have a response to an action of a visitor, or in a performance, the artist may control or interact with one or more media. To detect the actions of the visitor or performer sensing devices are required. In addition to this, it may be of interest to capture environmental variables, such as room temperature or windspeed. Up to now artists had to fall back on existing, commercially available controllers or sensing devices, designed for specific applications, i.e. with little flexibility, to include such interaction.

Before examining existing sensing devices, it is important to distinguish the levels of abstraction that can be used in describing events and changes in the environment and human behaviour. For example, the description of an event or change can be:

- physical (lightlevel in lux is represented in voltage)
- signal (rate of increase of lightlevel)
- gestural or environmental (hand moves away from light sensor, or lights are coming up)
- emotional or multimedia (tension increases in the currently playing sequence of sounds, lights, images etc.)

These distinctions are important because the aim is to interpret the events or changes in a given context so that they can be used to generate other events or changes. Therefore they need to be expressed in a similar representation as that of the context. This can be achieved by analysing the events and extracting features, information, meaning etc.. For instance, if the sys-

tem would describe touch as the amount of pressure exerted on a surface by a finger it is not apparent from the data, without further analysis, that someone is hitting the surface or stroking it. Transducers describe an event or change only at one level of abstraction, ie. in physical terms. They are devices that generate an electrical signal (voltage, current, charge, ..) as a result of an event. Sensors and detectors however address a variety of levels of abstraction. Sensors, transducers and detectors are all sensing devices. These distinctions are also very useful in the dialogue between artists and technologists, since they often communicate at different levels of abstraction.

Existing sensing devices and the interactive art design process

A variety of devices that output MIDI data exist (MIDI keyboard, MIDI guitar, Yamaha EWI (MIDI wind instrument), Zeta violin). However, they are only suited for very specific gestures in musical performance practice. Computer input devices (keyboard, mouse, trackerball, joystick, tablet) require know-how to access sensor data, while they are also designed for specific gestures, mostly for work with computer displays, ie. involving the visuo-motor system. Scientific research instrumentation (general purpose data acquisition system, motion capture installation, instrumented glove) requires a lot of know-how to operate and is also very expensive.

In many cases the artist's interaction needs require instrumentation with different shape, configuration or capabilities than is available or they cannot afford or do not need the extra capabilities of the systems that would cover their needs. Also, their process to a final art piece may require a lot of experimentation with different sensing capabilities which implies the need to purchase a number of different specialized sensing devices. However, when considering the possibility to design and build sensing devices with individual hardware components, it is currently technically challenging for an artist to use and experiment with transducers and build sensing devices in a way that suits their needs within a reasonable amount of time and money. Usually, the artist falls back on very simple systems, such as alarm installation components, that were designed for the consumer market but which can be hacked quickly into their art installation or performance. Very little flexibility and reliability normally results.

While it can be argued that the resulting technical solution is an integral part of the art piece, it is hard to believe that the point of the art piece is to convey to a visitor or an audience the technical solution itself. Such art would be indistinguishable from a demo as a technological research result. However, it is clear that the boundary between art and technology can be as thin as a silicon wafer.

Design of a sensing device development system for artists

With the above considerations in mind the design of a solution to the varying sensing needs of an artist has some surrealistic feel. On the one hand such a design would "improve" the day-to-day life of an artist since he or she wouldn't need to delve as much into the technical knowledge and an interactive art piece could be put together more easily, on the other hand many artists will say they still need to expend as much effort as before to come out with an interesting piece. This ambiguity has consequences for the design of such a system for the development of sensing devices, since it is not obvious which capabilities of the system are important to the users.

In interactive artworks, four types of systems can be identifed (fig. 1-4):

- Interactive Installations that respond to Natural, environmental phenomena (NII). Example: a sculpture that changes shape depending on windspeed and temperature.
- Interactive Installations that respond to actions of an audience, consisting of one or more persons (HII). Example: a puppet with temperature transducers and piezo elements that can be touched, hugged, hit etc..
- Non-immersive Interactive Performance Systems (NIPS) - systems that interact with a human performer, who performs for an audience. The performer perceives the system separate from the natural environment and his/her body. Example: a performance space with pressure transducers on the floor and lightbeams that illuminate lightintensity transducers. The performer can step on the pressure transducers and interrupt the light beams.
- Immersive Interactive Performance Systems (IIPS) - As NIPS, but the performer perceives the system integrated with the natural environment and his/her body. Example: a glove or suit with pressure, flex and myoelectric transducers. The performer can move or gesture and affect a virtual environment.

While NIPS and HII appear to have similar characteristics, a distinction is made because in NIPS (as well as IIPS) the performer (the system) has learned to interact with the system (the performer) with greater refinement than is the case with a visitor in a HII. One can also say that interactive art consists of interactive devices, from small ones, that are possibly wearable, to big ones, or it consists of interactive spaces. Interaction takes place between humans and/or nature and the system, where the level of familiarity of the human (system) with the system (human) plays an important role.

As discussed above, the variety of interactive art works and performances is large. Also, an individual artist may want to experiment with a variety of sensing devices. Therefore it is sensible to make a system that allows artists to design their own sensing device. This is feasible for non-engineers in the case of HII, NII and NIPS. However, in the case of IIPS, sensing devices that are designed to be worn by a human performer more often require very specialized engineering and transducers (Mulder, 1994).

Functionality

In general, the systems that enable the artworks or performances discussed above implement the following functions in order:

- Transduction of physical phenomena into voltage or current through transducers.
- Low level signal conditioning and processing.
- Feature extraction, data management and analysis.
- Mapping functions and setup management.
- Generation of sound, light, image, motion etc.

Furthermore, multi-channel analog to digital data conversion will be necessary at an early stage in the signal/data path to reduce noise and interference. Also, data transmission by cable or wireless systems, using a communications protocol will be necessary since not all functions will be implemented in only one physical device.

Max, an object oriented graphical programming language, by Opcode Systems, is used in many interactive artworks, especially music compositions and performances, as a prototyping and performance tool for mapping and setup management, because of its ease of use and expandability. Max is also suitable for implementation of feature extraction and data analysis.

Earlier work and products

Commercially available products that implement the first 4 functions listed above are hard to find. A number of manufacturers have marketed control voltage to MIDI converters. These devices however, convert usually only upto 8 channels from analog to digital with only 7 bits, which does not allow for any ranging ("zooming in"), ie. signal conditioning hardware is needed. They lack power supply for transducers that need to be powered or only allow resistive transducers. Also, although they can interface with Max because they output MIDI data, an interface that allows for easy configuring of a sensing device and its setup needs to be programmed. In fact, they were not designed for tranducer interfacing, but for converting signals from "ancient" analog synthesizers into MIDI. STEIM in the Netherlands has implemented most functions in their hardware design called Sensorlab (Anderton, 1994). Although it converts with only 8 bit resolution, it does include signal conditioning hardware which allows "zooming in" on a particular part of the voltage input range. The data transmission protocol is MIDI, while mapping is implemented in software called Spider. The Spider software environment is not as user friendly as Max, since it is a text based, C-like programming language. Some command line addicts will no doubt disagree. The SensorLab is quite expensive (about US$2500) and therefore not used by many artists with small budgets. Wired serially connected data aqcuisition systems that are marketed to the industrial market have no mappingsoftware suitable for the current application, too few channels, nor a MIDI interface.

They are also very expensive since they comply with industrial standards. Other efforts in the desired direction remain in R&D stages. Curtin (1994), worked on a system called the SoundLab, after STEIM's SensorLab, that included a lot of mapping functionality. His design mainly addressed electronic musical instrument design problems.

The iCube project

Since the system design criteria outlined above were not met by available systems, the iCube project was started to realise the desired system, gain experience in the field and possibly commercialize the result. An investigation into cheap transducers useful for artists was conducted and a system was built with the following properties :

- The digitizer unit, small and wearable, is based on a 68HC11 microcontroller. It converts analog signals to digital of upto 24 transducers with 12 bit resolution and upto 8 transducers with 8 bit resolution. It also has 8 binary outputs (switchable between 0 or 5 Volt). It normally communicates via MIDI system exclusive messages with Max.
- The digitizer plugs into the patchbay, a 19 inch rackmount unit, which, when needed, allows easy access to individual analog inputs.
- The iCube and oCube Max objects decode the MIDI messages and prepare the signals for processing and mapping .

In order to obtain user feedback, local artists explored the following HII, NIPS and IIPS works with the system.

"The space in between"

In the Western Front, an artist-run center in Vancouver, the author worked with Grant Gregson on an IPS application of the system. The piece explored the idea of capturing gestures, particularly of the upper body, of a musician (a pianist in this case) that do not normally result in sounds directly. The captured data then controlled lights as well as the actions of a piano, a Yamaha Disklavier.

Two computers were used, one for developing patches for controlling the lights and the piano and one for pre-processing the transducer data. Transducers were 10 light dependent resistors (LDR) and 2 force sensing resistors (FSR). The LDR's were positioned on the piano and used to detect changes in the light when the pianist moved his upper body, head or arms. The FSR's were positioned on the pianist's seat so that rocking to the left or to the right would change the values of these transducers. 6 lights were installed at the ceiling to light the area around the piano.

"Tactile sculpture"

To test the iCube system for interactive installation applications, Carlos Vela-Martinez used the iCube system in a sculpture of human proportions. The project aimed to incorporate the iCube system into the operation of an interactive object.

The object was about the size of two human trunks. It contained speakers, driven by a sound module, and a small television as output media and sensed visitor input through force sensing resistors (FSR), that sense touch, placed at various locations on the outside surface of the object, acoustic transducers (electret mikes), placed on the inside and light dependent resistors (LDR). The acoustic transducer signals were processed so that only an acoustic impact (handclap, stomp on the sculpture's surface) was detected and stored. An LDR was used to detect the proximity of the visitor.

"The virtual drum set"

For wearable interactive performance systems the author built on Rolf Wilkinson's (finger) drumming experience and used the iCube system to make a touch glove for creating a virtual drum set. This project aimed at using the iCube system with a sensing device that needed to be worn on the human body, ie. an IIPS application. The transducers (FSR's) were placed in gloves for the right and left hands and their signals were processed in a Max patch to detect whether and how hard the tips of the fingers as well as the palms were touching a surface. This data is then used to control a drum synthesizer, so that the perception is created the musician is playing a virtual drum set. An important requirement was that whenever the musician hit a surface the sounds had to coincide with the tactile sense of hitting the surface to make the musician perceive the virtual drums as one "gestalt". The project was the more demanding of the test projects, since a high timing resolution was needed, ie. a high sampling rate and low processing & transmission latencies. Also, the capturing of body signals required special attention to the design of the gloves, eg. placement of transducers and feel of the glove. The cotton glove currently in use is deemed reasonable.

Conclusions and outlook

The iCube project has realised an affordable and flexible environment for design of sensing devices. While development of newer versions is ongoing, a number of conclusions can be drawn from the iCube project:

• Although the iCube system makes sensor technology more accessible for artists, the system still requires a fair amount of technical knowledge (understanding of calibration, linearization, ranging, positioning etc. of transducers as well processing and analysis of their signals). Therefore, the supply of information on transducers and how to use them to design sensing devices is crucial.

• Tools for datareduction and sensorfusion are needed to make the use of many (upto 32 !) transducer signals practical and more efficient. Such tools are especially useful for applications with low latency requirements (less than ca. 10 ms) that tax the MIDI bandwith as well as the computer capabilities, particularly if signal processing and analysis is required.

• For less technically interested artists to use the system, transducer assemblies that plug directly in the digitizer and stand-

alone Max (version 3.0) patches that are specifically for these transducer assemblies need to be developed, as well as information about the system and/or sensing devices in terminology that more artists can relate to.

• The project mainly aimed at sensing problems. However, many interactive artworks appeared to require a few binary outputs too, e.g. to drive videosignal switches and turn on and off small motors and lights. They were added to the design.

• Although the current system works with the graphical programming environment Max, it uses symbolic command language messages to control the digitizer. Future work aims to control sensors with a graphical command language.

• While the current system can be made wireless through the use of a wireless MIDI system, other, cheaper avenues to wireless sensing are being explored.

Human Motor Systems Lab
School of Kinesiology
Simon Fraser University
Burnaby, BC
V5A 1S6 Canada

Infusion Systems
Suite 260, SFU Discovery Park
c/o Simon Fraser University
Burnaby, BC
V5A 1S6 Canada
Phone +1 604 291 6717
Fax +1 604 291 6015

The iCube system is commercially available. Contact Infusion Systems (see above) for detailed, up-to-date information.

References

Anderton, C. (1994). STEIM: In the land of alternate controllers. Keyboard (august) p54-62.

Anderton, C.; B. Moses, G. Bartlett (1994). Digital projects for musicians. New York, NY USA: AMSCO publications.

Atkins, S. (1994). Interactive media - virtual reality and the actual performer. Canadian Theatre Review 81 (winter 1994), p 16-19.

Crawford, J. et al (1994). Merging Media: Opportunities and innovation in computer-human interface. Symposium held in July 1994, Simon Fraser University Theatre, Burnaby, BC, Canada.

Curtin, S. (1994). The SoundLab: A wearable computer music instrument. Proceedings International Computer Music Conference, Aarhus, Denmark, p200-201. San Francisco CA, USA: International Computer Music Association.

Demers, L.-P. (1993). Interactive and live accompaniment lighting for dance. Presented at the conference on dance and technology, held in July 1993, Simon Fraser University Theatre, Burnaby, BC, Canada.

Gilbert, R. (1994). Computers and theatre - Mimesis, simulation and interconnectivity. Canadian Theatre Review 81 (winter 1994), p 10-15.

Huntington, J. (1994). Control systems for live entertainment. Newton, MA, USA: Focal press.

Leopoldseder, H. (1990). Der Prix Ars Electronica - International compendium of the computer arts. Linz, Austria: Veritas verlag.

MacLeod, D. (1994). Information theatre. Canadian Theatre Review 81 (winter 1994), p 5-9.

Mulder, A.G.E. (1994). Build a better powerglove. PCVR 16 pp 10-14. Stoughton, WI, USA: PCVR Magazine. Available through the WWW, URL http://fas.sfu.ca/cs/people/ResearchStaff/amulder/personal/vmi/PCVR.html

Mulder, A.G.E. (1994). Human Movement Tracking Technology. Technical Report, NSERC Hand Centered Studies of Human Movement project. Burnaby, B.C., Canada: Simon Fraser University. Available through the WWW, use URL http://fas.sfu.ca/cs/people/ResearchStaff/amulder/personal/vmi/HMTT.pub.html

Mulder, A.G.E. (1994). Virtual Musical Instruments: Accessing the sound synthesis universe as a performer. Proceedings of the first Brazilian Symposium on Computer Music, held in Caxambu, Minas Gerais, Brazil, August 2-4 1994, during the XIV annual congress of the Brazilian computer science society pp 243-250. Belo Horizonte, M.G., Brazil: Universidade Federal de Minas Gerais.
Available through the WWW, use URL http://fas.sfu.ca/cs/people/ResearchStaff/amulder/personal/vmi/BSCM1.rev.html

Schiphorst, T. et al (1992). The shadow project: An exploratory workshop in performance and technology. Workshop held in August 1992, Simon Fraser University, Burnaby, BC, Canada.

ACTING AND ENACTING: STAKES OF NEW PER- FORMING ARTS

By Sally Jane Norman

norman@world-net.sct.fr

Performing arts history is marked by an ancient, profound tension which is assuming growing importance in the realm of new representational technologies, namely the tension between seeing and acting, or between viewing and doing (theasthai = see -> theater; dran = do -> drama). New participatory, immersive live art forms are emerging at the dividing line between these two states. Whether they comply with existing definitions of theater is debatable, and closely hinged on how the "doing/ viewing" components are gauged, although pedantic comparison with existing categories of spectacle is of limited value when dealing with unprecedented perceptual arenas. Irrespective of how new performing arts end up being designated and categorized, the real task at hand is recognition and creative exploitation of nascent representational systems (*repraesentare* in Latin meaning to "make present") in situations involving live action and actors.

WHEN THE EYES NO LONGER HAVE IT

Harbingers of new technologies announce more or less virtual feasts of the senses which sollicit sight, audition, haptics, and kinesthesia. Longstanding western theater traditions, where staged visions and verbal renditions are essentially based on a literary starting point, are thus challenged by radically new ways of building and communicating multisensory works. Given the vertiginous possibilities opened up by new representational technologies, attempts to resuscitate aesthetic principles from obsolete performing art forms are to a certain extent useful and understandable. A major pitfall, however, is that over-zealous, overhasty appropriation of defunct models exhumed as stock formulae leads to neglect of other models which, while not as obvious or readily transposable, may point the way to richer, more meaningful lines of experimentation.

An instance of sadly shallow recuperation of bygone theater practice can be seen in attempts to move historically upstream of cerebral, script-based drama in order to rediscover archaic, immersive traditions. One can choose to read the past two thousand years of performing arts history as a process whereby the public undergoes an insidious "passivation", via increasingly visually-focussed stage configurations which end up trapping the spectator in the seat providing the best view. This process was launched within a period of just a few decades: Greek spectator-communicants united around the altar (*thymele*) actively participated in rituals officiated by the

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

211
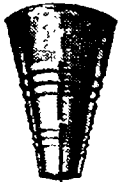
Dionysiac priest until emergence of the protagonist or first hypocrite (*hypokrites* = actor), followed by the deuteragonist under Aeschylus, then the tritagonist under Sophocles. As the growing troupe of actors took over the dialogue, the public was held increasingly aloof, and condemned to live the celebrations by proxy. This gradual separation was of course tightly enmeshed with the construction of a physical amphitheater, and the constitution of formal dramatic literature. Theater architectures were gradually configured and solidified to promote this aesthetic, the epitome being reached with the late 16th century Italian proscenium arch stage designed to ensure spectacular illusions, although only the ideally placed Prince really got to enjoy them (his courtesans had to make do with skewed, anamorphic perspectives). Subsequent reforms until the late 19th century, including naturalist "slice of life" or "fourth wall" stagings, where physical objects and sets replaced previously painted objects and sets, perpetrated the principle of the self-contained stage, viewed at a respectful distance from beyond the footlights (the French equivalent for this term, *la rampe* - which also designates a launch platform - is more open, and loosely usable to signify the vital zone separating viewer and doer).

In their desire to create works which go beyond conventional theatrical emphasis on "viewing", a number of artists using new representational technologies have sought out forgotten models which emphasize "doing". Eureka ! Overnight Hellenist converts have been illuminated by the Dionysiac rituals and phallophoric processions of archaic Greece (participatory aesthetics which likewise fired Nietzsche's and Wagner's enthusiasm). Yet those who adopt such models wholesale and pretend that the alternative to over-sophisticated dramatic narrative is pristine neo-bacchanal frenzy are definitely barking up the wrong tree.

Notions of participation and immersion in early Greece are indissociable from a culture where the notion of the individual is still embryonic. Archaic man, with his loose, labile identity, probably threw himself whole-heartedly into collective celebrations, as a fragmented being readily dissolved by the mass. Immersion in hecatombs and Eleusinian mysteries doubtless allowed him to affirm his identity as part of society. The Greeks of pre-classical times did not have the integrity of their contemporary counterparts (integrity here meaning totality). Their intellects had not been cast by the "cogito" which has molded the mindset of the modern individual ever since Descartes. Our ideas of independence and liberty of movement were unknown to them, mere playthings in the hands of a pantheon of malicious gods. They mastered neither their destinies nor their acts, whether free men or slaves (Paul Feyerabend's *Against Method* provides a superb analysis of this situation). It took painstaking centuries thereafter to build the autonomous individual of modern times, who had to relinquish divine medieval order in order to emerge as a thinking humanist, draw up civil codes and human rights to claim for social enlightenment, vie for imaginative and intuitive supremacy to burst forth as an

impassioned romantic, etc. For these reasons and many more, it simply does not make sense to pretend that new technologies will miraculously allow us to recover and rediscover pure, untrammeled, archaic sensibilities. Immersive and participatory aesthetics of twenty-five centuries ago are no longer accessible to us. On the other hand, by comparing sociocultural contexts and aesthetics at a little depth, we can glean valuable insight into the functioning of present and nascent art forms.

MOSAIC IDENTITIES AND SHARED SELVES

One of the most revolutionary features of today's immersive technologies lies precisely in their breakdown of individual integrity and holism, due to the implementation of mosaic, interchangeable forms of existence, and shareable physical and sensory experience. Borrowed or fragmented identities can be subtly generated and communicated by intimate interface appeal to eyes and ears, inner ears and touch. Cogito-hardened individuals steeled by materialism and determinism are thus subjected to a kind of psychophysical dismembering or cleavage. To underestimate obduracy of the modern identity in this situation is just as foolish as to ignore malleability of the archaic Greek identity. The more so in that the interstices between familiar, supposedly constant selves and momentarily adopted, foreign experiences seem to harbor powerful potential forms of theatricality.

For example, many virtual environments engender a singular situation of self-voyeurism, by reflecting a splintered mirror image of the actor/ enactor who penetrates them. In numerous immersive worlds, one's deambulations are facilitated by an iconic representation, initially and often still just of the hand, but sometimes of the entire body. From NASA wireframe butterfingers of the pioneering era, current trends are moving towards gripping, fully-fledged 3D clones, which may be realistically individualized using data phagocyted by scanning the actual subject. Relations with one's clone differ substantially from relations with a standard mirror image, insofar as the former is viewed as an effector, an operative incarnation within the virtual world. Hence, a fundamental gap or discrepancy, a difference in kind, alienates the human subject from his or her agent. Moreover, clones can be multiplied, made to meet, set into competition, granted different levels of adaptive intelligence and behavioral autonomy. They are imbued with a quality of otherness which withholds as much latent drama as the actor estranged by the stage (performance space Bauhäusler Oskar Schlemmer aptly described as "enchanted"). The split, mosaic selves induced by immersive technologies thus bring about an uncanny shift and refocus in the traditional actor/ spectator relationship.

To tax systems of this kind as narcissistic is to miss the point: self-projection and identification to varying degrees have always influenced spectator gaze. What really merits attention is the question of inherent theatricality of such representations : if the crux of live spectacle is the actor/ spectator relationship, i.e. the vital tension between viewer and doer, to what extent

can these new immersive realms be said to institute such dramatic tension, albeit through cloned doubles? Another key issue is how much importance should be attached to virtuosity of the projected actor/ enactors: are casual deambulations through a virtual environment sufficiently enthralling to maintain subject involvement, and if not, how can dramatic interest be enhanced ? A more challenging environment will theoretically elicit a higher performance level, and thereby heighten tension, but there are numerous ways of enriching virtual environments. Unfortunately, recourse to literary models on the one hand, and game models on the other, has so far tended to dominate virtual performance experimentation. Artists of the "story-telling" persuasion have busily built up complex arborescent scenarios based on interactions with other characters or environmental features-purebred virtual chimera or clones of fellow human players. But these narrative webs generally wear thin fast, and their laboriously calculated "nodes" or turning points quickly become too obvious (then again, most contemporary endeavors in interactive literature still pall by comparison with Raymond Queneau's *Exercices de style* and other *Oulipo* undertakings). Artists who opt for the "game" mode keep subjects in their virtual environments engrossed by exploiting the good old teleological will to win, an emotion quite distinct from those at work in the performing arts.

Strangely enough, these lines of research dodge or ignore one of the most significant features of new representational technologies, and one which might conceivably serve as a starting point for truly innovative live art forms. This feature is the appeal to haptics and kinesthesia afforded by various accoutrements and mechanisms (data gloves and suits, mobile platforms, etc.). Whereas numerous theater theorists, including Russian composer Alexander Scriabin, considered that the spectator's kinesthetic enjoyment of staged action constitutes an essential element in performance aesthetics, we are now in a position to impart kinesthetic and tactile experience to a subject directly and physically, rather than just as an ocular-derived percept. Yet investigation in this uncharted territory remains extremely limited, and the visionaries who seem to have prophesied such tools and designed works in anticipation of them have apparently been relegated to oblivion.

Such visionaries include Oskar Schlemmer, whose Metal Dance and Glass Dance constitute stagings of "portraits" of these two materials. Schlemmer builds up living visions of metal and glass, by having a dancer incarnate and express their physical and metaphysical qualities in the course of brief, hallucinatory choreographic sequences, set within a visual and acoustic environment carefully wrought to consolidate these "material visions". For the time being, we can merely dream of how this kind of approach might be adapted in technology-mediated immersive environments, perhaps providing us with semi-physical, semi-symbolic encounters of the elements, at the full-scale, macro or micro level. Schlemmer's Stick and Hoop Dances are created along singular lines, to try and bring out kinetic speci-

ficity of spaces wrought with respectively linear and circular forms. Exploration of immersive minimalist environments bearing distinctive geometric or material features might enhance our apprehension of virtual worlds, and help us learn how the body responds to different species of spaces.

Other approaches bent on communicating new categories of performance space have been formulated by artists concerned with the primacy of physical sensation such as Swiss Emile Jacques-Dalcroze and Austrian Rudolf Von Laban. Through their theoretical and practical undertakings (Dalcrozian "Rhythmics" and Laban's "Choreutics"), they predict bodily mediation to produce moving architectures, manifest through the play and interplay of constantly evolving, fictive weights and spaces. They prone new types of experience of the space and time worlds generated through live art, anchored at least as much in kinesthetic and rhythmic bodily sensation as in ocular enjoyment. Virtual dance spaces are explored by bodies that "see" with every pore according to exploratory modes that seem to offer richer and more novel forms of immersive enjoyment than pseudo-narrative structures with more or less enticing, more or less convincing scenarios.

The above-mentioned examples come from relatively recent western traditions, but countless cultures propose live art forms based on experience of symbolic spaces, and on interactions between different registers of existence. Staying within the context of formal theater, for example, the Japanese tradition of "mugen" or fantasmal Noh, which dates back to Zeami, is based on interplay between an unworldly protagonist (a fantom, divinity or demon) and the human characters in the play. Apparitional Noh finely orchestrates tensions between these two planes of existence, with subtle acoustic signals enhancing the visual clues. This timeworn art might well inspire designers of virtual apparitions which are supposed to interact with the human explorers of immersive environments, thus playing on multiple registers of presence.

PERFORMERS AS CATALYSTS FOR THE COLLECTIVE CONSCIOUSNESS

Performing arts are unique in that they offer up for contemplation an *in vivo* model of existence. At an era where intimate interfaces and technologies are operating ever closer to the bone, if not the cortex, an era of data flesh, chip minds, and all the other processes of usurpation of the archaic bio-logos which only yesterday still functioned as a viable raison d'être, this contemplative distance would seem to be all the more valuable and necessary.

In our secular society, there is a tendency to consider performing arts as being fortunately and definitively laicized, and to peremptorily dismiss their original ritual dimension. Archaic religious immersion is scoffed at. But this attitude tends to be simplistic and demeaning, in that it overlooks a basic function assumed by directly human-mediated art as a means for pro-

jecting alternative modes of existence. Theater is a spawning ground for models and ideals, and a vital catalyst for the collective imagination. Ardently realistico-materialistic paranoiacs invariably underestimate this deep, irrational basis of live spectacle. Throughout our societies, theater has continuously been more or less ritually employed to stage transgression of the human condition and of our physiological limits. Refusal to recognize this function does not just undermine history of the performing arts, and limit their potential expression via new technologies. It moreover jeopardizes collective ability to project ourselves beyond our mortal present.

The actor who stands before us is condemned like us to mortality, weighed down like us with his Newtonian mass, but is momentarily blessed with superhuman prowess by virtue of his stage setting. The quality of otherness his stage existence bequeaths him allows the actor to vanquish his fellow men, but above all to conquer death and defy the elements. He arises from his ashes like the phoenix, soars through the heavens, disappears, multiplies, etc. In short, the stage lets him accomplish with impunity feats denied to common mortals. The act of flying, for example, has been a spectacular mainstay for thousands of years, as evidenced by the first deus ex machina on the Greek stage, by flying angels who adorned medieval and Renaissance glories, and by airborne romantic ballerinas. Such "impossible bodies" have always sparked off collective jubilation, and no doubt always will. The model incarnated by the live actor, who acts as proof of its viability, nourishes our ability to transcend current physical limits. The impossible, hybridized, metamorphic bodies borne by new technologies, partially culled from reality and partially conjured up by sheer calculation, are gearing us for as yet untapped, barely conceivable modes of existence. In this manner, impossible staged bodies build up a kind of survival mechanism, firmly entrenched in the collective consciousness.

The stakes of new performing arts are thus intricately bound up with those of a nascent civilization: performing arts devise and convey living images of tomorrow's lives. Building up art forms grounded in new representational technologies demands substantial resources, both technical and creative. But since VR specialists concur that there are only two limits to building VR representations, namely CPU cycles and designers' mental cycles, we can only hope that it is not the latter that will ultimately prove to be the stumbling block. It is today's visions which fuel our dreams for the future. A whole new dramatic art has to be forged, with sufficient conviction to allow us to abandon depleted, inappropriate forms. We have all seen stereoscopic programs in state-of-the-art IMAX cinemas where filmmakers have brashly applied the usual formulae of "2D" screenplay: dissolves and other standard editing techniques suddenly seem silly and meager when employed in vivaciously 3D image fields, for which they were never intended and are totally unadapted. New editing languages have to be invented, based on previously unfathomable visual scales and depths. The same goes for performing arts implementing hitherto unknown, massively empowering technology: to fully exploit these new tools in a truly creative manner, we must have the audacity to get beyond anachronistic conventions and dare to venture into uncharted territory. This, despite overbearing socio-economic pressure: it is obviously far easier and financially safer to design virtual architectures for Hollywood movie spin-offs than to embark on the formidable quest for future art forms.

We need to learn to identify and exploit the sensitive loci of new media which are most apt to convey new forms and registers of aesthetic experience. The fringe of interference between acting and enacting, a fringe which has persistently housed potent dramatic forces, is assuredly one such locus. Kinesthetics and learning to grasp and evolve within qualitatively different spaces form another area that calls for enlightened exploration. The protean registers of existence enabled by immersive technologies have boundless implications for new performing arts. The onus is on us to recognize and use them.

IMMERSION
AND THEATER

By Sally Jane Norman

Q uerying the compatibility of immersion and theater is like querying the compatibility of narration and interactivity: deciding whether or not such notions are antithetical ultimately depends on how one chooses to define them. If narrating means telling a story, to what extent does the story keep a recognizable core when subjected to the umpteen bifurcations, ramifications and other convolutions that supposedly testify to interactivity ? Can infinitely splintering, unforeseeable scenarios be called "narration", or do they announce a form of collective writing for which we have yet to forge a term ? Similarly, if theater implies dramatic representation, to what extent is representation recognizable as such for the wholly immersed subject, no longer an onlooker or bystander, but caught up in the action ? Can totally overwhelming situations still be called "theater", or do they announce a form of collective experience for which we have yet to forge a term ? This text in many respects testifies to "work in progress", and contains far more questions than answers. Then again, perhaps trying to pose the essential questions is the most urgent task at hand.

INVOLVING ONLOOKERS AND BYSTANDERS

For several years, the Japanese theater troupe Agua Gala has chosen to work at the fringe between theatrical performance and interactive works involving spectator-participants, thereby raising many questions central to the theater/ immersion debate. In its latest work, *VALIS in the Victim*, Agua Gala recruits half a dozen spectators upon arrival at the performance site. Dressed in sackcloth cloaks, they are asked to undertake a number of simple actions while ten members of the troupe execute rigorously preordained choreography in a complex sound environment. The novices begin by walking around the performance space, resolutely indifferent to the sometimes aggressive dancers. Apparently contradictory actions are programmed: the volunteers have been instructed to pick up and carry shoes thrown into the arena, but the dancers immediately tear these objects out of their hands; the volunteers lined up on one side of the space are successively pulled into the center by a performer, and instantly hauled back into line by another. Such situations generate dramatic tension, as does the very coexistence of two different actor categories: virtuoso professionals (Agua Gala has a strong butoh background) versed in the planned work, and more-or-less bewildered outsiders trapped in what is for them totally unpredictable action. But over time, negative ambivalence is particularly felt by the third category of persons, namely the spectators who identify strongly with the volunteers, while scrutinizing them with a vague sense of voyeuristic guilt.
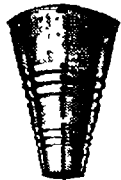
Those physically involved in the action are "blinded" by their implication, and unable to really watch what is happening: their emplacements and postures rule out a state of passive observation comparable to that enjoyed by the audience. Nobody would doubt that they are living a powerful aesthetic and emotional experience, but the problem is how to qualify that experience. Is it theater, and if so, for whom ? Can you see a work you are a part of ? What happens to theater when all become actors and there are no spectators, as in Rousseau's ideal ? ("...donnez les spectateurs en spectacle; rendez-les acteurs eux-mêmes; faites que chacun se voie et s'aime dans les autres, afin que tous en soient mieux unis." *Lettre à d'Alembert*).

The situation created by *VALIS in the Victim*, where spectators are the rather embarrassed (but perhaps also rather smug) witnesses to amateur antics of their hapless fellows, resembles that encountered in certain interactive, immersive environments. People observing a peer empowered to effectively interact with fictitious elements (characters, objects, forces, etc.) in a virtual space, while they can only look on and listen, are in a potentially ambiguous voyeuristic situation. In a world of sports or warrior-type activity using gestural interfaces, physical dexterity is good value for spectators, just as with any direct transmission of a major sports event. A chess tournament or the likes elicits appreciation of intellectual agility, as do certain fantastic games calling for quick-wittedness. We are quickly bored by clumsy amateurism in such fields, which may make us feel awkward and intrusive, but eagerly resume enthralled spectatorship when confronted with prowess. Virtual interactive environments for *homo ludens* constitute a flourishing industry, but they only have spectator appeal if taken over by expert players.

RECONCILING THE CONTEMPLATIVE AND THE CORPOREAL

With immersive constructs designed to aesthetic ends, things become more complicated. There are no clear-cut, conventionally imposed and accepted rules, although playfulness may be rife, and there is no teleological drive as in win-or-lose situations of the game kind. In the art world, we as spectators have no yardstick when passively observing a peer empowered to interact with virtual constructs. But assessment of earlier aesthetic approaches to immersion, including concepts formulated outside the realm of theater, may help to understand the specificity of current synthetic spaces, and shed new light on problems of bodily involvement. In "Notes on Sculpture" (1), written almost thirty years ago, Robert Morris considers contemplating minimalist sculpture as tantamount to being immersed in the space it exudes, i.e. the aesthetically and organically charged space which includes the spectator. Morris refers to *apprehension of the gestalt* to explain the uncanny perceptive impact of sculpture which is gauged in terms of size and distance to generate an intuitive, quasi-visceral apprehension of scalar relations between the work and bodily spectator presence. It will take much experimentation for us to begin to gauge and differentiate the perceptive impact of virtual objects as a function of distance and scale. Fleeting digital forms are light-years away from obdurate minimalist structures, but this does not mean that they cannot and do not impress themselves upon our senses.

In the domain of recent creation calling on virtual reality technology, the twofold "private/public" configuration adopted for Char Davies' *Osmose*, an environment for an active "immersant" (term coined by the artist) and an onlooking audience, has the immense merit of raising the issue of bodily engaged versus passively spectatorial involvement in new aesthetic spaces. The "immersant", wearing a head-mounted display and an upper-body harness fitted with position detectors for motion control (ensured via torso position and breathing movements), moves through a virtual world comprised of a number of different poetic spaces (such as a forest, a stream, a clearing, strings of alphanumeric characters). Each immersant's itinerary is unique, being determined by individual body movements. In the public version of *Osmose*, the immersant's journey is displayed in stereoscopic images on a large screen in a room adjoining the virtual traveler's "chamber" (the immersant's helmeted, cabled silhouette is poignantly visible against the fabric wall of the booth in the Montreal Museum of Contemporary Art set-up). Equipped with liquid crystal glasses and headphones (sound is a key feature of the installation), we accompany the immersant on his/her exploration, discovering the virtual spaces he or she penetrates.

In some ways, this active/passive differentiation is reminiscent of that instigated at the CAVE developed by Dan Sandin et al at the University of Illinois, in which head movements of a "leader" wearing an HMD fitted with position sensors allow impelling interaction with vivid stereoscopic images, observed by a flock of neutral spectators wearing standard stereo glasses. But the CAVE mainly serves the scientific community (works like artist Rita Addison's *Detour: Brain Deconstruction Ahead* remain the exception), for whom handing over the head-tracked system to the most competent analyst of the given visual data seems logical. *Osmose*, on the other hand, is an adamantly aesthetic undertaking, which moreover strives via powerful image technologies to manifest the immersive qualities Char Davies earlier sought to reveal through her painting. One problem is that another person's introspective meandering through unknown terrain does not necessarily withhold much interest for would-be art viewers, regardless of quality of the immersant's own experience (conversely, certain dancers who feel hampered by the immersant's trappings prefer to view *Osmose* as what they consider to be an audiovisual art, thus defeating the work's kinesthetic purpose). While challenges presented by a virtual scape which opposes resistance to the explorer (e.g. through geometry or textures) may heighten spectator attention, such features also jeopardize or undermine more quiescent aesthetic objec-

tives (*Osmose* offers an all too rare alternative to the usual war games and other VR simulations designed to boost adrenalin levels). This work raises some knotty questions: how enthralling and aesthetically stimulating are other immersants' journeys ? How involved can the passive spectator become as the virtual explorer's mere shadow, the more so in that discovery of creations like *Osmose* is patently body-bound (in this case, literally dependant on individual inspiration) ?

These questions will assume growing importance with the development of virtual art designed for various sorts of interaction, via increasingly intimate interfaces. New modes of perception will emerge as we learn to grasp unprecedented spatial and dynamic relations set up by new forms of bodily implication in our environment. It is paradoxical that emphasis on full-body perceptual response to aesthetics, as encountered in Morris's seminal work, should now be acquiring such pertinence in the realm of virtual technology-based creation, since the emerging technologies result from decades of platonic clean room research, accomplished in pure digital bliss far from the lure of the flesh. The current phenomenological plunge into sense experience is taking us by storm, and many artists are falling into traps that will perhaps seem obvious with hindsight, but are proving treacherous right now. One of these traps concerns communicability (and incommunicability) of certain kinds of sense experience: interactive virtual environments solliciting such privy functions as kinesthesia and proprioception profoundly modify traditional conceptions of collective aesthetic experience. Bystanders who revel in a subject's exploration of virtual space are delighting not in sensations being felt by the immersant, which necessarily remain confidential, but rather in the actual miracle of interactive immersion. In such cases, idolatry is at work just as much as aesthetics.

DIFFERENTIAL MODES
OF PERFORMANCE PROJECTION

The theatrical potential of interactive immersive systems is debatable, and adjudged non-existent by many persons. One reason is the fact that, unlike the vagaries of a virtual immersant, even the most wilfully monotonous performance, staging the most banal gesture and action, is designed first and foremost to communicate aesthetic experience to an audience. The public is not just incidentally integrated as collective witness to an essentially private situation, despite the fact that many performers deliberately trap their spectators in voyeuristic roles (Grotowski's seating arrangements for *El Principe constante*, in 1965, push this tactic to extremes). Deliberately inexpressive actors can project extraordinary dramatic presence, and there is a world of difference between a performer's intentional vacuousness and a non-performer's ingenuous blandness (Yvonne Rainer, a leading conceptual dance figure in the sixties, used to despair at how the audience would invariably read teleological structure and virtuosity into her flattest choreography). Interactive immersive environments may also be deemed inherently

non-theatrical because their specificity tends to be sacrificed when they "go public" via strengthened visual and auditory components, since the real novelty of such systems lies in their capacity to call on more intimate (notably haptic and kinesthetic) forms of sensory intercourse.

Kinesthetic experience is an essential source of aesthetic enjoyment in dance and circus arts, where spectators are mesmerized by physical marvels. The ballerina who crosses the stage executing a series of fouettés generates a complex geometric figure which belies all reasonable modes of displacement. Swift, minute, precise foot movements of long-gowned Georgian dancers endow them with supernatural gliding grace. Trapeze artists engender heretical spaces where the body repeatedly defies physical law. Break-dancers whirling upside down on their heads like spinning-tops, legs spread-eagled in the air, convey disturbing visions of ambiguous morphologies, at once familiar and alien. Such performing arts appeal to our intuitive recognition of corporeal prowess. We are spellbound by sheer immediacy of the miracle being accomplished before our very eyes, i.e. transcendance of the mundanely cumbersome body. When such feats undergo media processing for screened transmission, techniques have to be developed to transpose into film and audio language the gut impact of live action. Artful use of visual and acoustic resources must compensate for the absence of flesh and blood, a point clearly made in Eisenstein's writings, hard-won from his grounding in experimental theater (to take a less prestigious example, *The Greatest Show on Earth* is cinema and not circus, the gripping suspense of aerial numbers being rendered via judicious editing techniques - interspersed low and high angle shots, rapid reverse shots, etc.).

Another crucial point to be borne in mind when trying to instigate new participatory aesthetics with immersive technologies is the extreme diversity of live performance registers, each being characterized by gestural and dramatic specificity. There is a tendency in recent technology-based research to treat totally unlike and immiscible elements en bloc, the word "theater" being abused as a blanket term to cover purportedly homogeneous arts. This lack of discrimination leads to inability to even recognize the respective techniques operative in the art of the clown, acrobat, actor, dancer, magician, or mime. Yet each of these performance areas is subtended by distinct corporeal models, and each implicates both artists and spectators in its own distinct way. Physical danger communicated by a trapezist, astonishment triggered by an illusionist, mirth sparked off by a buffoon, and anguish provoked by a tragedian give rise to keenly different senses of immersion in live performance. A telling passage by Victor Shklovsky describes the essence of circus as residing in (physical) difficulty: strong men must wield authentic weights and break authentic chains, whereas theater, having "canonized" the art of make-believe, calls on other devices to captivate its public (2). Shklovsky's differentiation between circus performance which impresses through indubitable

physical prowess, and dramatic performance where shammed physical action is part of the game, is focal to the theater/ immersion debate. In order to really tackle an issue as sensitive and intricate as kinesthetics and communicability, an incursion into corporeal performance categories and techniques would seem more than worthwhile. A useful dance-based taxonomy of motricity drawn up by Jean-Claude Serre differentiates between "teleokinetic", "semiokinetic", and "morphokinetic" forms of bodily expression (3). Eugenio Barba's theater anthropology offers insight into how performance space is invested across different codes and techniques in a wide array of cultures (4). Such lines of approach will hopefully be taken into account in the quest for new kinds of performance-based art.

THEATER AS A TOOL FOR SOUNDING IMMERSION

In the context of immersive virtual environments, we are dealing neither with cinema, nor with a live art form akin to any kind of theater as we now know it. The problem of how to communicate aesthetics founded in visceral involvement must therefore be posed in totally new terms, as must the problem of what place (if any) can feasibly be ascribed to a collective audience. Attempts should be made to draw the dividing line between active performers and passive bystanders, and to define what constitutes an actor, as opposed to an interactor or an enactor or an actuator. The latter terms sound frigid compared with usual theater terminology, but convey differences in acting modes which may prove helpful when studying new performance environments (moreover, these seemingly barbaric terms can be productively analyzed with reference to acting theories propounded by commedia dell'arte, Elizabethan, kathakali or kabuki traditions, by Diderot's *Paradoxe sur le comédien*, by Stanislavsky, Craig, Brecht, Schechner, Kantor, etc.). For example, where prime importance is given to interacting with other players, involvement is not of the same kind as where emphasis is on individually enacting or acting out a role; the actuator is yet another species of performer, and can be seen as the impassive AND/OR//NAND/NOR push-button controller of an overall process. Distinctions may be subtle but are potent nevertheless, and many attempts to build up new forms of virtual theater are doomed to failure from the outset because vitally different modes of involvement are blithely lumped together.

Theater culture is vast and varied, and provides an excellent heuristic tool for sounding emergent immersive, interactive aesthetics. The dangers of research blinkered by productivist goals are obvious to most people, but the dangers of brandishing reductionist notions of theater as a cultural alibi are more insidious. A problem with much of today's experimentation bent on developing new interactive models for virtual worlds is that it is totally devoid of aesthetic value, even when hallowed by cultural institutions. This is because art is generally not laid down as a premise but tagged on as an afterthought, a potential cultural market strategy. Dazed by the myth of optimization -

optimized perceptive parameters, optimally coherent virtual spaces, i.e. the ideal of performance in its most mechanistic sense - we tend to forget the simplest home truths concerning immersion in non-functionalist, creative contexts. Hence, when VR perception analysts state that breadth of the visual field is directly proportional to the immersive power of a virtual world, there is a stampede to extend breadth of the visual field in all immersive constructs, whatever their end use. There's the rub. One of the most immersive performances I have ever seen was that of a flea-training clown, playing to a packed little theater. He mimicked and gesticulated dramatically as he ordered the flea to leap in a sweeping arc from one forefinger to the other. Hundreds of people were totally enthralled by the act and totally intent on the flea, which was not just tiny. Worse, it did not "really" exist. Immersion in the realm of creative performance is, fortunately, unfathomable.

References

(1) Robert Morris, "Notes on Sculpture", *in* Gregory Battcock (ed.), *Minimal Art, A Critical Anthology*, New York, E.P. Dutton, 1968, pp.222-235; see also S.J. Norman, "Du *Gesamtkunstwerk* wagnérien aux arts des temps modernes: spectacles multimédias, installations minimalistes", *in L'Oeuvre d'art totale*, studies grouped by Denis Bablet, presented by Elie Konigson, Paris, CNRS Editions, 1995, pp.273-289.

(2) Victor Chklovski, *La Marche du cheval*, Paris, Champ Libre, 1973, pp.129-131 (Shklovsky's *Hod Konja* has apparently not been translated into English).

(3) Jean-Claude Serre, "La danse parmi les autres formes de la motricité", in *La Recherche en danse*, Paris, numéro 3, 1984, pp.135-156.

(4) See Eugenio Barba and Nicola Savarese, *Anatomie de l'acteur*, Bouffonneries Contrastes, Cazilhac, 1985.

TRANSMITTING ARCHITECTURE: THE TRANSPHYSICAL CITY

By Marcos Novak

marcos@bongo.cc.utexas.edu

*Here and there, sick lamplight through window glass
taught us to distrust the deceitful mathematics of our
perishing eyes.*

F. T. Marinetti, Futurist Manifesto, 1909

*Analogy is nothing more than the deep love that links
distant, seemingly diverse and hostile things.*

F. T. Marinetti, Futurist Manifesto, 1913

T echno Chronology

• May 20-24, 1994. 4CyberConf: At the Banff Centre For
the Arts in Alberta, Canada, under the auspices of the Art and
Virtual Environments Project, the last virtual chamber created
for "Dancing With The Virtual Dervish: Worlds in Progress"
affords viewers the world's first immersive experience of phe-
nomena involving a fourth spatial dimension.

• February 3-4, 1995. The transTerraFirma project is
launched. Two Silicon Graphics Onyx/RealityEngine2 graph-
ics supercomputers, one at the University of Texas at Austin
and the other at the Electronic Cafe in Santa Monica, connected
to one another via ethernet, give audiences the opportunity to
navigate through and interact within shared virtual architecture.
Even though the two sites can communicate via live audio and
video ISDN connections, people prefer interacting in the vir-
tual worlds to simply seeing and speaking to one another di-
rectly.

• April 3, 1995. 'Webspace", a three dimensional browser
for the worldwide web (WWW), is announced by Silicon Graph-
ics and Template Graphics Software. Built around the VRML
(virtual reality modeling language) and OpenInventor graphics
formats, designed to work on all the major computer platforms,
and integrated into the functioning of Netscape, the most widely
used WWW browser, Webspace creates the first widespread
opportunity for the transmission and exchange of virtual envi-
ronments.

• May 20-28, 1995. At the Tidsvag Noll v2.0 (Timewave
Zero) art and technology exhibition in Götheborg, Sweden, the
transTerraFirma project continues. A series of worlds are con-

structed that can be transmitted over the web and visited by anyone with internet access and a VRML browser.

URL: http://www.ar.utexas.edu/centrifuge/ttf.html

• July 1995: RealityLab, the Laboratory for Immersive Virtual Environments is established within the School of Architecture at the University of Texas at Austin. It is the first facility devoted to the study of virtual space as autonomous architectural space.

Zero: Transmitting Architecture

The history of invention alternates between advances of transport and advances of communication, that is to say from transmitting the subject to transmitting the sign and presence of the subject, establishing a symbiosis of vehicles and media that leads from antiquity all the way to the present. Mode after mode of expression or perception have yielded to being cast across greater and greater distances as agents of will and power. Signal, image, letter, sound, moving image, live sound, live image, sense and action, intersense and interaction, presence, interpresence , telepresence, all express our awareness of other and elsewhere, and underscore our will to interact with the sum of what we know to exist simultaneously with us, relativity's complexities notwithstanding.

In this effort to extend our range and presence to nonlocal realities, architecture has been a bystander, at most housing the equipment that enable us to extend our presence. The technologies that would allow the distribution or transmission of space and place have been unimaginable, until now. Though we learn about much of the world from the media, especially cinema and television, what they provide is only a passive image of place, lacking the inherent freedom of action that characterizes reality, and imposing a single narrative thread upon what is normally an open field of spatial opportunity. However, now that the cinematic image has become habitable and interactive, that boundary has been crossed irrevocably. Not only have we created the conditions for virtual community within a nonlocal electronic public realm, but we are now able to exercise the most radical gesture: distributing space and place, transmitting architecture.

The transmission of architecture and public space alters all the familiar issues of architecture and urbanism. All at once, theory, practice, and education are confronted with questions that have no precedent of consideration within the discipline, necessitating that we turn elsewhere for guidance. Learning from software supersedes learning from Las Vegas, the Bauhaus, or Vitruvius : the discipline of replacing all constants with variables, necessary for good software engineering, leads directly to the idea of liquid architecture. Liquid architecture, in turn, leads to the reproblematization of time as an active element of architecture at the scale of the cognitive and musical, not just the historic, political, or economic event. The language and metaphors of networked, distributed computing apply even

greater torque to the straining conventional definitions of architecture: not only is real time now an active concern of the architect, but the logistics of sustainable, transmissible illusion become as real as the most physical material constraints. Form follows fiction, but an economy of bits replaces the economy of sticks and stones.

To be effective within these new conditions, the poetic, philosophic, and technological strategies we employ to generate architecture must reflect our current understanding of physics and cosmology, must utilize our most current concepts and methods of knowing the world, and confront fully the implications, constraints, and opportunities that arise from conceiving of a transmissible architecture.

1/4: Implicit Time

Gilles Deleuze has commented that in early cinema the treatment of time was bodily-kinaesthetic, embodying what he calls the 'movement-image, while what characterizes cinema now is the 'time-image.' The 'movement-image' uses time as it is readily perceived in expected sensory-motor action or plot. It is linear time, proper sequence, straightforward causality. The 'time-image', on the other hand, relies of mechanisms of association, memory, imagination, illusion, hallucination. An object out of place, out of time, or out of plot, rationally incongruous, colors a scene with its probable histories or possible futures. Building on Bergson, Deleuze sees in each object, in each frame of a film, a rhizome in time, allowing haecceities to communicate 'motion without action'.

An object is thus enveloped by an aura of its own trajectory through time that is immensely different from the sequence of images that would describe its motion through space. The 'movement -image' records positions in space while the 'time-image' records states in time. The cinema of the time-image adds to this the combination of disparate objects, each with its own, implied aura, and constructs a language of nuances in place of the language of actions. Actions themselves can be lifted from the simplicity of the movement-image and placed within the time-image.

Time permeates every architectural gesture, but in most cases, architecture's concern with time is passive. Even where the idea of the time-image is employed in the evocative arrangement of elements intended to speak through implication, the elements and the arrangement are static, responding only to the slow accumulation of patina and accident. Until now, architecture, even when speaking in the language of the time-image, has spoken in an inanimate way, using inanimate elements. The possibility of an animate , or at least animated, architecture, containing varying arrangements of animate or animated elements, has yet to be explored. What examples do exist are either vehicular, aircraft carriers and skyhooks, nomadic, like the ornate tents of Bedouin princes, or greatly extended in time or space: so far, the life of architecture has only manifested itself across continents and centuries.

Once we cast architecture into cyberspace, these concerns take on both theoretical and practical urgency. The architect must now take into active interest not only the motion of the user through the environment, but also account for the fact that the environment itself, unencumbered by gravity and other common constraints, may itself change position, attitude, or attribute. This new choreographic consideration is already a profound extension of responsibilites and opportunites, but it still corresponds only to 'movement-image'. Far more interesting and difficult is the next step, in which the environment is understood not only to move, but also to breathe and transform, to be cast into the wind not like a stone but like a bird. What this requires is the design of mechanisms and algorithms of animation and interactivity for every act of architecture. Mathematically, this means that time must now be added to the long list of parameters of which architecture is a function.

2/4: Implicit Space

When space existed as a separate category, architecture was the art of space; when time existed as a separate category, music was the art of time. The realization of the deep relation between space and time as spacetime, and the corresponding parallel relation between mass and energy, challenges the idea that architecture and music are separate, and prompts us to conceive of a new art of spacetime: archiMusic. But while we can surely imagine such an artform, we have had no way to actually construct and inhabit the spatiotemporal edifices of that imagination. While our science examines microscopic and macroscopic regions of curved, higher dimensional spacetime, we build within the confines of the small lots of what our limited sensorium can comprehend directly. Even though we depend on devices that rely on phenomena at these other scales, our architecture does nothing to help us form an intuition of the larger world we know through our theories and instruments.

Until relatively recent times, architecture kept pace with knowledge. By the middle of the 18th century, however, the historical congruence between ways of knowing the world and ways of conceiving and executing architecture was disrupted by repeated, and eventually successful, challenges to Euclidean geometry. Up to that point architecture could still embrace western spatial conceptions: even the heavens were Euclidean, it seemed. The efforts of Lobachevsky and Riemann, the descriptions of electromagnetic fields by Maxwell, and the world view that was slowly assembled via relativity, quantum mechanics, and that led to today's theories of hyperspace and stochastic universes, created a condition that architecture, burdened by its materiality, could no longer follow. While a handful of exceptional architects grappled with the new problems, for the most part, the modernism that was widely embraced was the most conservative available. Architecture, for the most part, ceased to embody the leading edge of our world-view, and turned to narrower and narrower problems, until it became indistinguishable from mere utilitarian building.

The spatial imagination of mathematicians and physicists has been far bolder than that of architects. Gauss's curvature, Lobachevksy's hyperbolic or 'imaginary geometry', Riemann's elliptic geometry, the ladder from scalar to vector to tensor to spinor to twistor, are yet undigested conceptions of space that must be considered by a new algorithmic and computational critical discourse and poetics. While the scale at which these conceptions apply is outside the range of everyday experience as we knew it, that range has itself changed. As Virilio has noted, our horizon has shifted from the edge of what is visible to our naked eyes to that which is visible electronically at the speed of light, that is to say, at the scales of non-Euclidean geometries. Actually, everything we see, we see at the speed of light: what we have overcome are atmospheric and perspectival noise, the constraint of seeing in a straight line, and constraint of seeing from just one point or in just one direction. Optico-digital orthographics: lossless clarity, curved omniscience, pantopical omnipresence.

The architecture of cyberspace offers the opportunity to mend the rupture between how we know the world and how we conceive and execute architecture. It allows a far greater latitude of experimentation than any previous architectonic opportunity. It is once again possible to seek to know what is known and to conceive a corresponding architecture, without always falling back upon the sacred geometries of ages past. This engagement only makes architecture more relevant to the world, more in keeping with what is sensed as a new condition. In fact, architecture's role in articulating spatially the outlook of an age is strongly reasserted.

3/4: Sampling

We cannot know the real in its entirety. As much shields as bridges, our senses isolate us from the outside world, even as the cognitive mechanisms that translate raw input into meaningful pattern isolate us from within. In either case, what we do know is known through sampling: continuous reality, if indeed it is continuous, is segmented and reconstituted to fit our understanding.

Sampling implies the existence of a field to be sampled, a sampling rate or frequency, and a sampling resolution or sensitivity. From subatomic particles to scanning tunneling microscopes to compact disks to video, film, meteorological and cosmological information, what we know empirically we know through this very particular form of observation. What we know synthetically or by simulation does not escape this either: whether we gather or produce data, we do so at increments and intervals that reduce the infinite, or merely vast, to the manageable. Our own senses operate by sampling: the finite grids of rods and cones that form our retinas feed a finite number of nerve endings at finite intervals: whatever continuity we perceive in the world is an illusion we construct.

Understanding the world as field is very different from understanding the world as dialectic of solid and void. The world of objects and emptinesses is enumerable, a world of local binary decisions: is/is-not. In a world of fields, the distinction between what is and what is not is one of degree. There can be as many sampling points where something is not as there are where something is. Sampling involves an intermediate sense of reality, something between real and integer numbers, a fractal notion of qualified truth, truth-to-a-point. An object's boundary is simply the reconstructed contour of an arbitrarily chosen value. Having captured a three dimensional array of pressure points around a tornado, we can reconstruct the pressure contour of the center of the storm just as surely as we can the leading edge. At one density setting the data from a magnetic resonance scan give the shape of one's skull, at another the shape of one's brain, paradoxically replacing the discontinuity of sampling with a new continuity across names and categories.

The data upon which these tools are applied can come from any of several sources: direct sensing of the environment, computation of functions that occupy space, fiction and fancy, it does not matter which. In McLuhan's sense, the advent of the tool already changes our reality by shifting the balance of all our practices and outlooks. In order to contend with the enormous amount of information provided by arrays of instruments directed at all aspects of the world, scientists have developed a panoply of tools for scientific visualization. The dominant metaphor behind the operation of these tools is that of the field or lattice. Volume visualization, isosurface construction, advection, and numerous other techniques exist that allow us to peer into a block of numbers and extract the shape of an answer to a question.

Architectural heuretics and poetics, even when employing the computer's boundary representations and solid modeling, still emphasize a Euclidean understanding of form and space, an ideology of presence and absence. Descriptively, analytically, synthetically, in every way, the rigidity of the canonical, orthographic descriptions of architecture fail to capture what is salient to space as we currently conceive it. Plan, section, elevation, perspective, axonometric, traces of pigment held by the tooth of vellum, ruler and compass, were perhaps appropriate to the cycles and epicycles of a Ptolemaic, Copernican, and Galilean universe, or even the ellipses of a Keplerian universe, but are completely impotent in arresting the trajectories of subatomic particles, or the shapes of the gravity waves of colliding black holes. Once this is observed, it can be readily seen that the plan is dead because its worldview is obsolete.

An alternative architectural poetics would look past the static depiction of objects and surfaces to the description of latent information fields. The air we move through is permeated by intersecting emanations of information from every object: electromagnetic flux, intensities of light, pressure, and body heat form complex dancing geometries around us at every instant. We already inhabit an invisible world of shapes, an architecture of latent information that is modulated by our every breath and transmission. The shapes are definite, and with the right tools of sampling and visualization, can be seen, captured, and, if so desired, manufactured. It is imperative that architects embrace these tools critically and creatively, and set aside the tools that Alberti used as beautiful, but finally nostalgic, vestiges of another era.

4/4: Transmission

The unprecedented potential to cast space into the electronic net surrounding the planet is not without restrictions of its own. The astonishing capacity of optical fiber to carry information is just being grasped. In the interim, between astonishment and proficiency, we must contend with the present limits of bandwidth. While everything is growing exponentially, it seems that the speed of computers and the number of users of the internet are expanding at a more rapid rate than the availability of the raw carrying capacity required to create shared virtual environments. We will soon have very many people with very fast computers vying for limited bandwidth. It is unlikely, and, in any case, against the fundamental insights of distributed computing, to have a central computer manufacture one reality for many participants. The paradigm that is emerging is quite the opposite: each participant receives a compressed, concise description of the world and information about the state and actions of all the other participants. Each participant's local machine then synthesizes a version of the shared reality that is similar to, but not necessarily identical with, all the others, depending on local factors and preferences. In a Leibnizian way, each location functions as a monad. Each location is independent of the others, and yet, by the fact of their relative agreement, a larger reality is constructed.

Obviously, what is required here is a transmissible form of reality in condensed form rather than in fixed description. Simple compression does not suffice, since it imposes the same limit on resolution for all participants, regardless of their communicational and computational resources. In the long run, what must be transmitted is not the object itself but its cypher, the genetic code for the regeneration of the object at each new site, according to each site's available resources.

Cyberspace as a whole, and networked virtual environments in particular, allow us to not only theorize about potential architectures informed by the best of current thought, but to actually construct such spaces for human inhabitation in a completely new kind of public realm. This does not imply a lack of constraint, but rather a substitution of one kind rigor for another. When bricks become pixels, the tectonics of architecture become informational. City planning becomes data structure design, construction costs become computational costs, accessibility becomes transmissibility, proximity is measured in numbers of required links and available bandwidth. Everything changes, but architecture remains.

Genetic Poetics

Slowly, from the considerations above, we can articulate some expectations about what a cyberspace architecture might involve. It would be an architecture designed as much in time as in space, changing interactively as a function of duration, use, and external influence; it would be described in a compact, coded notation, allowing efficient transmission; it would be amenable to different renditions under different fundamental geometries; and it would be designed with the most advanced concepts, tools, and processes available. Emphatically nonlinear and nonlocal, its preferred modes of narration would inherently involve distributedness, multiplicity, emergence, and open-endedness.

Just as chaos and complexity have switched polarities from negative to positive value, so too are all the expressions of disjunction and discontinuity being revisited as forms of a higher order. Unlike the disjunction of collage that has characterized much of this century, the new disjunction is one of morphing. Where collage merely superposes materials from different contexts, morphing operates through them, blending them. True to the technologies of their respective times, collage is mechanical whereas morphing is alchemical. Sphinx and werewolf, gargoyle and griffin are the mascots of this time. The character of morphing is genetic, not surgical, more like genetic cross-breeding than transplanting. Where collage emphasized differences by recontextualizing the familiar, the morphing operation blends the unfamiliar in ways that illuminate unsuspected similarities and becomings.

Narrative structures are similarly affected. Cinematically, the cut yields to the crossfade and the crossfade yields to the morphed blend, until what would be consequent scenes merge into a modulated, varying composite of simultaneous existences. The elements of meaning become atmospheric and temperamental, and narrative sequence proceeds from ellipsis to ellipsis, in a stochastic perpetual motion machine.

Though the question of architectonic merit admits no facile answer, it must still be asked. Just as simple engines exchange displacement for force, so too do the tools of cyberspace exchange computational cycles for the production of usable information. It is fair to inquire not only how much power an engine can produce, but to what purpose that power is directed. Of all the cpu-cycles expended in the design and construction of a work of architecture, how many are applied to improving its architectonic quality? Are they applied toward goals that increase architectonic merit , or are they applied to peripheral issues, such as the more rapid production of mediocrity?

One of the fundamental scientific insights of this century has been the realization that simulation can function as a kind of reverse empiricism, the empiricism of the possible. Learning from the disciplines that attend to emergence and morphogenesis, architects must create generative models for possible ar-

chitectures. Architects aspiring to place their constructs within the nonspace of cyberspace will have to learn to think in terms of genetic engines of artificial life. Some of the products of these engines will only be tenable in cyberspace, but many others may prove to be valid contributions to the physical world.

One: transTerraFirma: Tidsvag Nol 1 v2.0

transTerraFirma is the ongoing effort to assert the vitality of architecture after territory. It is also an investigation of the means necessary for architectural conception and production in cyberspace. For the Tidsvag Noll exhibition in Sweden, this exploration has taken the form of a series of city-worlds constructed for the pre-release version of the Webspace three-dimensional web browser. These worlds are now available on the net. In various guises, these 'worlds in progress' each explore a different facet of virtuality.

Words are portals. Woven through the worlds are several webs of non-linear narrative. Words suspended in space, at different scales and orientations, act as portals to other worlds. One set of words consists of the names of present or historical cities that have been the sites of disaster and destruction: Kobe, Kikwit, Oklahoma City, Waco, Beirut, Sarajevo, Mostar, Johanessburg, Soweto, Carthage... Another set consists of reminders of what humanity would rather escape: plague, pain, torture, virus, carnage, friction... A third uses only sentence fragments, preceded and followed by ellipses, such as:

this body ...	the necessity of voids ...
after territory ...	you inhabit her fearscapes ...
fragments of stories ...	he asked about you ...
homeworld ... laughter, pain ...	upgrade my love ....
a matrix of questions ...	broken glass ...
no room ... the necessity of voids ...	
you occupy my visions ...collapsing ...	centrifuge ...
komMERZ ... spectacle ...	

This third system always leads to a distribution node, a world unlike the rest. The distributor world is a fully spatialized poem consisting almost entirely of text, arrayed in three dimensional space. Every sentence fragment in this space is a link back into the city-worlds. By creating a field of text fragments that the visitor can navigate through, a new form of poem is invented: a spatial poem, characterized by shifting relationships between the foreground and background words, between the words that catch the light and the ones that disappear in dark fog. As the visitor travels through this poem an infinite number of poems shift smoothly past one another, each phrase an entry to another world. The slow rotation of the text destabilizes the viewer, creating the necessity to either move to keep the words in any particular configuration, or yield to the change and reread the kaleidoscopic wordplay.

Locked within the deepest recesses of each city-world are nodes of 'friction', places where the visitor is confronted with

screens displaying images that have been gathered on the net, but that recollect reality outside cyberspace. These images are often related to the names of the cities, but in ways that are not directly apparent. Rather, the construction of meaning remains the responsibility of the visitor, who must integrate the overall sense of place of each world with the sequences of names of places, keywords, and sentence fragments encountered.

The design of the shapes one encounters in these worlds is based on an analogy to sound synthesis, extended to include three dimensional form. Timbre, the character of a sound, is not given by the fundamental frequency of a sound, but by the structure, proportion, and onset pattern of the overtones, or multiples, of that frequency. If we visualize the fundamental frequency as a wave, the character of the sound is given by the perturbations caused by the addition or subtraction of subordinate waves of higher frequency but lesser amplitude. Even though we know that sound propagates spherically, we normally think of it as an undulating line, representing air pressure, moving forward in time. We can just as well represent it as an undulating surface, like the surface of a liquid, or as a solid block of pressure or density values. Let use assume that a simple shape, a cube or a sphere, perhaps, corresponds to a simple sine wave. We know that by adding perturbations to the sine wave, we can produce a richer sound: the same is true for our simple shape. The idea of a fundamental function with perturbations carries well into other dimensions. Assuming that the fundamental figure of architecture is the domain, represented in two dimensions by a boundary contour of an arbitrarily chosen value, and in three by a boundary isosurface, we can search for functions that produce simple figures, and that can readily be modulated by successive perturbations at higher frequencies. Applying the perturbations conditionally ensures a high degree of control . Such a conception of architectural space has the advantage of being extremely compact: a single mathematical expression can be expanded to become a fully formed chamber, at whatever resolution the available resources permit. Adding a temporal dimension is as direct as adding another parameter to the expression, and the expression itself articulates the genetic structure of the chamber, making evident the loci of intervention for the generative or genetic algorithm that determines the growth of the architectural artifact over many generations. And, of course, it is eminently transmissible. While most current three dimensional browsers do not yet support the transmission of executable applications, applets, along with data, exceptions do exist, and that functionality will soon be standard. It will not be long before form follows the functions of fiction.

One Zero: The Transphysical City

Discussions of the relationship of the actual to the virtual tend to polarize even more rapidly than discussions of morality, politics, or gender. Remnant of our predator/prey days, an exclusionary either/or mentality makes more detailed considerations difficult. In considering the urban implications of a transmissible architecture, we will have to set aside binary opposi-

tions and establish continua between extremes that may well wrap around to meet at their most distant ends.

The transphysical city will be suffused with intelligence. Sensors and effectors will be ubiquitous and will be linked everywhere with information utilities as common as running water. How can we begin to envision such a city?

The problem of the design of 'intelligent environments' can be instructive. Each term, and their relationships, can be replaced by 'tuples'. 'Intelligence' can be replaced by Howard Gardner's seven types of intelligence: <visual, verbal, mathematical, bodily, musical, interpersonal, intrapersonal>. 'Environments' can be seen to be of at least three types: <actual, virtual, and hybrid>. The loci of application of intelligence to environments can also be listed: <in, on, of, by, ...>. If we map these tuples onto a coordinate system, we create a space of possibility for what intelligent environments might mean, what projects might be undertaken and what directions explored. What is the bodily intelligence of a virtual environment? How is intrapersonal intelligence exhibited by a hybrid environment? How can technologically augmented intrapersonal 'intelligence' enhance an actual environment? Once we have understood some of the features of this space, we can add dimensions. What is the range of urbanism?

There is no question that urbanism as we know it will be altered, that our cities will become our interfaces to the net, that we will really be able to 'reach out and touch someone' across the planet and as far as our transmissions will allow. As important as the understanding of those changes will be, we must not forget to see the larger change: a new, nonlocal urbanism is in the making. This new urbanism, transurbanism, freed from a fixed geometry, will have to draw upon set theory and the physics of a quantum universe. As distant as this may appear from the city as we know it, the transphysical city will not be the postphysical city. As the prefix *trans* implies, it will be at once a transmutation and a transgression of the known, but it will also stand alongside and be interwoven into that very matrix.

Futurismo & Futurismi

In the decade that has passed since the *Futurismo & Futurismi* exhibition in the Pallazo Grassi in Venice, the relevance of Futurism to our experience with technology has become increasingly clear. It is plainly evident that the conditions we have created will bring about far deeper changes than the ones that fueled early modernism . Still, the parallels are strong, and it is worth considering them briefly.

Of the various ways in which the futurists saw simultaneity and dynamism, Umberto Boccioni's was perhaps the most prescient and applicable to the conditions we are facing. Critical of Balla's literal depiction of forms in motion, Boccioni sought to capture a sense of time that was implicit in being. Like Bergson's notion of 'duration' as the principle animating

the passage through time rather than the particular form at a given instant, Boccioni's work observed the lifelessness of a form arrested from motion in a single instant, and created forms that were condensed records of their own becoming, past and future both being contained in the vector of the present. It is perhaps not too surprising that Boccioni's sense of and Deleuze's time-image would both draw upon, and thus be connected by, Bergson. What is surprising is that Deleuze and Boccioni, especially the latter's *Unique Form of Continuity in Space* of 1913 and related works both anticipate and can be expressed by the tools and concepts of scientific visualization, especially isosurfaces. Our surprise is only the result of our forgetting; in his 1913 Manifesto, Marinetti is explicit: *"... we should express the infinite smallness that surrounds us, the imperceptible, the invisible, the agitation of atoms, the Brownian movements, all the exciting hypotheses and all the domains explored by the high-powered microscope. To explain: I want to introduce the infinite molecular life into poetry not as a scientific document but as an intuitive element. It should mix, in the work of art, with the infinitely great spectacles and dramas, because this fusion constitutes the integral synthesis of life"*.

"Here and there, sick lamplight through window glass taught us to distrust the deceitful mathematics of our perishing eye". The wings and propellers of the Futurists were severed by the rise of Fascism. Marinetti's words cut both ways.

References

Bergson, H. *Creative Evolution.* New York: H. Holt and Company, 1911.
Bergson, H. *Matter and memory.* New York : Zone Books, 1988.
Deleuze, G. *Cinema1: The Movement Image.* Minneapolis: The University of Minnesota Press 1986.
Deleuze, G. *Cinema2: The Time Image.* Minneapolis: The University of Minnesota Press 1989.
Hallyn, F. *The Poetic Structure of the World: Copernicus and Kepler.* New York: Zone Books, 1993.
Hulten, P. (Ed.). *Futurismo & Futurismi,* New York: Abbeville Press, 1986.
Jammer, M. *Concepts of Space: The History and Theories of Space in Physics, 3rd Enlarged Edition.* New York, Dover Publications, Inc. 1993.
Kaku, M. *Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the 10th Dimension,* New York: Oxford University Press, 1994.
Kauffman, S.A. *The Origins of Order: Self-Organization And Selection In Evolution.* New York: Oxford University Press. 1993.
Perloff, M. *The Futurist Moment: Avant-Garde, Avant Guerre, and the Language of Rupture,* Chicago: The University of Chicago Press, 1986.
Wolff, R.S. and Yaeger, L. *Visualization of Natural Phenomena.* New York: Springer-Verlag. 1993.

225

CYBERFEMINISM

By Nancy Paterson

nancy@utcc.utoronto.ca

I n her latest incarnation she is exceedingly voluptuous. The scalpel blades beneath her fashionably manicured nails are discreetly retractable. The arm twisted up behind her back is, at first glance, barely noticeable. Meet Molly in William Gibson's novel *Neuromancer*, or Melanie Griffith in the film *Cherry 2000* - sexy, tough, aloof, and ultimately a fantasy.

The power which these women wield is evil, technological and, of course, seductive. Any influence or control which they exert is clearly misguided or accidental. And, if they happen to be pre-menstrual, they may just blast you to hell and back. The powerful woman, bitch/goddess, ice queen, android, is represented in popular culture as a 21st century Pandora. And the box which she hold this time is electronic and very definitely plugged in.

Linking the erotic representation of women with the often terrible cultural impact of new electronic technologies is not a new concept. Cinema addressed the desire to anthropomorphize machines and vilify women in the process as early as 1927 in Fritz Lang's cult classic *Metropolis*. Women as anti-technology neophytes is also an enduring theme. Sex, danger, women and machines: the plot of virtually every mainstream, futuristic, sci-fi movie in which women play any role at all. Cyberfemmes are everywhere, but cyberfeminists are few and far between.

The deconstruction of feminism, the division of women according to geography and sexual or other politics, is as often self-inflicted as it is directed by the corporations and corresponding figureheads which oil the gears of mass media's machinery. A response to the acceleration of technology and history. Our lives are careening very nearly out of our control. With the pieces and parts scattered at our feet what can be salvaged from 20th century feminism? Through examining the relationship between women and technology, perhaps where science and fiction converge (in the new technological ethos of new electronic media and art) there may be an opportunity to reconstruct feminism. Post-gender, trans-gender - the possible parameters of a new philosophy.

Ubiquitous and omniscient, the significance of new electronic technologies, their development, design, implementation and dissemination, cannot be ignored and must not be underestimated. Whether directly or indirectly, issues of economics, class, race, nationality, personality and gender, are driven and defined by new electronic technologies. Immersed as we are in the popular applications of these new technologies and media, they become transparent, their long-term and more profound impact disappears. The rhetoric of the news release has become the new measure for truth. Reality is whatever the market will bear.

In *The Media Lab: Inventing the Future at MIT*, Nicholas Negroponte is quoted as saying: 'Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road.' Without indulging or condemning ourselves to a fetish-driven celebration of the military-industrial complex responsible for the development of these new technologies, and without resigning ourselves to the roles which a capitalist patriarchal culture has designated for us, what alternatives are left for women? Certainly not the association of the feminine with 'nature' advocated by eco-feminists and theorists such as Camille Paglia. If the goddess is making a comeback, she had better be computer and media literate. The progress of new electronic technologies will otherwise leave her in the dust.

There is a school within a school of thought - hard core Information Processing as it is known among Developmental Psychologists - which shares many characteristics and beliefs with a similarly situated 'school within a school' - in this case in the field of Computer Science - Artificial Intelligence. Tracing the essence of human characteristics back to the intricate twists and turns of the double helix - the DNA - they propose to simulate human thought and behaviour through computer programming. The DNA as a code for the biological and psychological human information processor. With which they relinquish all knowledge and interest in humanity beyond this model and turn their attention to the machinations of computer simulation. A thankless task. For all its merits, the DNA model does not and cannot explain a number of significant aspects of human behaviour and thought. A disappointing but not surprising number of artists are still grappling with this gap between reality and representation. And mainstream media has been wrapped up with this flawed interpretation for some time. The sooner that we grasp the concept that unpredictable random acts, whether of violence or kindness, are almost all that we can expect, the sooner we will gain some insight into the relationship between nature and technology. And yet, we must not perpetuate the myth that technology can or should be developed independently of ethical or humanistic considerations.

The resurgence of determinism, whether biological or technological, is bound to have nasty repercussions for women. The patriarchal system which controls the development and applications of new technologies implies that both the applications and the technology itself are inevitable. Technological utopianism at least encouraged optimism. Technological determinism has a death wish.

Women are not alone in the need to understand how, why and by whom our criteria and confidence for understanding ourselves, each other and our relation to the world, has been stripped away. The dissolution of conventional concepts of time and space through new electronic media has contributed to the acceptance and success of PoMo punk nihilism, pluralism, diversity and the disappearance of dominant history. Simultaneously, we are witnessing a crisis of both individual and cultural identity as we

are faced the interminable task of incorporating new electronic media into our lives without handing over control.

New electronic technologies are currently utilized to manipulate and define our experiences. Cyberfeminism does not accept as inevitable current applications of new technologies which impose and maintain specific cultural, political and sexual stereotypes. Empowerment of women in the field of digital media can only result from the demystification of technology, and the appropriation of access to these tools. Cyberfeminism is essentially subversive.

William Gibson is credited with having introduced the word 'cyberspace' into popular culture in his novel *Neuromancer*, defining it as a 'consensual hallucination.' In fact, cyberspace may be used to describe electronic space in all of its manifestations, ranging from virtual reality to the telecommunications infrastructure or internet. As illustrated by the recent U.S. Clinton/Gore initiative to regulate the internet or Information Superhighway, governments are beginning to recognize in public policy the commercial potential and danger of media which have been under development for several decades. More recent proposals include the clipper chip and the Communications Decency Act, raise serious implications for security, privacy and censorship. Predictably, the involvement of feminists and other marginalized groups in this process of development and design has not been solicited or encouraged, either in public or in private initiatives. The privileged elite on both the revolutionary and the reactionary sides of these questions, are not women, but men. Our fate, once again, seems to lie in their hands.

Lines of cultural influence are currently being drawn based on computer access and literacy. It is becoming the new political divide - those who have access to computers or are computer literate vs. those who are not. The North American Free Trade Agreement, workplace automation, and legislation regarding the 'Information Superhighway,' are generally supported by those individuals, organizations and corporations which have and promote access. Those who have access and are computer literate but do not share enthusiasm for these types of policies and initiatives, are severely isolated as they have no one to unite with in their quest for well thought out socio-economic reforms. At the other end of the spectrum, those who do not have access, are not computer literate, and are in fact, often technophobic, are critical, but not necessarily constructive in their analysis of new electronic technologies.

A factor contributing to the discouragement of women in these fields may be traced to the historical foundations of these media. The internet, a worldwide computer network, was originally a small military network of four computers known as ARPANET. This computer network was designed to research the feasibility of creating a decentralized system of communication which could survive a nuclear war. Similarly, VR (virtual reality) also had militaristic origins, having been initially

envisioned as a tool for battlefield simulations. These origins are clearly acknowledged in every book and article describing current and potential applications of these systems. However, this candor is deceptive, as no links are made between the origins of these media and the future towards which they are being driven. It is obvious that underlying assumptions are manifest in current popular applications of these media. The evidence is in the arcades, where video games such as the Sega Genesis 'Night Trap' challenges players to save scantily clad sorority sisters from a gang of hooded killers.

Margaret Benston, a Canadian writer and engineer with an interest in the social and political dimensions of science and technology, in 'Women's Voices/Men's Voices: Technology as Language,' describes technology as a language for action and self expression. Access to machinery and technology has been culturally sex-typed as masculine.

Despite these obstacles, women are increasingly successful in breaking through. Particularly in philosophy and cultural theory, an uneasy realization is dawning that mans' haphazard mastery of nature and technology has not provided an adequate foundation for a vision worthy of leading us into the next millennium. Across this bleak and plundered landscape cyberfeminist theorists are emerging, speaking and gathering. A new chain of beings and being in the world is constructed; they reshape each other, they redefine themselves, and they reclaim new electronic technologies for women.

Virtual reality and cyberspace - the technologies for living vicariously. Virtual reality may describe a wide range of experiences, including the transformation of two-dimensional objects and spaces through media such as holography; installations which use multiple video monitors or projections to surround the viewer; and the 'Hollywood' definition with which we are becoming increasingly familiar - head mounted display, touch sensitive gloves and full body suits. Telepresencing and cyberspace, where telecommunications networks enable instantaneous interaction from remote locations, have also been commonly described as virtual spaces.

The body/mind split which has governed our approach to new media, has gone underground, but has not disappeared. The disembodied mind is resurrected through applications such as VR - the desecration of the body has entered a new phase.

These new digital media have stretched and twisted our understanding of time and space as well as the limitations of our vulnerable, physical, human bodies. The proof of their impact may be measured by the paranoia which they have inspired. Cyberspace has become a fertile breeding ground for multiple personalities, flaming, electronic stalking and gender-swapping at the very least.

The body, in virtual space, is no mere user-interface; VR offers the chance to trade-in, remodel, or even leave behind the

physical nature with which we are, in reality, burdened. Outside forces which act upon us, impose restrictions, are gone. Gravity, and the laws of physics, gone. Entropy and the passage of time become meaningless concepts. Women have always, by virtue or necessity, been adept at free fall, grounding themselves in personal physical experience. This skill will serve well as we venture into other dimensions and back home again. However skilled we become at navigating these spaces and temporarily leaving our bodies behind, it is doubtful that we will ever achieve immortality. Virtuality is patriarchy's blind spot.

Paris Is Burning, Jennie Livingstone's film about gender, identity and style, documents what was surely (before the introduction of technology-based VR into pop culture), the ultimate virtual experience - walk down a runway, through Harlem, or down Wall Street for that matter, in drag. Transsexual and cross-dressing 'walkers,' competing in the categories of 'executive,' 'college boy,' and 'fashion model,' recognize that the successful embodiment or representation of stereotypes is measured by both appearance and attitude. 'Realness' has always been the unspoken criteria for 'passing,' and women (those who have avoided being institutionalized for not 'fitting in') have become experts at that.

Through Virtual Reality, deconstruction of gender is entering the realm of pop culture, and this link with new electronic technology has implications for cyberfeminism. Technological convergence describes the unification of computers, television and communications technologies. However, convergence describes much more than the evolution towards an environment in which electronic technologies are pervasive. Convergence is happening on more than a technological level - it is happening on a cultural/metaphysical level as well. Cyberfeminism is entering an arena in which much more than gender is up for grabs.

Multimedia, interactive video, virtual reality; for women these new technologies present opportunities to break out of prescribed roles and away from scripted dialogues. A rabbit hole through which we may tumble. Our real experiences, when not denied, have been acknowledged only in their immediacy. Our individual histories and the attempt to isolate or remove ourselves from a patriarchal context, have always been undervalued and undermined. We have learned to live from hand to mouth.

Transgressing order and linear organization of informatio, cyberfeminists recognize the opportunity to redefine 'reality,' on our terms and in our interests. The electronic communications infrastructure or 'matrix' may be the ideal instrument for a new breed of feminists to pick up and play.

In closing, I would like to remind you all that, "in the future, everyone will be famous for 15 megabytes (compressed)."

ONTOS, EROS, NOOS, LOGOS

By Mark Pesce

mpesce@netcom.com

Mircea Eliade, in *The Sacred and the Profane*, states that the sacred is that which ontologically founds the world. The sacred is the place for being, in its primary sense; all else is measured against it. This sacred space can be local and entirely personal, or global and hierarchical, but the essence remains.

Space has vanished; we find ourselves, through instruments of mediation, together in the same room, looking at each other, occasionally revolted by what we see, occasionally aroused, and sometimes interested - the Circus Planet Earth, a tent with a T-1, and a hundred million rings. All our sacred space is suddenly the same.

The ego erodes; that figment of the Greek imagination, born when man as individual asserted the I of self over the I of species - and warred with himself ever since - will be gone inside a generation, lost to a growing hum of collective being.

This collection is both rape and consummation; if we ignore the death of human ego, we will find ourselves pierced by a thousand constructions that combine biomechanics and propaganda into forms of mediation which will leave us wholly as receptacles for the being of others - Eros enslaved, ending as cyborg.

There is another way; connection need not presuppose domination, or mediation, control. The ecology of souls, together behaving as one organism, has in its form the embedded understanding that each part is important, and none dominant. The center is everywhere, the circumference nowhere. Pierre Teillard de Chardin called this nexus of connection noosphere; studies of connective mediation are equally studies in noospherics.

The space of our connection is the ground of our being, the collective beyond we, the singular before I. The original Ontos can not be named, Tao before division, Nothing before Fool. Our final unity, in either form - or perhaps in a middle which avoids the hegemony of either and creates a new assemblage of heavens and hells - is unspeakable now, for the Logos of our new aeon has yet to be uttered.

ISEA95 montréal isea95@er.uqam.ca T : (514) 990-0229

Ritual

Assemblage is seldom a conscious process. The confluence of elemental entities and their arrangement into plateaus of meaning occur naturally within the realm of psyche. This dark night, that bright moon, those shining stars. In this, ritual is a constant process; the perception of life is performance of memory, the consistent re-doing of that done once in order to reinforce its sacred nature.

Plateau has pattern, and is simultaneously realized at multiple levels of scale, boundaries fringed to infinitesimality with subcategory, form hyperinflated to universality in an echo greater than itself. Hermetic thought takes assemblage as the natural state of the universe - internal and external - and assigns to each instance of occurrence a location in the dynamic range of the cosmos.

Witchcraft is assemblage with sublime intent. Craft
It is said that the essence of Witchcraft is timing.

Time has qualities of circle and cycle. Earth orbits Sun, and tips itself, solstice to solstice, each of these the crest of a wave. The node points, the intervals between - identified as equinoxes - are the gates and transitions; between light and dark, dark and light.

In this form, to move in the interval is to move within time. The Equinox as balance point between crests is the gateway in a fundamental sense; the door opens, and the task appears. It becomes possible to harmonize with the cycle, apply creative energies to it, and change the world.

Casting

All magical actions have interior and exterior effects; as within, so without. The first delineation is the creation of the circle which marks this space as sacred, the rest, profane. Every line divides; that left outside, the profane, exists in opposition to the sacred.

Casting is the gathering in, the ultimate definition of what elements will be present in the assemblage, a conscious creation of the plateaus of meaning, the regime of signs is clearly delineated and invested with power. The circle serves as reminder that all things return; the selection of sacred sign is a function of the sacred self.

This action is also a casting away, a banishment of the oppressive regime which constructs mundane reality; the tension between the gathering in and casting off symbolizes the fundamental boundary between will and universe, yet represents the essence of their relation.

Ontos

There is another world - you can see it in the distance. Turn your sturdy craft around, and begin to tack toward it. As you move closer, you can see more of this world; its features become familiar to you. From far above weather systems are white pinwheels, but you move in. Diving closer. Closer. Closer. Finally you ride the rows in a forest of corn, swooping in like an eagle. Seeing everything.

As we translate the physical into the astral, and move from the concrete feel of the Mother beneath our feet into an electric evocation of her totality and possibilities, we create ajna chakra, participating in the movement from the singular to the unified. Foucault might be horrified (or perhaps delighted) at this global Panopticon, which promises to place us all under the rule of an all-seeing eye.

For the eye to grasp more than photons, it must express itself within the mind which conceives and understands. Observation engenders mutation, the lesson of Heisenberg. Knowing is doing, and the conception of Earth-as-one will quickly lead to the intuitive understanding that humanity is one, as life is one.

Ajna chakra sees through the false boundaries of maya to the undifferentiated state of being.

Eros

Then a plaza where all roads cross and the highways have their end. This place is crowded and bubbling and alive with speech and human presence. People are selling, "Things to-buy to-day!" and people are saying, "I'll buy that thing to-day." The space where all meet, display their wares, nourish friendship, transmit secrets, and listen to the noise of five billionanity.

The ecstasy of communication is the joy of uniting the divided self. Another implies the unexpected, something both interesting and divine. Connection is consummation; the closed circuit feeds back and governs a whole.

Wires which carry signal transmit the connective spark. Beholding a face is a meditation upon the heart. Mediated communication as refiner's fire transforms the self to include the other.

To cross again is to uncross; even as multiplicities dissolve into unity, it intuits itself as before a greater multiplicity. Union is instantaneous and fleeting, division eternal and permanent. These two create hope.

Noos

And a room - improbably long and impossibly high - dense with shelves and books. In this room all human things are kept, every memory or fragment of knowledge or wisdom or truth or scientific fact or creation or prayer or great word spoke. You glide through the room, and as you do, it changes - listening to what you say, conforming to your need.

Continuous mutation becomes synonymous with the conception of mind; each event which perception contains becomes contained by it. Each understands the universe from a locus articulated as self, yet this mind now contains the full volume of all experience. The center is everywhere; being of one mind has another meaning.

Virilio has said, "Speed Equals Light". At the limit, surrendering speed in favor of energy, self translates into a new form, a tongue whose only word is change. This flow - infinite, indivisible, inescapable - becomes the carrier wave for a different way of being.

Logos
Last, a place which is no space, but a feeling and a sound of a voice opened up and shared; every voice within - there and next door and the world around, being in here, in song, as one.

The harmony of the spheres is expressed as a single voice. Human music. The essence of the self in celebration transmitted globally singly representing something new.

Joseph Goebbels would be proud.

These two are the final cross; where they cancel AL is union. Nothing known.

In the Mirror (Goddess & God)

The evocation of Pan panics us; we have no space for the sacred insane, the holy prophet, the blessed fool. Thus, his appearance is marked with thunder instead of laughter.

In her descent to hell, Inanna loses the seven sacred items which crown her royal majesty. So in cyberspace are we stripped of the material. We enter with ourselves - nothing else will fit through that gate.

Look into this universe and see demons; we already know who put them there. And if we worship gods, we are divinity.

Cyberspace is the mirror held to the third eye.

May you never hunger * May you never thirst

The rhizome is equally the hybrid - neither this nor that, but something in between, encompassing all possibilities, releasing white light. McLuhan called this the "dangerous liaison"; at the ultimate intersection, all mediation is drawn into a single form, which, like some great, black star, consumes the universe of perception, radiating gamma rays.

Against this gathering in: concretized imagination, net cast forth, shared across the body of this planet - a new sea of stars, each shining brilliant in the body of the night.

The Circle Open yet Unbroken

The work is done.

Farewell to goddess and god, I and thou; then departing the Air, Water, Fire and Earth. An end as was begun; full circle, back to the gate at Equinox.
All is as it was before crossing.

The plateau is overrun by the regime of the mundane.
Only memory remains.

Back then, into the darkness.

THE DIS-ORDERLY CITY
A NIGGER IN CYBERSPACE

By Keith Piper

I was struggling to envisage a Rodney King computer game. Initially, one would be confronted with an interface asking you to choose one of two options, to be a Controller or to be a Transgressor. However, in response to your privileged position as custodian of the system, the role of Controller is set as a default, whilst transgressor is ghosted and inactive.

As the game opens on the first level you are alerted to the fact that your system has been infiltrated by a rouge 'virus', which you perceive to be crammed with transgressive algorithms. The 'virus' is moving at high speed along a communications bus, and you fear for the security of the cherished resources and privileged information stored in discrete locations elsewhere in the system. In response to this perceived threat you dispatch a series of devices programmed to 'protect and serve' and this level of the game develops into scenario of cat and mouse. The object of the game at this point is to apprehend the 'virus', and to return it to the part of the system which has been labelled the 'Trashcan', a location within which all redundant, inconvenient, unsightly and transgressive elements are deposited, out of sight and out of mind.

Once the 'virus' has been apprehended, this stage of the game is complete, and you are at liberty to move on to the second level. The second level of the game borrows elements from 'Street Fighter II'. However, as the controller you have up to eight agents at your disposal, arrayed against the single transgressor. The object of the game is to determine an adequate response to transgressive gestures on the part of the 'virus'. If for instance, the virus raises itself to an angle of 20 degrees or greater, you are presented with a choice of options ranging from administering a swift blow to the side of it's head with a long handled baton, shocking it with a electrified prod, or placing your heel onto the back of it's neck. This stage of the game is over when the 'virus' either assumes a position of absolute passivity, or lapses into unconsciousness.

On the third level of the game, you are confronted by the uncomfortable knowledge that the tactics employed on level two have been scrupulously logged in the systems memory, and you are called upon to defend your choice of responses as measured against the perceived threat to the system posed by the transgressive 'virus'. If you succeed on this level, if you are able to create an argument which sufficiently demonises the transgressive 'virus' and amplifies the danger which it potentially posed to the continued smooth running of the system, then you are at liberty to play another game.

The first time the game was played however the logic broke down and transgressive viruses flooded out of the Trashcan crashing the entire system.

A Rodney King computer game may at this stage represent a marketing flight of fancy, but it does provide us with a convenient entry point into a wider set of debates. It provides us with a recognition that we are currently entering a scenario in which we are coming to occupy two parallel landscapes, separate but inextricably linked. Both are sites across which a range of contests of territory are being played out in earnest.

Across one of these landscapes, these contests have already come to form the mythological backdrop which has come to inextricably colour the perception of that landscape in the contemporary consciousness. Across the other landscape a set of contests which have come to hauntingly replicate those played out across the first landscape are beginning to reveal themselves in all their startling complexity.

The first of these landscapes is the physical and social landscape of the city, both as an conglomeration of disparate neighbourhoods, and as key locus in a complex web of regional, national and international networks. The second is the parallel landscape which has come to be known as 'Cyberspace', the intricate and inextricably expanding universe of digital data; the spaces which it occupies and the channels through which it is disseminated.

Both of these landscapes historically came to be identified in modernist discourses as sites across which the optimism and opportunity afforded by the inextricable forward march of technology would inevitably bear their finest fruit. The city would become an arena replete with the technologies of economic, material and social enablement and recreation, and within this scenario of a brave new world, computer based technologies would play a key role. The new citizen of the high-tech metropolis (the Technotropolis) would be at liberty to delve into Cyberspace at will, tapping into informational networks and structuring lifestyles around the logical interaction between commerce, productive labour and entertainment.

The historical events surrounding the beating of Black motorist Rodney King, the acquittal of the Police officers who had been caught on video tape administering the beating and the subsequent rioting which gripped Los Angeles, and spread to a series of other American cities, provides a symbolic point of dislocation, a key indicator marking the inextricable breakdown of those previously held scenario's of optimism.

Instead, what emerges is the notion of the 'dislocated city'. What emerges is a vision of the contemporary 'city' as a dislocated jigsaw of isolated and antagonistic communities entrenched within balkanised neighbourhoods. Disintegrating communications systems along with the entrenchment of privilege

and disenfranchisement has not only created a dangerously volatile underclass, but also a disjuncture between the language systems with which these dislocated communities conceptualise the world around them. It is this chaos of language, this fragmenting of a 'common sense' which led the Simi Valley Jury in the Rodney King beating trial of 1992, to accept the logic which framed excessive force on the part of the Police officers as a justifiable protective measure. After all, these were individuals who had enlisted to guard the boundaries of those neighbourhoods of plenty, of good order and accumulated privilege, from incursion by outsiders; individuals from those other neighbourhoods; neighbourhoods of poverty, chaos and bedlam; neighbourhoods of the racial 'other'. These were their front line troops in the contest of territory between white wealth and the numerical expansion of black and other 'Third World' peoples. Here was a key point of struggle in the battle against the inextricable 'Africanisation' of the city.

This language and the logic which underpinned it, was lost on those black and 'Third World' folks and for three days the city burned. The metaphor touched upon within the scenario of the Rodney King computer game which identifies the black as a rouge virus, as a conglomeration of transgressive algorithms whose presence must inextricably disrupt the smooth running of any system which it infiltrates is useful only to the extent to which it parodies white racist discourses which frame the black as the cause rather than victim of urban depravation and decay.

The wider issues however, around the particular in-roads and struggles for visibility of a black theoretical and aesthetic presence within the realm of digital media, within Cyberspace, and the sense to which it parallels the various struggles around black visibility and presence across the landscape of the post modern city is of particular interest to us here. This is very much a contest of territory, a struggle around the colonisation of Cyberspace by various constituencies, and within this colonisation, a series of eclectic and expansionist 'Africanised' enclaves are emerging. These 'Africanised' presence's are transgressive to the extent that the 'founding fathers' of Cyberspace very much replicated the social and economic interests of the enfranchised white status quo, and within their 'brave new world' as in the landscape of the affluent city, the black presence would always be a trespassive one. It is however the extent to which the black presence in Cyberspace uses it's transgressive and trespassive nature as a tool of tactical engagement and struggle which I shall go on to explore in this text.

Transgressive behaviour has been a feature of Cyberspace since close after it's inception. The so called computer 'Hacker', a technically literate data burglar, ensured an early entry into the lexicon of digital demonology, presenting himself as the swashbuckling scourges of the banker and the information manager. The image of the 'hacker' seemed to hover in the space between the rouge and disgruntled digital professional, using

his insider knowledge of systems architecture to roam Cyberspace at will; and the adolescent digital progeny launching raids from a computer rig cobbled together amidst the clutter of an untidy and unventilated bedroom. Such an individual was conjured into celluloid life in the John Badham film 'War Games' which sees a teenage boy 'hack' his way into a military mainframe computer in order to play a game of 'thermonuclear war'. What becomes interesting about such characterisations, is that the 'hacker' is firmly located against a backdrop of middle class white America. Whilst this may in fact be an accurate reflection of the background of progressive generations of digital technocrats, and the path from teenage hacker to corporate new technology yuppie may indeed be a well trodden one, it has the net effect of recreating Cyberspace as a domain peopled exclusively by clever white males.

This image is to an extent off set not only by the predominant role of the Japanese and other far Eastern companies in the expansion of Cyberspace, but also the growing phenomena of the so-called 'Otaku ': Japanese kids who are busy colonising Cyberspace' sometimes for transgressive ends. In his article on the subject, Volker Grassmuck maps out the transgressive spaces into which the Otaku frequently wonder and begins to touch upon the resultant wide scale moral panic which such excursions have come to engender.

Though minuscule discrepancies in the informational level can have immense consequences for Otaku, they seem less discriminating with ideologies. War and sex, fantasies of mass murder and sado-masochistic rape appear regularly in their media. Volker Grassmuck .

Moral panic around the dangers of allowing young people to emerse themselves into a Cyberspace universe as threatening as any inner city no-go area, replete with violent games and corrupting pornography has now become another favoured 'cause celebre' of the British tabloid press. In a recent article entitled 'Sex, Lies and video games' Stevie Kennedy states that:

It is one of those ironies of life that, after years of printing articles on the possible social effects of games software, the computer press should see the embryonic spark of mainstream interest in the subject turn into a bush fire of hypocritical hysteria and tabloid hyperbole. Stevie Kennedy

It is interesting therefore to begin to examine how various aspects of black visibility, so often characterised as an almost essential cipher in the recasting of a space into a site of dangerous and transgressive activities have impacted upon the universe of Cyberspace.

In very real sense the world of new technology has succeeded in projecting an image which either sees the black as placed outside of it's domain, as being literally 'other', or frames the black as the 'subject' of the high-tech gaze. The so called

'Third World' for instance, the world of underdevelopment and poverty, is seen very much as a pre-technological space. It's dark skinned peoples are characterised within the Western gaze as being unconscious to any notion of a digital realm of logic, development and privileged knowledge. Their only interaction with Cyberspace comes at those points where they are subjected to the gaze of the Electronic News Gatherers, their passive images beamed out into Outer Space to be collected and reprocessed for the consumption of distant, technologically engaged audiences.

Their other potential interaction with Cyberspace would come only if they ever attempted to trespass into the so called 'First world'. The perceived threat of the migration of peoples from the poor South into the industrialised centres of Europe and North America have resulted in an unprecedented escalation in investment in new technology as a means of monitoring and controlling their movements. At every port of entry, Cyberspace forms an invisible but all pervading barrier, scrutinising potential migrants and adding high-tech re-fortification to the fortresses of economic privilege which are now Europe and North America.

It is within the boundaries of the so called 'First World' however, that the perception of the black as being either outside technology, or passive subject of the technological gaze comes under it's severest strain. Although often celebrated as occupants of a more intuitive, physically reflexive space, a space in touch with the body, as opposed to the cerebral, coldly logical and physically detached space of new technology; The black presence has marked out a whole set of terrain's in Cyberspace as sites of contest with the enfranchised status-quo.

Principal amongst these sites has been the terrain of new technology and music. In the track 'Caught, can I get a witness!' Rap group Public Enemy being to explore the legal mine field opening up around copyright ownership and the re-appropriation of black creativity through the use of the digital sampler as an act of political defiance.

I found this mineral that I call a beat I paid zero I packed my load 'cause it's better than gold People don't ask the price, but it's sold...

The power which new technology gave to plunder the previously sacrosanct world of copyright ownership, (the copyright of much popular music being in the hands of the Record Company as opposed to the artist) represented a major transgressive threat to the music recording establishment. Initiating a form of digital looting. The realisation that the technology also allowed production capabilities which were formally the exclusive domain of the enfranchised, to become available to individuals to use in their bedrooms, redoubled it's transgressive potential. The fact that the resultant musical movements of Rap, House, and Acid House were all the products of the

democratisation of Cyberspace, and represented a significant creative entry into that technological domain by young black people is noteworthy. The recognition that around all of these movements have gathered a smoke-screen of media demonology and hysteria, from panic around the violent, political and sexual lyrical content of Rap, to the spectre of British riot police storming 'illegal' Acid House 'raves', is testimony to the transgressive potential afforded by the colonisation of these spaces by black and black derived cultural activities.

The key issue here is one of control. The contest has always been between those agencies which need to preserve Cyberspace as a tightly structured domain where information can be organised and accessed by the privileged, and by so doing reinforce their control over the physical landscape of the City and the Nation State, and those for whom that control has always been detrimental. In this sense I would argue that the enthusiasm on the part of Cyberspace insider's for so called 'Interactivity' has to be placed in perspective. True 'Interactivity', in the sense that for example African cultural forms have always displayed interactivity, allowing a unpredictable and intuitive interaction between presenter and spectator, would represent an anarchic nightmare to the enfranchised controllers of Cyberspace. The sense to which the listeners intervention into the 'Griot's' account, or the traditions of 'call and response' in black cultural events, or more recently in 'Scratch' music where the DJ intervened with the received pre-recorded disc, creating a new 'interactive' collage of sound, is at odds with the Artist and audience scenario of western 'high culture'. Within this scenario one is presented with the work of the gifted 'maestro' as fixed and eternal. As audience you are asked to passively spectate and applaud at the end, using a fixed set of expressive gestures.

In this sense, I would argue that many of the digital products presented as 'interactive' remain in point of fact tightly structured matrix's which one is allowed to navigate only along preordained pathways to a set of fixed destinations. In a sense these interactive products become models of the orderly city of which the power structure has dreamed but failed to realise. As a pedestrian in this orderly city, one can only proceed along predetermined roadways, turning left, right or straight ahead at set junctions.

Within the truly interactive city on the other hand, the unruly pedestrian could jay-walk and trespass, cutting across waste land and leaving graffiti on hallowed walls. Worse (or better) still, such a pedestrian could force a path through or over those walls and help him or herself to the treasured resources beyond. This becomes the interactive domain as riot zone with the user not as orderly citizen but as digital looter, disorderly and anarchic. Within this zone, treasured and privileged resources are redistributed and exclusive spaces a democratised. It is within this nightmare scenario for the controllers of Cyberspace, that the digital equivalent of the disorderly black of urban chaos and

transgressive behaviour steps into full visibility. It is at this symbolic point that Cyberspace changes from a sterile zone at the service of the establishment into a free domain within which everyone becomes a liberty to seize a portion of terrain and reshape it to their individual needs.

© Keith Piper.1995

2

LES INTERFACES MULTIMODALES AVEC RETOUR DE FORCE
LA MÉTAPHORE DE L'AVEUGLE ET DE L'ASTRONAUTE

Par Christophe Ramstein

cramstein@citi.doc.ca

CITI

Il était un aveugle qui cherchait son chemin,
Et prenait repères de son oreille et de sa main.
Il demandait aux passants qu'il rencontrait,
De décrire séant objets et actions qu'eux voyaient.
Mais rien n'y fit vraiment car les incides qu'il reçut,
Remplaçaient difficilement sa vue perdue.

Ailleurs se promenait un astronaute,
Qui voyait parfaitement et sans faute,
Il consultait sa carte, sans peine ni effort,
Et savait d'avance trouver son chemin en dehors.
Mais ses membres sans poids au gré du vent allaient
Contre sa volonté pourtant fort développée.

Finalement il n'eut de meilleur choix que de demander,
Au passant aveugle qu'il rencontrât,
Si ce dernier pouvait lui prêter, le temps d'un pas,
Une main ferme et un pied assuré.
Ensemble ils découvrirent l'art de conjuguer
Ce qu'avant ils ne faisaient que regretter.

La nécessité de considérer les trois canaux de communication principaux (visuel, auditif et gestuel) dans le processus de l'interaction personne-ordinateur est analysée. Un dispositif à retour de force est décrit : grâce à deux moteurs et à un espace de travail important, il permet de créer la sensation d'objets et de propriétés physiques, perceptibles au toucher. Mais l'intégration d'un tel dispositif dans les interfaces contemporaines n'est pas immédiate et exige de concevoir et de développer des modèles et des modules logiciels. En effet, le canal gestuel, malgré sa richesse, ne peut être abordé raisonnablement qu'en complément aux modalités visuelles et auditives. Aussi se pose le problème de la multiplicité et de la combinaison des modalités (multimodalité). Outre les descriptions techniques, l'intégration sociale de cette technologie sera abordée.

Introduction

Avec les interfaces graphiques à manipulation directe (GUIs), l'utilisateur interagit avec l'ordinateur à l'aide d'un écran, d'un dispositif de pointage et d'un clavier. Ces interfaces sont dites faciles à apprendre et à utiliser, grâce à une spatialisation de l'information qui réduit la charge cognitive de l'utilisateur. Toutefois, ce schéma d'interaction est incomplet. En effet, il exclue les utilisateurs non-voyants, il est non-portable à des milieux exceptionnels comme la microgravité et finalement, il néglige la nature multi-sensori-motrice de tout en chacun. Avec la standardisation de ces interfaces, il est donc primordial de mettre en oeuvre de nouvelles interfaces, en se laissant guider par les capacités sensori-motrices potentielles des utilisateurs, conjointement aux avancées technologiques répondant à cette logique modale.

Depuis 1991, le CITI, centre de recherche du ministère de l'industrie du Canada, conçoit, développe et évalue, en collaboration avec le milieu universitaire et des partenaires privés, des interfaces multimodales avec retour de force. Il s'agit d'interfaces personne-ordinateur qui combinent trois types de stimulations: visuelle, auditive et haptique. Ces trois types de stimulation sont combinées, complémentaires et redondantes, dépendant de l'application et de l'utilisateur cible. Cet article décrit l'avancement conceptuel, matériel et logiciel de la recherche sur ces nouvelles formes d'interface.

Un dispositif haptique pour toucher de la main

Le terme haptique qualifie le moyen de perception composite tactilo-kinesthésique. Le sens tactile donne une conscience des stimuli apparaissant sur le dessus du corps grâce aux récepteurs placés sous la peau et au système nerveux associé. Pour sa part, le sens kinesthésique offre une information sur la position du corps (positions et déplacements relatifs des membres du corps) grâce aux capteurs placés dans les fibres musculaires, les tendons et les jointures (Lederman 1990). La différence est importante. Bien que généralement omniprésents dans la réalisation d'une tâche manuelle, chacun intervient de façon sélective pour percevoir le phénomène et les deux sens ne sont pas stimulés de façon égale pour percevoir la texture d'une feuille de papier, pour écrire avec un stylo ou pour taper sur le clavier de l'ordinateur.

Quels sont les choix ?

Les dispositifs existants pour stimuler activement le sens haptique se présentent sous deux formes complémentaires ; les stimulateurs tactiles et les dispositifs avec retour de force. Les dispositifs tactiles viennent stimuler les extrémités digitales avec des matrices de points programmables pouvant créer la sensation de textures et de formes. Il s'agit par exemple d'afficheurs braille et de cellules vibrotactiles tel que l'Optacon (Craig & al 1982) ou de stimulateurs en robotique ou réalités virtuelles (Pennywitt 1986).

Les dispositifs à retour de force sont programmables dans leurs formes et dans leurs comportements. Grâce à des moteurs, ils peuvent créer la sensation d'objets et de phénomènes phy-

siques (i.e, murs rigides et élasticités), alors même que ces objets n'existent que pour celui qui les perçoit avec le dispositif. Les forces retournées peuvent atteindre plusieurs centaines de grammes par degré de liberté (Cadoz 1990 ; Minski 1990 ; Hunter & al 1994 ; Johnson 1995). Certains dispositifs à retour de force intègrent une composante tactile programmable : c'est le cas du Pantobraille, un afficheur braille mono-cellulaire (Ramstein & al 1995b). Mais les dispositifs de pointage à retour de force sont également capteurs, comme les souris d'ordinateur conventionnelles. L'ordinateur connaît à tout moment ses variables d'état : position, vitesse, accélération, force exercée, pour peu que le dispositif ait les capteurs correspondant.

Le Pantograph

Malgré leurs qualités respectives, aucun dispositif à retour de force n'est adapté à la manipulation directe dans les GUIs (i.e, espace de travail trop petit ; retour de force trop faible ; coût trop élevé). Le Pantograph est un dispositif de pointage haptique, conçu pour la manipulation directe (Hayward & al 1994 ; Ramstein & al 1994). Il est basé sur une structure mécanique parallèle à 5 barres qui garantie une bonne stabilité, très peu de frottements et offre un espace de travail confortable de 10x16cm accessible par un bouton (le knob). En déplaçant le knob, les quatre barres sont entraînés, corrélativement et de façon univoque. À chaque instant, la position absolue du knob est calculée dans l'espace cartésien grâce à deux capteurs.

D'autre part, deux moteurs puissants, couplés aux barres intérieures, permettent de contrôler numériquement le comportement du knob et par conséquent de donner à un utilisateur la sensation haptique de phénomènes physiques (i.e, élasticité, rigidité). Pour créer une force sur le knob, il suffit d'alimenter les moteurs avec les courants adéquats, lesquels vont créer des couples moteur qui vont être propagés par les segments rigides, pour synthétiser la force mécanique sur le knob ; elle pourra atteindre 10 Newton en pic.
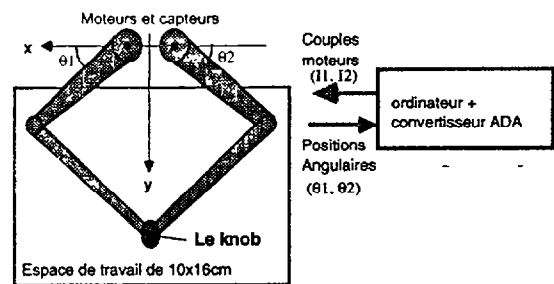

Figure 1: Structure mécanique du Pantograph et échange avec un ordinateur

Prototypage de la multimodalité

La mise en oeuvre d'une interface multimodale avec retour de force est un processus complexe: il faut concevoir et réaliser le dispositif haptique, il faut mettre en oeuvre l'interface haptique du point de vue logiciel et conceptuel et enfin, il faut l'intégrer à la technologie graphique et sonore.

Le Multimodal User Interface System (Ramstein 1995a) est une boîte à outils qui permet de concevoir et de réaliser l'interface WIMPS (Windows, Icons, pop-up Menus et Pointing System) avec retour de force d'une application. Le MUIS est basé sur une architecture logicielle orientée-objet C++, qui permet de prototyper facilement et rapidement les éléments de l'interface. Chaque objet de l'interface est représenté par un objet C++ auquel des attributs graphiques, sonores et de force sont associés. Dans le MUIS, le Pantograph vient remplacer la souris. Il permet d'une part de pointer, de sélectionner, de déplacer et de redimensionner. Il permet d'autre part de rendre sensible aux bouts des doigts les objets et les actions de l'interface.

Pour faciliter la conception des stimulations haptiques et les rendre cohérentes, il faut utiliser un modèle. Le modèle utilisé dans le MUIS est intuitif: tout objet est représenté sous la forme d'un objet polygonal en trois dimensions à la surface desquels une masse (le pointeur de souris) se déplace. À chaque instant, la somme des forces appliquées à cette masse est calculée (réaction de l'objet, friction et gravité) et retournée sur le Pantograph. Ainsi l'utilisateur a la sensation d'objets physiques, de trous, de gouttières, de cadres, etc. De plus, les actions comme le déplacement ou le redimensionnement sont représentées par des objets physiques visco-élastiques, particulièrement adaptés à traduire une distance et une direction.

Pour les sons, deux approches ont été étudiées. L'une basées sur un modèle physique et une simulation en temps réel de membrane: tout objet de l'interface est représenté par une membrane vibrante qui produit des sonorités dès lors que le pointeur contrôlé par le Pantograph la rencontre, la frotte, la percute. La seconde approche utilise des sons échantillonnés plus variés, traduisant la nature et la fonction de l'objet (i.e, entête de menu, choix de menu coché) ou de l'action (i.e, entrée de fenêtre, sortie de fenêtre). Ces deux approches s'avèrent complémentaires.

Aveugle mais voyant des mains

Avec la standardisation des interfaces graphiques, les non-voyants perdent l'accès à l'ordinateur. Les outils logiciels disponibles sont des revues d'écran (screen readers) qui traduisent l'information graphique avec de la synthèse de parole ou du braille et proposent un mode de navigation par le clavier (i.e, Outspoken de Berkeley System Inc). Ces moyens matériels et logiciels sont largement insuffisants pour reprendre pleinement les principes pourtant fort confortables pour les voyants de la navigation et de la manipulation avec un dispositif de pointage. La traduction complète des informations graphiques en des informations perceptibles par le non-voyant s'avère donc complexe,

voire infaisable, en l'absence d'une technologie nouvelle et adaptée.

PC-Accès est un ensemble matériel et logiciel, conçu et réalisé au CITI, qui vise à offrir une accès facile et confortable aux applications et à l'interface graphique de MS-Windows. PC-Accès privilégie une navigation et une manipulation avec un dispositif de pointage. Cette approche s'appuie sur le postulat que les personnes non-voyantes utilisent leur espace de bureau de façon similaire aux personnes voyantes (Mynatt 1995). Mais dès lors se pose un problème double : celui de la présentation de la scène graphique à la personne non-voyante et celui des actions réalisées dans cette interface. PC-Accès vise à traduire ces informations graphiques par des informations multiples: informations haptiques (retour de force) et informations auditives (sons non-parlés et parole de synthèse). Pour le dispositif de pointage, PC-Accès propose deux versions. L'une avec une tablette à dessin (souris en déplacement absolu) sur laquelle une texture à été posée pour faciliter le positionnement de la souris (Martial & al 1994). La seconde version, plus complexe, utilise le Pantograph et traduit les objets et les actions graphiques avec en plus des stimulations haptiques.

La démonstration de la pertinence d'une interface bimodale (audition et retour de force) a été faite lors d'une expérimentation menée avec 12 sujets voyants et 12 sujets non-voyants. L'interface comportait des fenêtres, menus déroulants et icônes et traduisait l'information graphique par des sons non-parlés et du retour de force. Tous sujets confondus, c'est l'interface bimodale qui permet le plus de confort et de performances (80%).

	Voyants: 12	Non-voyants: 12	Total: 24
Audio	68%	61%	64%
haptique	78%	71%	74%
Bimodale	83%	78%	80%
Total:	76%	70%	73%

Tableau 1: performances en pourcentage de nombre d'erreur pour trois situations modale : audio, haptique et bimodal (audio et haptique). Extrait de (Dufresne & al 1995)

Voyant mais aveugle des mains

Contrairement à ce que d'aucun pourrait croire, les GUIs ne constituent pas le standard des interfaces personne-ordinateur utilisés dans l'espace par les astronautes. Ces derniers utilisent des interfaces protéïformes comportant d'une part des éléments graphiques présentés sur un écran et d'autre part des tableaux de boutons mécaniques. Ceci s'explique par le fait qu'en l'absence de gravité, le sens kinesthésique est perturbé et il est difficile et malaisé de manipuler des dispositifs comme une souris d'ordinateur. L'utilisation d'une interface avec retour de force s'avère alors pertinente dans la mesure où sa nature programmable permet de compenser l'absence de stimulations phy-

siques comme la gravité.

Toutefois ceci n'est qu'une hypothèse et pour mieux comprendre l'introduction d'interfaces multimodales avec retour de force, il est nécessaire de tester la situation. Aussi, l'Agence Spatiale Canadienne, conjointement avec le CITI et l'université McGill a développé un protocole de test pour mesurer les avantages d'un dispositif de pointage à retour de force sur un dispositif de pointage standard (i.e, trackball) en microgravité. Le test consiste à proposer une interface graphique comportant des fenêtres, des icônes, des menus déroulants et de multiples indicateurs. Les mesures sont des indices de performances (i.e, temps et erreur) captés lors de tâches conduites d'abord en milieu avec gravité puis en microgravité. Les résultats de cette expérimentation seront publiés prochainement.

Conclusion

Les exemples du non-voyant et de l'astronaute constituent deux facettes complémentaires d'un même problème: celui des limites de l'interaction entre un individu et l'ordinateur. Dans le cas du non-voyant, c'est la déficience de l'utilisateur qui limite l'échange avec l'ordinateur: il ne perçoit pas l'information qui lui est donnée. Dans la situation de l'astronaute, c'est le milieu dans lequel l'utilisateur évolue qui limite l'interaction: une information précieuse lui est enlevée. Pour réduire ces deux limitations, l'hypothèse a été faite qu'il est nécessaire et suffisant d'intégrer deux canaux de communication supplémentaires, l'un audio et l'autre haptique. Et c'est grâce à la complémentarité et la redondance des stimulations apportées que les interfaces personne-ordinateur élargissent leur public d'utilisateur et leur domaine d'application.

Finalement, la rencontre de l'aveugle et de l'astronaute est féconde puisqu'elle ouvre en sus de nouvelles portes aux voyants. Par l'expérience multimodale, l'astronaute et l'aveugle qui sommeillaient en nous surgissent alors à la conscience pour révéler, il ne faudrait plus en douter, des dimensions jusqu'alors oubliées.

Références

Craig, J.C & Sherrick, C.E. (1982) "Dynamic tactile displays", in W.Schiff & E.Foulke (Eds.), Tactual perception - a sourcebook, Cambridge:Cambridge University Press, 1982, p209-233

Cadoz, C., Lizowski L. & Florens, J. L. (1990). "Modular Feedback Keyboard." Computer Music Journal, 14, N2, p.47-5. MIT Press, Cambridge Mass (1990).

Dufresne, A., Martial, O. & Ramstein C. (1995) "Multimodal User Interface System for Blind and "Visually Occupied" Users: ergonomic evaluation of the haptic and auditive dimensions", in proc. of IFIP Interact'95, Lillehammer, Norway..

Hayward, V., Choksi, J., Lanvin, G., Ramstein, C. (1994). "Design and multi-objective optimization of a linkage for a haptic device." in proc. of the 4th workshop on Advances in Robot Kinematics, ARK'94, Ljubljana, Slovenia, Kluver academic

Hunter, I.W, Doukoglou, T.D., Lafontaine, S.R, Charette, P.G., Jones, L.A., Sagar, M.A., Mallinson G.D., Hunter P.J. (1994). "A teleoperated microsurgical robot and associated virtual environment for eye surgery" in Presence, Vol.2, No.4, Fall 1993, pp.265-289, MIT Press.

Johnson, R.C (1995) "Virtual touch arrives", OEM Magazine, April 1995

Lederman, S.J & Klatzky, R.L (1990) "Haptic classification of common objects:knowledge-driven exploration", in cognitive Psychology 22, p421-459, 1990

Martial, O., Dufresne, A. "Les interfaces graphiques, obstacle ou espoir pour les aveugles", in proc. of ERGO-IA'94, 1994, Biarritz, France

Minski M. Ouh-Young M., Steele O., Brooks F.P.Jr. (1990) "Feeling and Seeing: Issue in force Display". Computer Graphics 24(2), April 1990, pp.235-243.

Mynatt, E.D., Weber, G. (1994) "Nonvisual presentation of graphical user interfaces: contrasting two approaches, proc. of the ACM CHI'94 conference on human factors in computing systems, 1994, Boston, p.166-172

Pennywitt, K.E (1986) "Robotic tactile sensing", in Byte, January 1986

Ramstein, C. (1995a). "MUIS: multimodal user interface system with force-feedback and physical models.", in proc. of IFIP International conference Interact'95, Lillehammer, Norway 1995.

Ramstein, C., Hayward, V. (1994). "The Pantograph: a large workspace haptic device for multimodal interaction." in proc. of ACM CHI'94, Interactive Experience.

Ramstein, C. (1995b) "The Pantobraille: design and prevalidation of a single cell braille display based on a force feedback device", in submission.

IDEOLOGIES OF INTERACTIVITY:

FREEDOM, CHOICE AND CREATIVITY

By Catherine Richards & Kim Sawchuk

sawchuk@vax2.concordia.ca

Catherine:

" Ideologies of Interactivity" outlines and examines the term interactivity- a key reference point in the media arts, popular culture and technical discourses to describe the interplay between "an individual and an artificial intelligence system." (Popper, 8)

Kim :

The terminology of interactivity functions, as Kenneth Burke writes, as a "terministic screen" that selects and deflects particular attributes of any phenomenon. (45)

Catherine:

The contributors to the panel and the publication that will result, were requested to think through the language of freedom, choice and creativity frequently deployed in discussions of the topic.

Kim:

In this rhetoric, interactivity is said to increase participation between viewers and the work. This is promoted as an enhancement of choice and hence individual freedom/for the user/spectator. Because of this, interactive works are often said to be more accessible than other forms of art thereby countering the elitism attributed to modern art.

Catherine

This project examines these premises and opens up the term interactivity to include considerations of power and control as they are related to aesthetic issues. We have resurrected that unfashionable term ideology in our title, not as a means to reduce aesthetics to politics or politics to class or economics, but as a reminder of the inextricable connection between aesthetics and power.

Kim:

And here power is not merely understood in its repressive sense, but as Michel Foucault argues, for its productive capacities as form of organization of space and time: technological environments design interaction and circumscribe choice. But choice is not the only issue. Artists projects that have an explicitly interactive element may map out its micrological functionings in late-capitalist cul-

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

240

ture rather than serving classically modernist ends tied to a specific set of cultural values that echo a neo-liberal agenda- at the level of the body, within the economic spheres of consumption and production, and at the political level of events.

Catherine:

In interrogating the promises of freedom, choice and creativity, the participants in "The Ideology of Interactivity" ponder the following questions, questions that form the backbone of this project: the connection between interactivity and architectural projects (Brian Massumi: philosopher); the fashioning of interactivity in the electronic arts through an examination of the presuppositions built into computer software (Douglas Back: media artist); the role of the artists working within the digital media environment and the conceptualization of the artist in these practices, from the perspective of an artist in the field (Catherine Richards: media artist; writer); artists' projects that take surveillance as their conceptual basis as a way of discussing the dynamics of power and seduction (Kim Sawchuk: media theorist); and finally the use of digital technologies that are participatory for ends other than assuring greater efficiency in a productivist culture. (Laura Trippi: curator)

Kim:

The panel "Ideologies of Interactivity: freedom, choice and creativity" is the first event in a future series sponsored by the Cottage Collective. The series is designed to initiate creative exchanges between artists, educators, curators and critics working in the media arts in Canada.

Catherine:

The goal of this collaborative venture is to pinpoint contentious issues in media arts; respond quickly to ongoing changes in the field; document the history of media arts projects; research past and present writings and theories pertinent to the area; and finally, create a supportive but critical environment for inspired thought and production from an interdisciplinary point of view.

Kim:

But as well, we are concerned to sponsor initiatives by artists from the perspective of local production where artists work within very tight economies of scale and often without the institutional or economic resources they need to realize these projects- despite the hype.

Catherine:

The Cottage Papers will play with different combinations: mixtures of virtual and real presence; the confrontation of prepared pieces and spontaneous interactions; and finally, experimentation with the dissemination of results that can take the form of working papers, web pages, books, panels, and perhaps in the future, a CD ROM.

Kim:

While we are interested in creating a supportive working environment for artists working with new media, we are guided by the principal that new technologies do not necessarily entail displacing less technologically oriented methods of information exchange or tried and true methods of collective action. We are working counter to naive evolutionary theories of technological development and diffusion and an over-investment in the "rhetoric of the electronic sublime." The rhetoric of the technology makes it seems as if this will all take place without human intervention. Although new technologies may facilitate discussion and exchange amongst artists and writers, their organization still takes thought and effort and financing: the virtual is connected with these very pressing material issues.

Catherine:

Process is integral to the evolution of these issues. We are striving to build intensity, trust and commitment amongst the participants in this panel and in our future work.

Kim:

For more information on the Cottage Collective or the publication that will result from this project please contact: SAW Gallery 67 Nichol Street, Ottawa. 613-236-6181.

Or contact Kim Sawchuk at sawchuk@vax2.concordia.ca

References:

Burke, Kenneth, "Terministic Screens," *Language as Symbolic Action: Essays on Life, Literature and Method* (Berkeley: University of California Press, 1966).

Foucault, Michel, *Power/Knowledge: selected writings and other interviews*, Colin Gordon, ed. (New York: Pantheon Books, 1980).

Popper, Frank, *Art of the Electronic Age* (New York: Harry Abrams, Inc. Publishers, 1993).

INTERACTIVE NARRATIVE; A FORM OF FICTION?

By Martin Rieser

M-RIESER@wpg.uwe.ac.uk

The narratives of the world are numberless. Narrative is first and foremost a prodigious variety of genres, themselves distributed among different substances-as though any material were fit to receive man's stories. Able to be carried by articulated language, spoken or written, fixed or moving images, gestures and the ordered mixture of all these substances; narrative is present in myth, legend, fable, tale, novella, epic, history, tragedy, drama, comedy, mime, painting..stained glass windows, cinema, comics, news item, conversation

(Barthes-The Structural analysis of Narrative in Image-Music -Text)

Narrative permeates every aspects of our lives: all societies and cultures and individuals generate and live by the stories they tell themselves. In the personal sphere we are constantly converting the past into an ordered edit of the significant..or trivial, in other words: memories. While these may be recalled in an associative or seemingly random manner, they are tied to a structure implicit in the history of the individual. Once in the social domain, linearity seems to become an essential part of communication.

The problem is that the addition of Interactivity places an intolerable contradiction on what is understood as traditional narrative. It implies that the reader/spectator be transformed into a true authorial role as shaper of events , weaver of stories, a possessor of agency:

Interactivity replaces the concept of the passive viewer by the active participant....An interactive cinema needs to offer a fundamental range of choices to the user ...This cannot be confined to a few alternative linear routes, endings or character view-points in an otherwise linear narrative structure.
(Malcolm LeGrice -Virtual Dialogues)

For the artist the struggle for appropriate form is never an easy one:

Most people imagine there's a spectrum between conventional written stories on one side and total interactivity on the other. But what I believe is that what you really have are two safe havens separated by a pit of Hell "
(Walt Freitag in 'Wired ' August 1995)
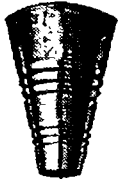
But the challenge is worth the labour, since the rewards of the new medium are manifold:

..it is the quality of direct physical and kinesthetic engagement, the rolling of hapticity in the service of both drama and the dramatic, which is not part of the cinematic mode.
(Allucquere Rosanne Stone)

Inertia in artistic practice and commission ensures that, although interactive narratives will soon become common-place through broadcast on cable, satellite, network or CD-rom; such forms as exist often remain mere extensions of spectator modes such as video, or cinema; only becoming truly interactive when the author attempts to transcend the syntax of earlier art forms and invents a coherent artistic language for interaction in the virtual world, capable imaginatively engaging the audience at the deepest levels of serious art.

The issue of narrative and dramatic structure is not one that will easily be resolved. Robert Coover remarks about Hypertext in Camerawork hold true for all interactive forms:

How does one judge , analyse, write about a work that never reads the same way twice?

Obviously, new criteria are needed to evaluate such a radical departure from tradition, but the form itself defies precise definitions

These explorations are crucial to how the world can be redrawn and viewed in an art whose power is in its open-endedness and polyphony.
(Regina Cornwell)

A process of education is also desperately needed for the growing audience of such works. Recognising the narrative codes of traditional media is now a daily unconscious act. On opening a newspaper, switching on the television, going to the theatre -we adjust automatically to the medium's unspoken code and its implied etiquettes. I doubt that we have yet learnt as audience the code and language of the interactive, or even that such a language has been fully formed by any practitioner.

Pioneers of interactive narrative such as Luis Borges and Robert Coover anticipated some of the negatives of the form and of the game as a narrative vehicle, before it actually existed: In 'An examination of the works of Herbert Quain', Borges invents an English multi-linear novelist of the 1930s and both anticipates hyperfiction and Barthes's contention of the death of the author, when he makes Herbert Quain say of his second novel, 'April March':

I lay claim in this novel... to the essential features of all games: symmetry, arbitrary rules, tedium. Indeed, Quain was in the habit of arguing that readers were an already extinct spe- cies. "Every European", he reasoned " is a writer, potentially or in fact"

In the work of Robert Coover we find a different approach: the sudden move from stream to stream of parallel lives or consciousnesses. In 'The Babysitter' interwoven scenes are re-told in ever more fantastic salaciousness, as though a heavy breather had control of a joystick and kept pressing the more bizarre button.

In many ways traditional written Narrative resembles musical code in the discipline of its elements:

art is without noise..art is a system which is pure, no unit ever goes wasted, however long, however loose, however tenuous may be the thread connecting it to one of the levels of the story.....writing is inescapably distinct
(Barthes-The Structural analysis of Narrative in Image-Music -Text)

To understand the failures of most current attempts to create interactive fictions it is first necessary to determine the grammar of traditional narrative forms. In his essay in 'Dissimulations' Andy Cameron wisely quotes Barthes in support of his claim that traditional fiction cannot sustain the conversion into interactivity. And indeed, on re-examining structuralist analysis it becomes obvious that most interactive fictions in hypertext form tend to be a collection of 'cardinal functions' or narrative hinge points without the necessary 'indices' and 'catalysers' which add depth and flow to the narrative:

These (nuclei) are both consecutive and consequential ....a catalyser... accelerates, delays, gives fresh impetus to the discourse..the catalyser ceaselessly revives the semantic tension of the discourse, says ceaselessly there has been, there is going to be, meaning...A nucleus cannot be deleted without altering the story, but neither can a catalyst without altering the discourse
(Barthes-The Structural analysis of Narrative in Image-Music -Text)

and even more crucially, lack the full orchestration involved in successful form:

Narrative thus appears as a succession of tightly interlocking mediate and intermediate elements; dystaxia determines a 'horizontal' reading, while integration imposes a vertical reading..each unit is perceived at once in its surfacing and its depth and it is thus that the narrative works
(Barthes-The Structural analysis of Narrative in Image-Music -Text)

But Cameron's argument is ambiguous about future strategies for creating interactivity, centering as it does on the computer game as a way forward, and ignoring other forms of narrative where interpretation plays a stronger role than in the linear novel.

In many ways Drama differs from narrative fiction through the freedom of interpretation given to the performance. There are as many versions of Hamlet as there are directors; music is even more vastly dependent on the interpretive. The composer's original coding is given new 'interactive' life with each performance-in this we seem but one step away from Barthes's conclusions about authorial authority:

We know now that a text is not a line of words releasing a single 'theological' meaning (the message of the Author-God) but a multi-dimensional space in which a variety of writings, none of them original, blend and clash. The text is a tissue of quotations drawn from the innumerable centres of culture ..but there is one place where this multiplicity is focussed and that place is the reader..The reader is the space on which all the quotations that make up a writing are inscribed without any of them being lost; a text's unity lies not in its origin but in its destination.
(Barthes-The Structural analysis of Narrative in Image-Music -Text)

However, whilst we know how much influence such interpretations and inflections beyond the authorial can have on the fixed codes of the script or score in music or drama, in the case of interactive narrative must the logical conclusion be that we are reduced to the role of amateur architects and builders, constructing our own storylines, as in Max Whitby's metaphor?

By giving the audience control over the raw material you give them precisely what they don't want. They don't want a load of bricks, they want a finished construction, a built house.
(Max Whitby-Multimedia Corporation)

And if , by necessity, Hyper-fiction narrative structures are composed of multiple hinge points; are all first attempts at interactive fiction then doomed to take an obvious 'tree' structure form with all its inherent disadvantages?

The volume of story web increases exponentially with additional points of interaction. An author is faced with an inevitable and depressing tradeoff - sacrificing time spent on the texture of the narrative, its literary or cinematic qualities, for an enhanced interactive complexity. The result can be interactive but schematic, resembling the outline of a story rather than the story itself.
(Andy Cameron, Dissimulations)

This schematic domination of the structure at the expense of content is vividly critiqued by Gareth Rees :

These writers have all come up against the exponential problem, the combinatory explosion of the number of endings as the number of choice points goes up. With ten binary decision points, there are a thousand endings, with twenty, over a million. .. If every English-speaking person wrote a single section, together they could not complete all the branches on a

tree with 28 decision points (a story in Chinese would get one decision point further) .."
(Gareth Rees -Tree fiction on the World Wide Web)

And the absurd reductionism of such an approach tellingly satirised in an imaginary interactive Hamlet:

1.[the battlements of Elsinore Castle]
HAMLET: To be or not to be, that is the question
If Hamlet takes up arms against a sea of troubles, go to 3;
if he shuffles off this mortal coil go to 2
(Gareth Rees -Tree fiction on the World Wide Web)

In our own production of 'Media Myth & Mania' (Ship of Fools research group, based at the university of the West of England, Bristol) we encountered the intrinsic problems of the tree form, forcing the participant to repeat a part of the logic branching on each replay and constraining any true freedom of choice in the development of narrative.

Designed as an interactive spoof game, using digital sound and photographic sequencing, it examines issues of power and control of the mass media by a multi-choice biographical journey through the life of a media 'Mogul'. The individual player identifies with the protagonist and makes moral choices at various life stages viewing the consequences in dramatised photo-romance style tableaux.

Photo-realistic image based adventure games are a growing section of the computer games market and are spearheading the penetration of interactive CD into the domestic environment. Our game was an attempt to subvert this process by de-mystifying the use of representation within the genre, through both form and content. Density was achieved through themes related to the role of public media and their relation to the domestic sphere being questioned via hidden quotes and layered juxtapositions of facts embedded behind the tableaux.

Photo-romantic magazines and adult comics provided the inspiration for the visual 'feel' of the piece. Actors were posed for various life situations and placed digitally against computer -generated photomontage backgrounds. In a sense this updated the Citizen Kane idea of rooting the public figure in the personal depths of childhood. Biographical parallels to the lives of such contemporary 'Moguls' as Maxwell and Murdoch are explored.

In consequence the piece was structured as a dual branching choice seven ages of man or woman interactive biographical narrative, with the player assuming the role of the either male or female Mogul . The player chose between two action options at each level. There were more than 80 Interactive tableaux images in the whole game, plus accompanying sound, text and Quick Time movies. A mythic parallel universe of neo-classic futility interweaves the narrative at various key points as a metaphor for the ultimate emptiness of the scramble for media control.

A different structural form is offered by Coover's idea of parallelism or concurrent streams between which the viewer can alternate without breaking the narrative flow. In Graham Weinbrene s interactive cinema piece 'Kreutzer Sonata' the viewer is offered control over the aspect of the narration - the screen is divided into four temporal regions, left for flashback, right for the present, up for an expanded present and down for filmic elements which are outside of the time of the story altogether.

In Jon Dovey s Moviola Toybox CD rom: 'The Desktop Theatre of Amnesia' (Jon is a member of the Ship of Fools group) the techniques of parallelism were tested , as emotional states and their visually equivalent symbolic analogues are mapped onto a matrix of Quicktime minimovies, like multiple personalities inside one frame.

In 'The 12 Most Beautiful Things I Know' my colleague Chris Hales created a lyrical piece of interactive cinema when the syntax of interaction involves flow rather than branching , where the visual clues as to active screen areas are hinted at by the use of colour and movement within the frame.

In its participatory form interactive narrative is found in networked interactions with events with no director, but many equal players who are also the audience; in situations open at both ends, engineered by the artist for shared development. But, as a short exploration of such sites on the Web makes only too clear, so much of this type of interactive art has been concerned with simply exploring its own matrix of delivery, that some of the concerns of mainstream art practice have taken a secondary role. It is no accident that as virtual forms became a fashionable currency, artists like Damien Hirst and Gilbert and George turned to ever more visceral installations of bodiedness. (This situation is starting to change with a rush of fine artists such as Helen Chadwick , whose previous work has been deeply physical , trading tactility for the level of interaction afforded by CD-rom)

This participatory aspect of audience as performer is implicate in most VR sessions. Brenda Laurel has already explored this in her 'Place holder' experiments at Banff Centre in the early 1990s , where local Canadian Native Indian myths were incorporated into a participatory performance. This extension of drama into Virtual Reality marked a profoundly important step in the development of narrative forms.

Participants could create their own stories within the broad boundaries set by the artist. Laurel s work fused improvised theatre with the cutting edge of VR simulation, combining sensor feedback for arms and torso as well as hands and head. The participants could alter their voices electronically to match the mythic characters whose identity they assume, and can swim or fly through the recorded video landscape mapped onto a computer 3D model.

In 1989 in the 'Legible City' Jeffrey Shaw also broke new ground , combining multimedia effects with a virtual reality environment. The City is a computer controlled and projected virtual urban landscape made up of solid three-dimensional letters that form words and sentences instead of buildings along the sides of the streets. The architecture of text replaces exactly the positions of buildings in a plan of the real cities (New York and Amsterdam). This spatial transformation of narrative is literal in every sense.

Bicycling through this city of words is a journey of reading , choosing a direction is a choice of text and meaning. The image of the city is projected on a large video screen in front of the bicycle which is fixed like an exercise-bike. The image is computer generated in real-time using a combination of a humble PC and a Silicon Graphics Iris workstation . Feed-back mechanisms attached to the pedals and the handle bars control it so as to simulate a feeling close to that of cycling through a real environment. Just in front of the viewer is a small liquid crystal display which locates the cyclist within the overall plan of the city.The texts have a close correlation to the history of the city, being fictional tour-guide monologues delivered by illustrious sons of the city, such as, in the case of New York Frank Lloyd Wright and Donald Trump

Although the Spatial metaphor is a prevalent form in many interactive narratives, as Cameron points out this is:

> *more than just the change from a simple line to a more complex diagram or space, it involves moving from one kind of representation to another.*
> (Andy Cameron-Dissimulations)

The role of the artist is radically challenged in the construction of such immersive narrative environments, The action of the artist/author begins to resemble the designer of a model and although the artist may describe its properties in great detail, he or she is no longer author of the events set in motion by the audience, here one can guess at a new critical theory drawn from architecture as much as from theatre, from cybernetics as much as literature.

As Cameron contends, Games have also been seen by many as coherent templates for new forms of interactive narrative and even such commercial models as 'Sim City ' or 'Civilisation' are fascinating examples of complex simulation of story shells. The Player/ Participant/ Gamer follows formal and rule-based interactions for pleasure and stimulus, but is nevertheless conscious of participating in an apparently reductive medium, incapable of addressing the deeper existential concerns of art. This lack of resonance, seems precisely caused by the random shifting nature of its unfolding narrative (although the causality of time and action is maintained).

But we do have access to quite other models than simulation games in examples of social and participatory story spaces such as are provided by Ceremony, Carnival and Ritual- symbolic affirmations of spiritual watersheds or transitions, precise narrative codings of resonant moments in a culture's development as well as in individual lives, a rules-based and compelling immersive experience , often embodying the primary narratives of adolescence, maturity and death.

In dreams as well a form of associative narrative occurs, seen as the 'Royal Road' into the unconscious by Jung and Freud alike. Narrative does appear to underlie our deepest mental structures -Jung has outlined the narratives of the collective unconscious and the process of individuation and demonstrated how ritual and rites of passage externalise such structures culturally. Narrative as a spatial metaphor is ubiquitously implicit in every cultural expression : in mythology (Aboriginal Songlines) ; in the visual arts (sculptures of Richard Long) and everywhere in architecture. and engineered social space.

A Gothic cathedral such as Chatres is the work of many hands, guided by a shared vision. Its beauty is both in the detail and it s overall shape , a metaphor of stone forests , filtered light, soaring trunks, interlaced branches-immediately recognised, it can be read by the pilgrim as a series of self-directed journeys or as a guided ceremony, for example by tracing the floor maze as a analogue of life spiralling towards death.

This serves as a useful model for an immersive narrative environment -the only limits of agency are the fixed walls and the rules-based rituals of Christianity, where the mediaeval mind found a living enactment of religious narrative

In the current Dreamhouse project, Ship of Fools were seeking to bring such an experience up to date, combining spatial , ritualistic and dreamlike elements. As in many other games we find ourselves in a house. However here the house stands as a place of identity, a place that offers us experiences that reflect upon who we are. In the dream world , the house represents self, a space of memory and formation. Here it is a place where we tell stories, a narrative space. Stories which inter-relate to create a space of reflection.

Our walk through house offers access to a number of rooms or experiences. Each has been designed by an artist reworking traditional storytelling structures. So the house becomes an interactive theatre, where different tales are triggered by audience exploration.

The bland domestic environment of a real suburban house (in fact a real Barrett's 'Show Home' in a suburban estate at Bradley Stoke, the negative equity capital of the U.K.) is the main interface. Through various devices-doors, windows, mirrors and other objects, gateways to the narratives of a semi-mythological world are opened by the user. The piece focuses

on the transmuting of known mythologies into more personalised or contemporary forms. Various rooms are appropriately matched to the different psyches of those involved in authoring the piece. Short connected narrative fragments can be awakened by the viewer through an examination of the interface environment. A visitor to the house can interact with these presences and be caught up in their world, often through a response to a riddle or enigmatic question .

A major part of the content involves a decoding of the family as a construct. Themes of restriction and drudgery sit alongside those of the forgotten or hidden worlds of childhood- the chest in the attic, the secret garden etc. Images we keep from the world, but pass on freely to our own children.

The themes of intimacy and alienation are explored through non-linear narratives presented through such devices as multiple talking heads, each with their particular fragments, or through a hall of sleepers who can be individually awakened. The interactive house is a place of magic, permeable to other mythic spaces, but the narratives involved attempt to form a bridge between the personal and the political. Various sources of narrative structure and imagery have been adapted, ranging from Oedipus, Orpheus and Euridice, Theseus and the Minotaur, Icarus and Daedalus, Celtic domestic myths and legends, Biblical reference and stories and the modern mythologies of Science and Technology.

In speaking of the pleasures and engagement of VR environments Janet Murray of MIT Media Lab identifies "Immersion, rapture and agency" as the key requisites of interaction in virtual space. While these certainly identify the pleasures of the medium, they do not of themselves create the complexity of meaning found in the fixed structures of traditional forms.

In the search for narratives without predetermined scripting, I believe that through use of independent agents, artists will increasingly be led towards what I would term 'The Pinocchio strategy'-at present more a pious hope than a reality.

Laurel's researches in interactive narrative led directly to the Oz project at Carnegie Mellon which used live actors and directors to test Laurels's rules-based for dramatic interaction in Virtual space-the ostensible reason was cost, but perhaps encoding the complex rules of drama and character were well beyond any Artificial Intelligence programmer's ability at present. The end of such simulations must be in convincing forms of artificial life and the complex coding of autonomous agents using genetic algorithms. The state of the art seems to be at the level of MIT's attempts at programmed behaviours exemplified by Bruce Blumberg's virtual dog in the 'Artificial life Interactive Video Environment', where a computer generated ball-fetching creature is mapped onto a mirror image of the real user's

environment. The wooden nature of such experiments to date suggest that they might need more than the attentions of a Good Fairy to breathe artistic life into their frozen hearts.

Media, Myth and Mania was produced by Ship of Fools , a mixed group of six male and female electronic artists, as a research project at the University of the West of England in 1994 , part of Siliver to Silicon-The photograph in the Digital Age , an interactive CD-rom exploring the impact of the digital on photographic practice (a joint Artec / University of the West of England / Watershed / Focal Point research project)

CRITICAL FRICTIONS, CONNECTIVE AFFINITIES

"IDEOLOGIES OF INTERACTIVITY"

By Kim Sawchuk

sawchuk@vax2.concordia.ca

I n this morning's talk, I will return to some rudimentary issues that have been pestering me for some time and which now seem pertinent. I hope it isn't a statement on the obvious.

Rather than offering my thoughts on art and surveillance, as promised, I would like to respond to a comment that Simon Penny made on Tuesday in another panel on interactivity and art. When asked what he thought of the critical writing on interactive work he gave a witty and provocative answer, an answer provided by Mahatma Ghandi. Apparently when Ghandi was asked what he thought of Western civilization, he replied, "it would be a good idea." The implication, of course, is that the same can be said of writing on art and new media technologies.

This response piqued my interest because it says something about the very complicated ties- the surface tensions- between different practices or modalities of expression: theoretical discourses, writing, criticism, art works, artists, and institutions. It made me reflect on the ways our terrains diverge and overlap. After all art and theory share some common features within North America in the popular imagination: they are both often seen as useless activities.

What are some of these points of contact? Of interaction? In its most banal form - and in my most cynical take on this interrelationship- we use each other to legitimate our activities, existing in a parasitic codependency where we feed off each other, rotating roles as host and parasite. For example, theorists and critics may use art as examples -or worse- as illustration in their texts. In these models these works then serve as evidence of some grand idea, or concept, that we want to promote, such as simulation, recombinant culture, or in my case surveillance. (By this I refer to my interest in means explicating the workings of power through the organization of time and space in connection to various social technologies.) But it is not only writers who engage with theory. Artists may invoke theoretical terminology as references when writing a grant or in artists talk. Theory can provide us credibility to alleviate our insecurity or bolster our arguments; but credentialism is also an issue. Writers need shows to review -and artists to make shows-to build a track record of written works on their c.v.' s. Artists need the attention of writers and critics to indicate they are legitimate; that their work is current and talked about. The irony is that as critics or researchers we may treat artists as our objective ground, or ethnographic subject, as if the artists had some intuitive con-

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

nection to these forces resurrecting the old idea of artist as mystic and visionary, one which McLuhan was given to pronouncing and which Catherine Richards will explore in more detail in her talk for this panel. But there is little art practice, particularly those practices in new media, that aren't influenced by some theory or at least a set of cultural values and assumptions. Artists themselves are often eloquent and learned in their considerations of these connections because of their own intimate histories with these technologies.

At a more profound level our work intersects because we often are trying to pinpoint and grapple with similar questions, such as the impact, meaning or the embeddedness of technology within a given social formation, a social formation that we share. The words, concepts encountered on a page, organized into an argument and sometimes sweeping and lofty statement about the world and the media, may in some way illuminate the movement of abstract forces- relations felt but which have no language. Raymond Williams, a communications theorist who wrote on emerging cultural forms, called this vague intuitive sense that often guides our perceptions and our work "the structure of feeling." In the same way, artist's projects, particularly those that skillfully and thoughtfully employ the tools of their day -video monitors, cameras, computers, telephone lines, broadcast media, virtual technologies- give shape to these abstract forces and relations by deploying them in the work. This happens because of the representations invoked. It may happen because the materials and techniques borrowed and their properties or tendencies. A consideration here is the way the work or the technologies it uses situates us as spectators. The manner in which we interact with the work may make us aware of our positioning vis a vis some other set of relations. Finally, these works either in their representations, their materials, or the behaviours and encounters they may invoke memory.

These encounters that stimulate memory can be conceptualized as a form of movement: chain of associations and connections are left in the work that sets my mind and body into motion. It may bring us to places we do not necessarily want to revisit. For example, I was forcefully propelled by one of Chris Csikzentmihlyi's robots that he presented as a slide for discussion at this same panel. It provoked my discomfort, it agitated me. The robot was a being that responded to aggression with aggression . If a loud sound was made, it had the potential to fire a bullet in the direction of the sound's source. I could not help but think about this work in my own context, that of Montreal where 5 years ago on December 6, 14 women were killed at L'Ecole Polytechnique. Technologically based art is like other art in this respect: the spectator doesn't merely come to these interactive pieces as a universal subject devoid of memory, devoid of history- and sometimes anger. Our affective responses and critical assessments of the appropriateness of works, such this, takes place in a context. But this location is not a solid or unified ground, that provides the truth of that piece. Every place is but a layered space of shared meanings, in some

instances, but also contested territory and zones of conflict. Rather than bury these frictions, they can be a site of critical reflection and writing.

In the current theories, borders seem to be falling, the distinctions between high and low obsolete, at least rhetorically. The languages drawn upon to discuss art no longer come from the aesthetic tradition, which itself has had a pretty checkered history with lots of borrowings appropriations and subfields. The new critical vocabularies that are being generated and incorporated into our writing and art practice come from communications, media studies, philosophy, cybernetics, literary theory. In considering this interdependency particular names become very current: Gilles Deleuze's theory of rhizomes as a way to explain the supposedly non-hierarchical nature of network communications; Paul Virilio to talk about the nefarious effects of speed and visuality. Within the Canadian tradition of writings on technology, Marshall McLuhan still has currency, while others, less trendy more stolid and stodgy like Harold Innis are left behind. Psychoanalysis, once dominant as a critical framework, wanes while the vocabulary of poststructuralism takes hold. There is an issue of fashion here, but also one of formation: where does one go to learn to write on the new media? What disciplines support this work? While intellectually we strive for interdisciplinarity, academically we still seem to be in a state of split existences. Resistances and frictions still exist.

In departments like mine, communications, we are encouraged to read and examine theories of media, technology and culture. These theories are germane to the issues in new media, but we rarely are encouraged to write on art or artists because of the hierarchies that exist between different kinds of published work (refereed, non- refereed). Nor do we encourage our students to explore artists practices -or not- so- -popular culture, as performance artists Tanya Mars so aptly terms the arts. In the humanities and social sciences we have too little understanding of the history of representation and aesthetics that these works may also call upon. But as well, we often lack the technical knowledge or expertise in the cognitive sciences to comment upon these aspects of an artist's practice, while those trained in these disciplines seem to have little interest in writing art criticism. Conversely, while course outlines in Fine Arts may include the occasional communications article, it is my guess that their curricula don't include media studies courses or histories of the media that may provide invaluable ways for students to contextualize their own work. While most programmes offer some access to each other, in these times of budget crisis the doors to courses and resources may be closing. We need new strategies of collaborative work, but overwork seems to be the only thing that many of us share or have in common.

In short, it isn't enough to comment on the lack of critical writing. If there is, or it is inadequate, it is incumbent upon us as writers and teachers and practitioners in other guises to figure out why and how and where we encourage writing within

local spaces at the same time paying attention to what movements are taking place elsewhere. What publication possibilities exist for such writing? Are they enough? How do we practically nurture this type of writing intellectually and financially? How do we shift our attention to what has not been legitimated yet? For we share another common tendency: star gazing. If you are a media theorist, it is much easier to write on a phenomena from pop culture where you know everyone at least as heard of Madonna. Slides are easy to pirate, videoclips to find, and the sheer numbers in the audience guarantees a certain relevancy to the research. To write about some obscure media artist may take more time. It raises that embarrassing question: "who cares?" If you are a critic, it is tempting to write on art works or the practices of artists who have already garnered international attention.

Do we have the courage to the unknown and encourage this kind of practice in others? This doesn't necessarily mean trumpeting what is new and pronounces itself to be on the cutting edge , or valorizing everything that is marginal or considers itself as such. It does mean paying attention to the here and now. In practical terms it implies concerning oneself with the so-called dead end user: those left behind in the wake of technological change.

Finally, while I must admit that I have my pet theories which help me to make sense of the world and guide my interests as a writer, it is my belief that the search for a unified aesthetics of interactivity or of new media is a useless pursuit: different works speak to different issues in our relationship to technology, but also to issues other than technology. When asked to write catalogues essays, short reviews or longer articles in the media arts it is my job to ask what I want to promote in my critical practices and to discern which theories are the most appropriate to those works. But one needs to be aware of the performative dimension of these choices at the same time as one is aware of the potential of the unintended or chance meeting. Of the possibility that your work, which takes on a life beyond you, may cause you to be misinterpreted, or misunderstood. Or maybe you didn't understand yourself in the first place, and now you find yourself in uncomfortable disagreement with your own previous position. But I digress. What is needed, perhaps, is less general theories that can be universally applied to all work and more consideration of what we create when we bring the different modalities of practice, whether they be theories or visual representations, into contact and conjunction.

Stimulating encounters and charting changes, or lack of change, may mutate into what Doug Back has called "critical frictions." I like this term. Firstly, because of its sonic invocation of the term fiction, which displaces any notions of ultimate truth. Secondly, because of its rather crusty reference to abrasion and the sparks that can be created when two bodies or materials rub together. Without friction we would not have a sense of feeling or touch and hence no pain or pleasure.

In addition to critical frictions, we also may want to instigate "Connective Affinities": ways of working with art, writings, theories that intermingle these discourses. In this concoction they become more than two discrete entities soldered together. Their interaction produces another entity, a new assemblage unexpected by both. These are the surprises that Norm White has mentioned and the chances I spoke of a few paragraphs back.

There are two further challenges that I will address before ending: on the one hand, it is critical that theory doesn't occupy a place at the top of art practice in our s/m relationship where the critic is a top, as the arbiter of good taste, in a classically modernist sense. On the other hand, it is necessary to avoid becoming a p.r. person for either artists or new technologies. This has particular relevance in the current context of hype around media technologies. Let's not forget that the support now lavished on the new media is taking place in the midst of governmental and corporate exuberance for all things technological, specifically in the area of new media, where these technologies are expected to act as a kind of panacea for other problems. This has very old history, as John Quirk and James Carey point out, in North America where technology has been seen as a way bringing progress to humanity. Our conception of technology is still tied to the tendency, drive and faith in the goals of modernization as progress, and this ideology cannot help but infuse art that takes these technologies as their medium and/or content. Modernism has been thoroughly critiqued in other realms of the arts, and postmodernism has definitely influenced the theoretical vocabulary of new media. But new media retains its ties to modernism and the avant-guard when it espouses technological innovation. Modernism thrives in the language of new technology. Perhaps this accounts for the bipolarization of much of the work and thinking in the area into either radically hopeful or dystopian views of technology's longterm effects on a culture. Even more specifically, in Canada technology has had a cherished place in our political life. Maurice Charland has charted the history of technological nationalism in terms of government policy. This is the belief that communications technology can unify a very unwieldy geographical polis, a very real issue that I am now exploring in other work that may be indirectly relevant to the media arts.

In the current rhetoric of modernization and progress, interactivity is a central buzzword used to describe the democratic and participatory nature of consumer culture and the entertainment industry. When searching for discussions of interactivity in the media for this paper, my library search inevitably coupled the term with the research of Videotron, the Quebec cable company who have been investigating and promoting home shopping and playing blackjack via your t.v. for some time. It made me wonder whether interactive engagements are a desirable state of affairs after all, and who was doing the desiring. But maybe I'm paranoid because of the theories I have been working with... As I mentioned, I seem obsessively con-

cerned with the means by which we are increasingly regulated through the gathering of information about our lives and habits.

Connectivity or collaborations; affinities between bodies and practices suggesting not only a connection of like but of the dissimilar in the desire for exchanges and friendship at a personal level, connections at an intellectual level, transformations at the political and economic level of the distribution of power and capacities. For me, this is virtuality in its originary sense of potentiality. It is an approach to theorizing I learned from feminism. It includes in its agenda for critical writing the chance to respond to what is affective, in an equally affective and engaged way. It risks failure. Finally, it is a practice that needs these frictions to produce any sensation or movement at all in this field called new media.

IMMERCE CUNNINGHAM MULTI-MEDIA PROTOTYPE

A VISUAL DATA-BASE BASED ON THE DANCES OF MERCE CUNNINGHAM

By Thecla Schiphorst

thecla@cs.sfu.ca

"In one way or another what we thought we couldn't do was altogether possible, if only we didn't get the mind in the way"
Merce Cunningham[1]

T he *immerce* Cunningham visual database, is an interactive multi-media prototype based on the dances and the choreographic process of Merce Cunningham.

In *immerce* dance material is explored and navigated using an interface metaphor which is based on a process grounded

in Merce Cunningham's working methodology and in the nature of dance itself. Cunningham's process deals complexity, the incorporation of chance procedures, the relatedness of space and time, and multiple points of reference.

The multi-media work explores notions of interactivity, of navigation and of representation related to dance, the body, and the choreographic process of Merce Cunningham. A key part of the design process has been to remain allied with Cunningham's choreographic process. The system design has incorporated the use of chance operations, complexity, and a multiplicity of cen-

ters with respect to both time and space, concepts derived from Zen Buddism. *immerce* allows dance to be re-experienced and re-defined in multiple layers, from multiple vantage points. This way of viewing the system design comes from a position where one is not seeking solutions with known methodologies but instead seeking experience and re-experience through a process of exploring the unknown.
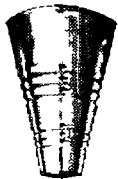
This material can be explored in three different navigational contexts or modes. In the linear navigational mode, selecting identified buttons leads to single logical outcomes. In the chance mode, the system presents an increasingly complex montage of randomly selected material, throughout which any element can be explored by clicking on it. In the associative mode, selecting symbols derived from parts of the body lead to collections of related material, originating directly from the participants choice, and including a gathering of connected yet randomly selected elements. These three navigational modes are flexibly interchangeable and can be switched at any time during the participants interaction.

Tools are available to enable users to create their own menu system or structure, retrace their path through the archive, and to gather their own "body of knowledge" for later viewing. At any time, the user may choose to view the material from the point of view of the computer system itself by selecting the *System Gaze*. This serves as a window into the functionality of the system, a critical acknowledgement of the constructs that have been implemented in order to allow the participant to view the material, and also provides a help feature for the user when required.

Design Goals

1. In order to align the design process of the system with Cunningham's working methodology: incorporate Cunningham's underlying philosophy and creative process with respect to chance procedures, no fixed points in space, multiple events occurring independently of one another. The use of chance processes in Cunningham's choreography means that in terms of both time and space there is possible a "multiplicity of centers" (a concept derived from Cunningham's interest in Zen Buddhism) in which no one element is necessarily more, or less, important than another.

2. In order to provide a rigorous interpretation of, and access to the material in the archive: incorporate a navigation system which enables information to be accessed, viewed, interpreted and perceived from three different conceptual frameworks (the chance-random, the linear-logical, and the associative-gathering modes)

3. In order to interpret the material of dance and of the body in a language which comes from dance itself: utilize systems of mapping the physical body (for buttons and menus)

in order to relate non verbal knowledge inherent in physical body systems to the selection of categories of information in the archive. This involves the mapping of body parts to the dance itself, to choreographic notes, dancers, production history, composer, designer, and other archival elements.

4. In order to enable the system participant to create their own context dependent navigation environment: create a memory map enabling the participant to trace their own steps through space and time. This tool enables the participant to produce their own menu system or structure, retrace their path through the archive, and to gather their own "body of knowledge" based on their interactive experience.

5. In order to present a critical context which exhibits the system design itself as a part of what is experienced and observed: provide a *System Gaze* feature which shows "the computer design's point of view". This tool serves as a window (or a veil) which transparently overlays itself, providing a look at the constructs that have been implemented in order to allow the participant to view the material.

Notes

[1] Merce Cunningham quoted in the CNN television series. *Arts and Technology Report,* March 1991.

TOUCH AND GO:

HYPERFORMANCES, AUTOMATED TELLER MACHINES, IDENTITIES, SOCIAL RELATIONS

*By Jeffrey Schulz*

See it.
Feel it.
Touch it.
Experience it.

Scads of baby boomers no doubt get weak in the knees with this nod to the pinball wizard Tommy who pleaded some twenty years ago "See me. Feel me. Touch me. Heal me." But this appropriation of the Who is far from the anti-establishment, touchy-feely sentiments that are now attributed, rightly or not, to the 60s. The reworked refrain is actually a recent advertising campaign for Citibank ATMs. The campaign's shameless new-age component no doubt served its purpose well by stirring the nostalgic impulses of those boomers who sang along with Tommy. It was a brilliant new context for this hippie anthem — a psychologically packed site of technology, especially so for aging boomers who often feel literally blind to the impact of information technology on their own lives, and whose children often know more about it than they do.

But the decor on Citibank's ATMs was also part of a much wider campaign by this bank and the rest of the financial industry to make information surfing both pervasive and user-friendly — and of course to make a lot of money. From the recent wave of bank mergers — including the one between Chase and Chemical, *creating the largest bank in the United States* — to business section stories describing new "relationship" banking strategies, to op-ed cartoons showing ATM customers watching Disney's "Pocahontas" while they're performing transactions, it's becoming more and more clear that our future will be mediated by financial instruments like ATM cards, credit cards, debit cards and other financial/demographic currencies. Playing into this dynamic is the World Wide Web's enormous interest in insuring the security of credit card transactions. With all the anticipation of a mission into space — or, dare I say, cyberspace — stories seem to break almost daily that count down to when a secure credit infrastructure will launch us into a new age of "safe" web transactions. Where's the cyberspaceship headed anyway? But more importantly, what kinds of experience does touching an ATM screen activate?

It's all kind of touch and go, actually.

ATMs are, literally, tools that speed our travels. They allow us to simply touch a few surfaces and be on our way — quickly. But we not only perform our transactions at ATMs; we
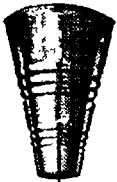
hyperform our tranceactions. We enter an ATM with a subtle sense, conscious or not, that we're somehow traveling, leaving our bodies behind — going into a trance — until our cash is delivered, our stocks traded, our balances transferred or checked. And in terms of hypertextual experience, ATMs long ago set the standard: multiply documented, transferred, routed, and transmitted, these transactions were hyper way before HyperCard dropped out of the Apple tree and our microminds were expanded with MacroMind Director. In this way, ATMs are much more closely aligned with William Gibson's use of the term cyberspace than is the relatively simple process of checking out a Web site in some remote part the world. Gibson well knew that the real importance of cyberspace would be fast finance, an info-dimension that most technoids continue to avoid as they dream in their interactive strawberry fields.

The expression touch-and-go also means up in the air, unknown or unstable. In demographic terms, it's that shifting sensation, the instability of our own identities that we register, for example, when we answer the phone and an anonymous telemarketer shockingly and surprisingly knows us by name — and maybe what we like to buy, a more shocking prospect. It's also the disorientation we feel when we call a bank to confirm a new credit card, and the issuer automatically activates the card simply because we call from a home telephone. This wouldn't happen if we called from, say, a pay phone (subtext: they know where we live). But it all makes sense to Citibank, and it again comes out in one of their ads: against a backdrop of the song, "Stand by Me," a woman praises her photo-id card, confidently declaring, "Citibank has really given us a new sense of self."

With this in mind, the rush of New York Telephone's intoxicating old slogan "We're all connected" returns, although this time with a swig of delirious social interaction as the chaser. Our social fabric now looks like a flickering landscape; a sometimes bewildering, constantly shifting admixture of the physical and the virtual. Touching an ATM screen is a social transaction from the outset, connecting us with other people — bankers, demographers, credit workers and more — and intertwining us into a shimmering matrix of social relations. The finger that elects "withdraw cash from credit card account" might no longer wrap itself around the physical hand of another human being, but it nonetheless activates very similar social and legal mores: trust, risk, support, moral and financial debt. In short, mutual dependency.

In fact, we're become dependent on ATMs, and they've become crucial to our survival. They're part of the air we breathe, and if we can't breathe it, we suffer a mild suffocation. This dependency is not necessarily a new idea. After all, it was way back in 1834 when Daniel Webster opined to the Senate, "Credit is the vital air of modern commerce." What's new is the pervasiveness of this air. Taking a cue from VISA's slogan "It's everywhere you want to be," transactions are no longer restricted to physical location. They occur pervasively and continuously.

On the subject of transactions, Steve Case issued a kind of challenge in his June, 1994, letter to AOL subscribers: "Be ready to transact. New media is about having relationships with customers, even entire markets. Get ready to have millions of transactions each and every second." Are we up to it? It's a little bit touch and go at the moment. But, given that another financial industry slogan is "Expect more from us," it's not a challenge we'll be able to ignore.

I've developed a tool, the Hyperformer, who meets Case's challenge head-on.

The Hyperformer rollersurfs the terrain of the Manhattan, weaving a path through taxis, heating grates, trucks, oil splotches, busses, cigarette butts, pedestrians, and other surfactants. It's from one ATM to the next, and the next, and the next, checking balances and withdrawing funds along the way.

This is science fiction this is not.

For the series last fall, titled Hyperformances 1.1: Synergistic Tranceactions, the Hyperformer wore an Armani shirt, Fendi tie, Body Glove surfing trunks, Leader swimming cap and goggles, and Rollerblades equipped with 80 millimeter 78 and 81A Hyper Shock wheels. Although the body of the Hyperformer belongs to me, the Hyperformer's legal agency and identity does not. The Hyperformer often check balances and make withdrawals with someone else's card — friends, gallery dealers, collectors — effectively turning the Hyperformer into the cardholder. It is, after all, the cardholder's information that makes the transaction, legally transferring agency from that cardholder to the Hyperformer. In this way, the Hyperformer is an identity entity, a container of sorts that is periodically filled and emptied of personal information — a sort of demographic currency, if you will.

The current series, titled Hyperformances 2.1: Crossing Tranceactions, is in progress. For each of five performances that occur over a ten week period, the Hyperformer dresses in a completely different set of clothing while skating a roughly 100-block stretch of Broadway that connects Lincoln Center and Wall Street, crossing the entirety of Manhattan's business districts in the process. The sabre maneuvers of the previous series have been replaced in the current project by a variety of activities, including: bouncing a large, three-foot in diameter yellow ball; using a cell phone to leave a recording of breathing patterns on my own answering machine; pulling another skater, who holds plastic tube reins connected the Hyperformer; wearing a wetsuit that's fashioned into a strait jacket while blowing a whistle; and more. These and other images, as well as performance descriptions, Hyperfictions and other textual material, are part of my web project, titled Touch & Go, which will be updated throughout the current series on äda 'web (http// :adaweb.com).

Regardless of the version, the Hyperformer is an investigative tool with which to unpack the multiple entities, trajectories, nodes, and meanings that circulate through an increasing number of our social and financial transactions. However, I should also mention that the Hyperformer is highly subjective, the product of my own hybrid educational background of international business and relations, and visual arts. As such, the Hyperformances allow me to navigate not only the emerging cultural spaces of information technology, but also the variegated terrain of my own psychic spaces. Rather than dividing and inspecting these various aspects separately, the Hyperformance series instead seeks to forge and maintain a variety of connections, exploring the always-intermediate interconnectedness that increasingly characterizes our experience. As an investigation into this experience, the Hyperformer attempts to link a variety of issues, including: freedom of movement and the surveillance of that movement; club fashion and techno culture; alchemical aspects of interacting with an ATM; the use of swimming and surfing metaphors in the context of information technologies; connections between information technologies and military traditions; the dispersion of identity; the influence of science fiction on business practices; extreme sports and extreme lifestyles; and others. The outgrowth of these links is a hybrid organism coupled with a hybrid analysis, the combination of which works toward developing relational tools for the emerging cultural spaces of information; spaces which are virtually real, really virtual, and endlessly flickering, shifting back and forth.

ELECTRONIC ART AND THE LAW:

INTELLECTUAL PROPERTY RIGHTS IN CYBERSPACE

By Patricia Search

searcp@rpi.edu

I ntellectual property is an important issue in the age of electronic information. The impact of electronic technology on the rights of artists is being debated worldwide. Changes in the way we create and disseminate works of art require revisions in the copyright law to protect the rights of authors and artists. The copyright law protects the commercial value of artwork, and the degree of intellectual property protection afforded new forms of electronic art will impact the way this work is created, critiqued, and marketed.

The dematerialization of art which began in the 1960s has reached new heights with the use of electronic media. Many forms of electronic art exist as intangible objects in an abstract digital format. Current copyright laws, derived from a history of the print medium, are based on fixed forms of communication and do not adequately protect the intangible, plastic forms of artistic expression created with electronic media.

This paper shows how current copyright legislation does not reflect the changing dynamics of electronic art, including postmodern perspectives that blur distinctions between original artwork and copies, and new forms of authorship defined by collaborative and interactive works of art. This paper also takes a look at the legal and commercial implications of artistic appropriation in cyberspace.

Copies and originals

With electronic media, the concept of "original" artwork no longer presumes a unique or rare object. One set of data can result in many works that vary in size, color, and medium, depending on the method of display or reproduction. Furthermore, we cannot view the artwork in its original digital format, we must view a *translation* of that format. In computer simulations and virtual reality artwork, it is especially difficult to sort through these philosophical paradoxes and define the meaning of original art. While the actual works of art themselves may be original, they are also simulations of real (or original) objects and experiences. As with photographs, the creative value of computer simulations and virtual reality environments is based on the likeness of the original.

Hence, in the digital medium where it is possible to make exact copies of artwork, where virtual interpretations of the original may be the essence of the creative experience, and where

copies are required for data transmission over electronic networks, more commercial value may be assigned to copies or reproductions than originals. Since copyright law protects the right to make reproductions, adequate copyright legislation is essential for digital works of art.

Authorship and copyright

The foundation of the copyright law is based on authorship. The United States Copyright Act states that statutory copyright "vests initially in the author or authors of the work" [1]. Throughout history, however, the concept of authorship, as defined by the copyright law, has changed. Peter Jaszi, a professor at Washington College of Law, points out that authorship used to be the critical foundation of copyright protection [2]. The significance of authorship in the creative process reached new heights during the eighteenth century when authorship was linked to the Romantic movement in literature and deemed synonymous with creativity and genius [3].

However, with the "commercialization and the commodification of print culture" in the nineteenth century, the "concept of work" gradually replaced the importance of authorship as a basis for copyright protection [4]. Any work was eligible for copyright so long as it did not duplicate existing works. In Alfred Bell & Co. v. Catalda Fine Arts, the court issued an opinion that reduced the significance of creativity as a criterium for authorship:

All that is needed to satisfy both the Constitution and the statute is that the "author" contributed something more than a "merely trivial" variation, something recognizably "his own." Originality in this context "means little more that a prohibition on actual copying." No matter how poor artistically the "author's" addition, it is enough if it be his own [5].

There have also been changes in the role of authorship in electronic art. With electronic media, the dematerialization of artwork, the lack of tactile qualities, and the absence of the "artist's hand" negate the visible presence and authority of the artist. Moreover, in interactive collaborative works, there are multiple authors, and under the copyright law, all of the authors have equal intellectual property rights. The size of their individual contributions or the amount of creativity in the contributions is irrelevant. The law merely states that a copyrightable work of joint authorship is "a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdependent parts of a unitary whole" [6].

To complicate matters further, with interactive works of art, the boundary between author and viewer is blurred. Some hypertext/hypermedia computer programs enable the user to create new paths or links through the program as well as add annotations to the original material. According to the copyright law, a new work of creative expression based on a previous work constitutes a derivative work which is also copyrightable.

However, only the copyright owner of a work can authorize the creation of derivative works. If the user of a hypermedia program adds links or information to the program, does this new material constitute a derivative work? Can the user claim a derivative copyright to these new sections? There are no clear answers in today's copyright legislation.

Joint authorship of artwork raises important questions concerning the protection of intellectual property rights and ultimately, the protection of the commercial value of the artwork. If there are multiple authors, each author or artist owns the copyright to the work. Hence, each artist can independently authorize the reproduction of the artwork and the creation of new works derived from the art. Pamela Samuelson, a law professor and expert on intellectual property rights in computing, points out that "Joint authorship fractionates ownership rights, rather than consolidating them" [7]. Samuelson goes on to note that electronic technology compounds the problem of ownership fractionation and creates a "nearly unsolvable fractionation problem" because computers can access information owned by numerous authors, each of whom may have an ownership interest in the final product [8].

In addition to multiple authors in electronic art, there are some new forms of authorship that do not fit the "traditional" interpretation of authorship. For example, the concept of authorship implies someone who makes a concrete contribution or addition to a work. "Non-authors" or "destructive" authors who create computer viruses that destroy information are not included in this perception of authorship.

Other important questions of authorship stem from the use of artificial intelligence in computer programs. Who is the author of a poem, image, or story generated by a computer program? Samuelson identifies five prospects: the computer, the programmer, the individual who uses the program, the programmer and the user, or no one [9]. Samuelson uses legal arguments to conclude that the user is the author of a computer-generated work. However, she points out that there is no definitive answer in the United States Copyright Act because the law does not define *author* or *authorship*; it merely describes some examples of authorship [10]. Some countries have defined the author of a computer-generated work as the user or person who defines the query [11]. However, until this question is addressed on an international level, artists using artificial intelligence techniques in their work may not receive adequate copyright protection.

Inadequacies of the copyright law

In electronic environments where it is easy to make exact digital reproductions of files, where the "original" artwork may change continually, and where multiple authors can create an infinite number of derivative works, the importance of copies, reproductions, and derivative works takes on new significance. Since the commercial and aesthetic value of copies may be as

great or greater than the originals, adequate copyright protection is paramount. However, there are important gaps in the current copyright legislation that may impact electronic works of art. Several of these issues are discussed below. While this discussion refers specifically to the United States Copyright Act, similar problems exist in other copyright laws.

Difficulties in Determining Infringements

When determining copyright infringements, the courts evaluate the "substantial similarity" between works of expression. However, there are inherent philosophical problems in identifying similarity between objects. As Nelson Goodman points out, there are too many variables in defining similarity. Similarity often depends on perspective as well as context and purpose [12]. For this reason, the courts have devised several tests for evaluating similarity. The test traditionally used to determine substantial similarity is called the "subtractive test" [13]. This test divides a copyrighted work into copyrightable and noncopyrightable items and compares only the copyrightable items with the allegedly infringing work.

However, with electronic information, it is often difficult to determine similarity and prove infringement for the following reasons:

1) Electronic media raise new questions regarding similarity that are not addressed by the current legal tests for similarity. In digital art, similarity may be based on algorithmic similarities as well as audiovisual comparisons [14]. With these types of similarity, the issue of function versus expression must be considered. If two works contain algorithmic similarities that involve similarities of functions or processes, there is no copyright infringement because functions and processes are *patentable* not *copyrightable* [15]. However, algorithmic functions in artwork are usually coupled with expression, which is copyrightable. Therefore, in order to prove infringement, the artwork would have to patented as well as copyrighted.

2) When determining copyright infringement, the courts have ruled that an "ordinary observer" must be able to discern "substantial similarity" [16]. In Dawson v. Hinshaw Music, the court clarified this interpretation by stating that the ordinary observer should be the "intended" audience for the work [17]. However, with electronic communication and networking, it is increasingly difficult to identify the intended audience. In mass communication models, such as those defined by computer networking, information may not be directed to a known or specific audience [18]. Furthermore, with electronic media, it is possible to modify and synthesize data to a point where an "ordinary observer" (or a trained expert for that matter) cannot determine the original source in order to evaluate the similarities.

3) In interactive programs, the users may add annotations or new links to the program. As previously noted, these "similar" programs could be considered derivative works which would constitute a copyright infringement because only the original author has the right to create derivative works. These new issues concerning user interaction and derivative works are not addressed by the current copyright law. Moreover, the courts have had difficulty defining derivative works. Court decisions and the copyright law do not make it clear whether "the derivative work must be substantially *similar* to the prior work or that it simply must incorporate in some form a portion of the prior work" [19]. If the law isn't clear on the issue of similarity in the basic definition of derivative works, it will be especially difficult for the courts to define the rights of authors in new forms of interactive works where the boundaries between authors and users merge.

Electronic Dissemination of Information

The electronic dissemination of information raises new issues in intellectual property rights that are not addressed by current copyright legislation. The nature of the medium itself and the techniques used to transmit electronic data mandate changes in some of the terminology and definitions found in the copyright law.

To begin, the meaning of the word "copy" must be redefined within the context of electronic technology. Loading a digital file into a computer, uploading or downloading digital data between a computer and a server, and displaying an electronic work on a computer screen create copies which may be copyright infringements. In MAI Systems Corp. v. Peak Computer, Inc. and in Advanced Computer Services v. MAI Systems Corp., the loading of copyrighted software into the computer's random access memory constituted an infringing reproduction [20].

On electronic networks, it is not possible to transmit information without creating copies. The copyright law must be revised to define how and when copies can be made for electronic transmission without constituting an infringement. In a recent Internet discussion on this topic, one participant summed up the critical issues as follows: ". . . the important consideration about copying is what is done with the copy, not how the copy is made, and . . . the new definition of "copy" in the copyright domain will take that into account" [21].

Problems also exist concerning the importation of work over electronic networks. Section 602 of the U.S. Copyright Act states that copies and phonorecords acquired outside the United States cannot be imported into the U. S. without the permission of the copyright owner. However, the use of electronic networks to import digital data is not considered an "importation" because no tangible objects are being imported. In other words, anyone in the U.S. can import electronic files without the permission of the copyright owner.

Inadequate Categorization

The copyright law covers eight categories of protectable information: 1) literary works, 2) musical works, 3) dramatic works, 4) pantomimes and choreographic works, 5) pictorial, graphic, and sculptural works, 6) motion pictures and other audiovisual works, 7) sound recordings, 8) architectural works [22]. However, there is no category for interactive multimedia computer programs. While multimedia works may include elements from several of these categories, most multimedia works are registered as audiovisual works. Technically, under the copyright law, multimedia works receive protection under all applicable categories even if they are only registered under one category. While this type of umbrella protection may seem adequate on the surface, there is concern in the legal arenas that the courts may not award complete protection under all applicable categories [23]. In the United States Department of Commerce, a Working Group on Intellectual Property Rights published a green paper which states that a work which doesn't fall into one of the copyright categories is in a "copyright no-man's land" [24]. The report goes on to point out that "proper categorization" is critical for copyright protection because some rights as well as some limitations in the copyright law are category specific [25].

Interactive multimedia programs are not the only artworks with inadequate protection under the existing copyright law. A work of art may contain elements that do not receive any copyright protection. As previously noted, if a work of art uses algorithmic functions or processes, those elements are not copyrightable. This copyright distinction is significant because the lines between creative expression and function often merge in today's electronic art, especially in interactive works. In addition, it should be noted that works of art that are transmitted via satellite communication or electronic networks are not copyrightable unless they are "fixed" in a permanent format. In other words, those works must be documented (e.g., videotaped, stored on disk) in order to be copyrightable. Of course, this legal requirement for intellectual property protection may conflict with the aesthetic goals of an artist who specifically uses telematic communication to avoid the temporal and physical constraints of documentation.

The lack of intellectual property protection for certain types of artwork may impact the direction of future art forms as well as determine how new works of art are marketed and published. These problems will continue to increase as new forms of art emerge and challenge the parameters of the copyright law.

Appropriation of copyrighted work

Throughout history, artists have incorporated imagery created by others into their work. Contemporary artists often use appropriated images and symbols for social commentary, and the appropriation of copyrighted works has often resulted in legal complaints.

Larry Rivers incorporated part of a famous photograph of Picasso, taken by Arnold Newman, in a print that was part of his 1975 *Homage to Picasso* portfolio. Rivers claimed that since he used only a small part of the photograph (a section around Picasso's eyes) the use was legitimate and comparable to using a quote [26]. Newman didn't agree with this analogy because he was never credited as the author of the photograph. This case resulted in a heated dispute that was publicly aired in the *New York Times*.

Robert Rauschenberg ran into problems with photographers Dennis Brack and Morton Beebe. Brack complained when Rauschenberg used his *Newsweek* photograph of the Detroit riots in a print called *Signs*, and Morton Beebe initiated a lawsuit when Rauschenberg reproduced a photograph called *Diver* in a print entitled *Pull.*

Andy Warhol received legal complaints from photographers Charles Moore, Fred Ward, and Patricia Caulfield. Warhol used three of Charles Moore's photographs of the Birmingham race riots in a 1964 painting called *Race Riot*. He also used a *Life* magazine cover photo of Jacqueline Kennedy Onassis, taken by Fred Ward after President Kennedy's assassination, in several prints and paintings. Patricia Caulfield sued Warhol when she discovered that he had used one of her photographs in his 1964 series of paintings and prints called *Flowers*.

All of these cases were settled out of court. The photographers and their agents or attorneys received works of art from Rauschenberg and Warhol [27]. Beebe also received a promise that he would be acknowledged as the author of the photograph *Diver* in future exhibition catalogs of Rauschenberg's art, and Caulfield received a promise of royalties on future uses of her image by Warhol.

Unfortunately, because these cases were settled out of court, no legal precedents were set concerning artistic appropriation of copyrighted material. In the world of digital communication, these types of legal disputes are certain to escalate. With electronic networks, all artists, not just well-known artists, have a mass distribution network for their work, and copyright infringements are more likely to be identified. Moreover, with digital technology, it is very easy to reproduce artwork, further increasing the prospects for copyright infringement.

Martha Buskirk points out in her article "Commodification as Censor: Copyrights and Fair Use" that legal problems are most likely to arise when there is an intersection of reproduction technologies [28]. For example, if the appropriated material is reproduced in a similar medium (such as an electronic medium), the courts may find it easier to use the similarity tests to prove infringement. As previously mentioned, the "subtractive" test has traditionally been used to prove similarity in infringement cases. However, two other tests, the "totality" test and the "extrinsic/intrinsic" test, have become increasingly popu-

lar in the courts [29]. Both of these tests compare works using a "total concept and feel" standard to determine substantial similarity. If two works use a similar medium, the "total concept and feel" of the works are inherently similar.

In addition, when two works are produced in a similar medium, there may be a greater chance that the appropriated work will compete in the market with the original work, an important economic determinant in cases that involve "fair use" claims. The fair use provision of the U. S. Copyright Act allows copyrighted work to be reproduced without the copyright owner's permission "for purposes such as criticism, comment, news reporting, teaching (including multiple copies for classroom use), scholarship, or research" [30]. However, the use of the material must comply with certain statutory criteria, one of which pertains to the impact the use of the work will have on "the potential market for or value of the copyrighted work" [31].

Artists will also find it increasingly difficult to use mass media images in social commentaries because many of these images are commercial symbols that are valuable commodities. With the widespread distribution of artwork over electronic networks, many works of art will be assimilated into cultures and become mass media symbols and subsequently, targets of appropriation. In Bleistein v. Donaldson Lithographing Co., a Supreme Court Case involving the reproduction of three circus posters, Justice Oliver Wendell Holmes said that the circus performers, who were the original subject matter for the posters, could be copied but the posters themselves could not be reproduced. He delivered a famous opinion in which he stated, "Others are free to copy the original. They are not free to copy the copy" [32]. However, the court at that time did not foresee the media-saturated cultures of today in which objects, people, and activities would symbolize commercial interests.

As a result, electronic artists who appropriate work for social or political commentary may find themselves caught in an unforgiving web of intellectual property battles. Commercially successful artists like Rauschenberg and Warhol may be able to resolve appropriation disputes by compensating other artists for the use of their work with gifts of artwork, royalties, and promises of future acknowledgment. However, artists who do not have an established market value for their work may not be able to settle their legal problems so easily.

Such commercial inequities may impact the interpretation of intellectual property law in the courts. Commercial interests that stand to gain from artistic appropriation, such as companies that consider the public exposure and association with a renowned artist a beneficial form of advertisement, may set precedents by settling out of court or opting to ignore the infringements completely. The work of some successful artists may become popular cultural symbols that are subject to frequent appropriation. The copyright law does not distinguish between different calibers of authors. However, if commercial hierar-chies in the art community begin to dictate discriminating standards for resolving cases involving artistic appropriation, we may eventually see the courts attempt to enhance equity under the copyright law by restricting the criteria for fair use, thus limiting the ways copyrighted material can be used for research, criticism, and artistic expression.

The new legal arena

Electronic communication will accelerate the commodification of mass media images and works of art. Artists will find it increasingly difficult to successfully navigate the legal tight ropes that spring up along the way. Ironically, the legal system itself will not provide a stable foundation to address these challenges. The use of electronic databases in the legal profession will encourage frequent updates and undermine the stability formerly established by precedents [33]. As a result, court cases will be less authoritative and less final. Many cases will be settled using appeals processes that have yet to be devised, and the legal nightmare will escalate.

Changes in the copyright law are needed to clarify existing legal ambiguities concerning the creation and dissemination of electronic information. These changes, however, must reflect the new dimensions in authorship that have evolved, in part, because of the growth of electronic communication. Authorship in the twentieth century is becoming increasingly pluralistic with less emphasis on one view or opinion. This new perspective recognizes that authors and artists do not operate in a vacuum isolated from the creative ideas of others. Current copyright law is not directed toward this new concept of authorship. Instead, copyright law is founded on a Western interpretation of authorship that emphasizes individual ownership of a creative work in order to facilitate the marketing of the work.

The copyright law must support the dynamic, multilateral dimensions of the creative process that are reflected in many new forms of social discourse and electronic art. The law and society have traditionally legislated power and authority to *stable* forms of expression. The law must now reinterpret these ideals within the context of a dynamic communication structure where *change* is the essence of authority and power.

© Patricia Search 1995
Associate Professor
Rensselaer Polytechnic Institute
Troy, New York 12180 USA

References

1. 17 U.S.C. § 201(a) (1982).
2. Jaszi, Peter. "Toward a Theory of Copyright: The Metamorphoses of 'Authorship'." *Duke Law Journal* 2 (1991): 455-502.
3. Woodmansee, Martha. "The Genius and the Copyright: Economic and Legal Conditions of the Emergence of the 'Author'." *Eighteenth-Century Studies* 17 (1983-1984): 425-448.
4. Jaszi [2] p. 474.
5. Alfred Bell & Co. v. Catalda Fine Arts, Inc., 191 F.2d 99 (2d Cir. 1951).

6. 17 U.S.C. § 101 (1982).

7. Samuelson, Pamela. "Allocating Ownership Rights in Computer-Generated Works." *University of Pittsburgh Law Review* 47 (1986): 1185-1228, p. 1222.

8. Samuelson [7] n. 152.

9. Samuelson [7] p. 1190.

10. Samuelson [7] p. 1189 n. 12.

11. In the United Kingdom, the Copyright, Designs and Patents Act defines a computer-generated work as "a work that is generated by computer in circumstances such that there is no human author of the work" and provides that, for copyright purposes, the author is "the person for whom the arrangements necessary for the creation of the work are undertaken" [Copyright, Designs and Patents Act, 1988, ch. 48 178 (Eng.)]. Hence, the author is the person who defined the query not the programmer. In Australia, the Copyright Law Review Committee has recommended a similar position and stated that the author should be defined as a) the person who arranges for the creation of the work or b) the person for whom the arrangements necessary for the creation of the work are undertaken [Wodetzki, Jamie, "An odd copyright question." Electronic message to CNI-copyright (electronic discussion group). 7 October 1994. 11:29:52 EST. Available from listserv@cni.org.].

12. Goodman, Nelson. *Problems and Projects*. Indianapolis, IN: Bobbs-Merrill, 1972.

13. Information Infrastructure Task Force (B. Lehman, Chair). *Intellectual Property and the National Information Infrastructure: A Preliminary Draft of the Report of the Working Group on Intellectual Property Rights* (green paper). Washington, DC: United States Department of Commerce, 1994.

14. Karnow, Curtis. "Data Morphing: Ownership, Copyright and Creation." *Leonardo* 27, no. 2 (1994): 117-122.

15. A patent protects innovative processes, systems, procedures, and technologies. A copyright protects the expressive elements that depict processes, systems, procedures, and technologies. For example, the design of a machine is patentable; a drawing of the machine is copyrightable.

16. Arnstein v. Porter, 154 F.2d 464 (2d Cir. 1946); Peter Pan Fabrics, Inc. v. Martin Weiner Corp., 274 F.2d 487 (2d Cir. 1960); Ideal Toy Corp. v. Fab-Lu Ltd., 360 F.2d 1021 (2d Cir. 1966); Eden Toys, Inc. v. Marshall Field & Co., 675 F.2d 498 (2d Cir. 1982).

17. Dawson v. Hinshaw Music Inc., 905 F. 2d 731 (4th Cir. 1990).

18. McQuail, Denis and Windahl, Sven. *Communication Models for the Study of Mass Communications*. New York: Longman House, 1981.

19. Information Infrastructure Task Force [13] p. 72 n. 233.

20. MAI Systems Corp. v. Peak Computer, Inc., 991 F.2d 511 (9th Cir. 1993); Advanced Computer Services v. MAI Systems Corp., 845 F. Supp. 356 (E.D. Va. 1994).

21. Agin, Dan. "Restrictions on links on N." Electronic message to CNI-copyright (electronic discussion group). 23 January 1995. 19:02:53 EST. Available from listserv@cni.org.

22. 17 U.S.C. 102(a) (1982).

23. Mesiti, Nicholas. "Intellectual Property and Multimedia." Presentation at Rensselaer Polytechnic Institute, Troy, NY, 17 February 1995.

24. Information Infrastructure Task Force [13] p. 25.

25. Information Infrastructure Task Force [13] pp. 25-26.

26. Morris, Gay. "When Artists Use Photographs: Is it Fair Use, Legitimate Transformation or Rip-off?" *ARTnews* (January 1981): 102-106.

27. Ironically, Warhol gave Charles Moore prints from the *Flowers* series.

28. Buskirk, Martha. "Commodification as Censor: Copyrights and Fair Use." *October* 60 (1992): 82-109.

29. Information Infrastructure Task Force [13] p. 69.

30. 17 U.S.C. 107 (1976).

31. Section 107 of the copyright law lists four statutory factors that are used to determine if the use of a work in a particular case is fair use: "(1) the purpose and character of the use, including whether such use is of a commercial nature or is for nonprofit educational purposes; (2) the nature of the copyrighted work; (3) the amount and substantiality of the portion used in relation to the copyrighted work as a whole; and (4) the effect of the use upon the potential market for or value of the copyrighted work."

32. Bleistein v. Donaldson Lithographing Co., 188 U.S. 239 (1903).

33. Grossman, George S. *Legal Research: Historical Foundations of the Electronic Age*. New York: Oxford University Press, 1994.

THE 'FINISHED' WORK
OF ART
IS A THING OF THE PAST

By Tom Sherman

sherman@claive.art.nd.edu

At the close of this century we are witnessing a major change in how value is determined. The value of material wealth is giving way to the value of information. In this time of transition, these apparently incongruous value systems mix and form hybrid systems for determining value. Unique, precious material objects still hold their value; some actually increase in value in a relatively short time. Information that is useful but scarce is also valuable. Scarcity, even in an era marked by an abundance of information, is still a key factor in determining value. Those who hold valuable information may still wish to maintain exclusive, proprietary control—to increase the life of the information. Information is subject to decay or aging. Information is not inexhaustible. It may revert to data, the raw material from which it is formed. How and when information is maintained and released is determined by those in control; those who initially recognize its value, manage it and operate with it accordingly.

Contemporary art is part of an emerging sector of the economy called information and knowledge. Knowledge-workers create information for others to use. Worker in this case does not imply those who act only upon the instructions of others, knowledge-workers think for themselves. They know things that others do not know. They solve problems or help others solve problems. Knowledge-workers produce information, they transform data into information—distinguishing key aspects of disorder through the discovery and/or imposition of form. Artists fit nicely into this description of knowledge-worker. Contemporary artists, curators, critics and art historians are the knowledge-workers who form the contemporary art domain of the new sector of the economy called information and knowledge.

CONTEMPORARY ART MUST BE SEEN AS INFORMATION TO BE OF VALUE

The product of the knowledge-worker is information. The product of the artist is art. In an economy where value is determined by information and knowledge, art must be seen as information to be of value. The process of creating information requires a set of skills, methods developed through higher education and experience. Creative processes, in their most basic forms, can be taught and learned. Creative processes thus become products themselves. Although these creative processes have universal characteristics, creative work is messy, chaotic and mysterious. In art schools experienced artists attempt to teach young, emerging artists how to work, how to create art.

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

Audiences for art (the consumers of art) have to be creative themselves to find the products of artists valuable. If the work of art is an object, then an audience has to be able to decode the object to extract information encoded in it. This participatory investment is most commonly described as interpretation. Interpretation, besides being an intellectual exercise, is an intuitive, subjective process verging on psychic identification. Essentially, the work of art is performed by the audience, who retrace the creative processes of the artist through a kind of virtual creative process. Galleries and museums focus the attention of audiences on objects of art in isolation: the 'white cube' removes the art work from the world at large and permits the work's aura to be witnessed in a quiet contemplative serenity; that is, conducive to psychic identification. With contemporary art, curators and critics offer their assistance in this information exchange. Dealers and artists themselves also go to great lengths to help audiences find ways of relating to objects of art. The dealer loves and respects his or her artists; the artists display their personalities in public appearances, offering clues for interpreting (identifying with) their works.

The art object described above is a material manifestation of vision and thought; the artist sees and thinks and completes the creative process by fixing his or her perceptions and experience in material form. Traditional forms—painting and sculpture—have been extended through photography and architectural manipulations (installation), including attempts to integrate information technology (video and computer-integrated media). Over time there have been attempts to shake up the whole system of material, object-based art. Ideas have become accepted as art (conceptual and neo-conceptual art) and performance art and other kinds of 'live' events (some via telecommunications) have been introduced to the world as art; performance art often centers on the physical reality of the body itself. These conceptual and 'live' forms have found more receptive audiences in public spaces not defined as art spaces. When artists move into public spaces they find that audiences in these neutral spaces invest in their work differently. They are not interested in history, not even in recent history. They are interested in today; the experience at the moment of exposure.

The problem with the conceptual or live forms has been economic. How can one exchange art to economic advantage if there is no adequate system of currency, an accepted symbolic medium of exchange? Part of this economic problem is due to the fleeting, immaterial and impermanent nature of conceptual and live forms. The work does not manifest itself as a currency for exchange. There is no accumulation of material history. This has led to an obsession with documentation (catalogues, interviews, photography, video, CD's, CD-ROM's) and the indirect commodification of live forms through mementos or souvenirs (limited edition prints or drawings or other unique material objects deriving from the production process).

An emerging solution to problem is apparent in the recent proliferation of immaterial objects. Open-ended, 'living objects', or more precisely 'living systems' are now being produced under the generic description of software. Living systems, such as expert systems or other manifestations of artificial intelligence/perception/experience, while in their primitive stages of development, present a very serious challenge to fixed or 'finished' art as we know it today. Artists working in live forms will first collaborate with the experts who make immaterial objects (multimedia programmers), then they will learn how to author these living systems themselves.

THE LIVING ARTIST'S BODY OF WORK IS NEVER 'FINISHED'

Let us return to what we understand fully. When we visit a museum or gallery and view objects of art, an aspect of the interpretative process is based on knowing when and where the object was made. Art works by living artists have to be viewed differently than works by deceased artists. Curators, critics, art historians, dealers and artists always point out the importance of knowing the entire body of an artist's work when one is attempting to decode a single, discrete object of art. When an artist dies, his or her body of work is complete. Each object is then a fixed component of a body of work, complete in and of itself. The living artist's body of work is an open-ended, expanding work-in-progress and therefore each single, discrete object of art is part of the body of the unfinished work-in-progress. An audience interpreting such unfinished work must update the work with more rigor than they update the 'finished' works of deceased artists.

The work of dead artists can be decoded for information it provides about a specific period of time (the past). While the works of certain deceased artists sustain their value as information and therefore increase in value as material objects, this value is based in their concreteness and ironically the fragility of their finite material reality. A painting from the 17th century can afford to look dated. Audiences are not so kind when viewing contemporary art by living artists.

INFORMATION IS THE PERCEPTION AND EXPERIENCE OF DIFFERENCE

Contemporary works of art are valued most if they appear to be up-to-date. The fresh 'new look' always has value. Hot new work by young artists, or brand new twists in new works by established artists, have the look or appearance of information. New technologies are great for achieving the 'new look' and for creating the 'look of information', whether or not the work achieves value as information. Contemporary artists, young and established, compete for the most up-to-date look. Appearance is a territory. Curators, critics, art historians, dealers, collectors and artists participate in this search for contemporary artists who distinguish themselves as being hip (informed) through the look of their work. Audiences are exposed to the newest, most informed work, and they verify through their ex-

citement and energy if the work is charged with information value. The new look can never be predictable. Information is always a perception and an experience of difference. It must come as a surprise. The most unlikely things slam together to become information. Often it is impossible to explain why specific works are so information rich. All information is time sensitive and in a very short time the new look becomes tired and old. A work by a living artist that has gone out of fashion is practically lifeless (95% dead).

The 'new look' can be easily dismissed as the primary attribute of superficial art or shallow art that will quickly fall out of fashion. Surely an art work of real depth will stand the test of time. Deep works are structured so their information is released slowly, over the long run. Usually these deep works are seen to function as universal knowledge structures. Universal works of art defy identification with a specific time or place. But from another perspective, perhaps the deepest works of art are constructed to be totally devoid of information, thereby functioning as attractors of layer upon layer of incomplete interpretation, an ongoing investment of intellect.

Speculation on how a particular work of art will function in terms of information can be addressed by asking three questions of any work of art:

1. Is the work of art loaded with information?
2. Is the work of art totally devoid of information?
3. Does the work of art transform data into information?

The first question asks if the audience is informed by the work? Does the work offer a rich field of information and knowledge to the viewer? Can the viewer learn and take something useful away from the experience of the work? The second question asks if the work of art defies those who would try to extract information from it? Such a work could be labelled anti-information. It offers no information and literally rejects all associations with information. The third question reintroduces the term data, the raw substance from which information is created. Artists as knowledge-workers distinguish aspects of disorder, previously indistinguishable data, with form. They perceive difference, significant difference, and construct situations (frequently in or through the use of material objects) where information can be produced by the audience. Does the work of art transform the data in the field around it, which is constantly changing, into information? These three questions can be asked of both material and immaterial works.

IDENTITY IS ADDRESS
IN THE TERRITORY OF APPEARANCE
One single critical problem emerges from this period of chaotic transition. How can a work of art be updated so it does not lose its value in such a volatile information environment? Information (and certainly art in an information age) has a very short life. Contemporary art begins to fade immediately after it

is exposed to an audience. The living artist updates his or her body of work through subsequent releases of new work. The living body of work is continually updated through twists and turns, rather than reversals in direction. The thread of consistency, aesthetic logic, must remain unbroken. At the core of the living artist's evolving work there must be a redundancy of form and a consistency in the method by which disorder is processed into form. This redundancy of form and method creates a recognizable identity. This identity is the address of the work—the site of information. An evolving body of work has no fixed address except its recognizable appearance. Identity is address in the territory of appearance.

The stability created by one's own history (a body of finished art works) produces the artist's address in the trans-spatial territory of appearance—his or her identity. This address, while necessary for recognition, unfortunately prescribes the parameters of new works. All mature artists with considerable bodies of work eventually fall victim to the weight of their own history. They must continuously update what they do while remaining consistent with their past work. In fact a common strategy in the 20th century has been to remain completely consistent—to repeat the same information as art over and over and over. In a 21st century culture, value will be determined increasingly by the freshness or newness of information, and this vitality of information will be based on the timely, continuous introduction of apparent new qualities. Stability, unless it is poetic ("poetry is news that stays news", Ezra Pound), will not be a positive attribute in an environment characterized by continuous change. The difference between poetic stability and mundane redundancy is that poetic information is volatile in its own way.

ETHERIAL CULTURE IS GROUNDED, MADE CONCRETE, IN ITS AUDIENCE
In a digital era immaterial 'objects' are increasingly prevalent, but their function will initially differ little from their material predecessors. They are carriers or rejectors of information, or transformers of data into information. As immaterial objects of art, they function best in virtual spaces. Where museums and galleries are physical architectural sites best suited for the public presentation of material objects of art, immaterial objects function best on networks—virtual public spaces that connect private spaces. At the turn of the century, there will be an increasingly more complete synthesis of material and immaterial objects, of physical and virtual architectures, of value systems based on dichotomies of scarcity and abundance, material wealth and information wealth. Mixed economies, perceptions and experience will countervail to produce radical new hybrids.

The stable, poetic information structure of an ambiguous artwork yields information through the creative efforts of its audience. The audience interprets (participates, interacts with) the work to create information. The chief edge that immaterial objects have over material objects is their potential for direct,

active participation and interactive manipulation by audiences. Immaterial objects fly back and forth across networks at the speed of light into private spaces where audiences can manipulate and modify identical, digital copies of original art works, updating these works as their information is consumed, or more correctly, processed. This is why interactivity is such an obsession in computer-integrated media. The whole digital arts sector is completely chaotic and volatile except for the potential of societal integration via networks and connectivity.

Ethereal culture is grounded, made concrete, in its audience. Works of art in the immaterial domain are never finished, they are simply introduced (initialized) and placed (contextualized) for participation and interaction: the audience may add to, alter, customize, pass on, subtract from the work, etc. The identity or address of the work is therefore shared by the artist and the audience. The artist, of course, may choose to revisit any or all of his or her own works for revision in such an interactive environment.

This updating process—where the artist sends instructions for transforming his or her entire existing body of work by adding, subtracting...emphasizing, amplifying...twisting, tweaking, reversing, transposing...recontextualizing, destroying...(you name it)—is how attractiveness, vitality and ultimately value will be maintained and recreated in the new information economy. The artist will no longer simply be as good as his or her latest work. Instead, the artist's work will only be as valuable as it is up-to-date. Works of art previously valued because they represented concretely the perception and experience of a particular, fixed period of time will have to be updated and at least partially reformed to maintain their value as information. The artist, while living, will participate in this updating process with his or her audience: curators, critics, art historians and anyone else with access to the work.

RADIO AND TELEVISION AND TELECOMMUNICATIONS-BASED MULTIMEDIA CONTINUE TO UNDERMINE 'FINISHED' ART

For the roughly seventy years that art has coexisted with instantaneously updatable electronic media (radio, then television and most recently telecommunications-based multimedia), artists have functioned primarily as reactionary figures, producing material history valued largely because of its stability and strong ties to the past. Things are far more complex in the 1990's. Today artists are moving in two completely opposite directions, determining and fulfilling the criteria of two incongruous value systems. For some, value is determined by establishing and dating 'finished' works of art—setting up stable structures designed to hold and perhaps increase their value as they recede into the past. For others, art is valuable only if it is current—existing as a living system, characteristically fluid or 'liquid' in nature. Building in mechanisms for updating works of art, such as interactive mechanisms, is a strategy for maintaining and recreating the value of art as information. In such interactive works

the potential interval frequency of revision will become the primary factor for determining value.

In between these divergent value systems there is a broad spectrum of hybrids. Paradoxically these include traditional material objects that function as highly sophisticated information generators and immaterial objects structured as 'poetry' which stand rock solid against the swirling, chaotic patterns of change. Art that produces information, transforming data into information in its relationship with audience, is always a living system (whether concrete and solid, fluid and liquid, or fleeting and etherial). The contemporary artist and his or her audience breathe life into such systems, or more precisely each distinct 'species' of living system. The evolving living works of a living artists naturally defy completion and stasis and death (and ultimately extinction—being discarded and forgotten). One emerging strategy for survival is to build in mechanisms for updating. Making interactive works that are updated as they are used certainly has potential as a survival strategy.

Programming interactivity is all about the potential for sustaining the life of the work; making updatable art invites the audience (including the artist) to participate in creating the future of the work. This contrasts with the usual abandonment of the 'finished' work of art. As we look back at 'finished' works of art, left behind to sustain themselves (in special vaults, the 'white cubes') against the ravages of time, it is clear that the 'finished' work of art is a thing of the past.

Bibliography

Bell, Daniel. The Coming of Post-Industrial Society: A Venture in Social Forecasting. Basic Books, New York, N.Y., 1973.

Drucker, Peter F. Post-Capitalist Society, HarperCollins Publishers, New York, N.Y., 1993.

Feather, Frank. G-Forces: Reinventing the World, the 35 Global Forces Restructuring Our Future, Summerhill Press, Toronto, Ontario, 1989.

Gelernter, David. Mirror Worlds: Or the Day Software puts the Universe in a Shoebox...How it will happen and What will it will mean, Oxford University Press, New York, 1992.

Hardison, O. B. Disappearing Through the Skylight: Culture and Technology in the Twentieth Century, Viking Penguin Books, New York, N.Y., 1989.

Nora, Simon and Minc, Alain. The Computerization of Society: A Report to the President of France, The MIT Press, Cambridge, Mass., 1980.

Penzias, Arno. Ideas and Information, Touchstone/Simon and Schuster, New York, N.Y., 1989.

Poster, Mark. The Mode of Information: Poststructuralism and Social Context, The University of Chicago Press, Chicago, Illinois, 1990.

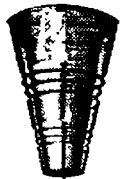# LARGE SCALE EXPERIMENTAL MEDIA AND PERFORMANCE

By Joel Slayton

T|his discussion presents three works by media technology artist Joel Slayton. Two of the projects, *DoWhatDo* and *Conduits*, integrate large scale media technology with site specific experimental performance. The third project, *Telepresent Surveillance*, (a work-in-progress) is a media installation scheduled for exhibition at the Krannert Art Museum in Champaign Illinois in November of 1995.

DoWhatDo revisits the urban drive-in as a principal means of social interaction. The top floor of the city of San Jose's six story public parking facility was transformed into a hi-tech, multimedia drive-in movie environment. The performance was experienced from strategic vantage points in and around an atmosphere of automobile culture. The theatrical space enabled total immersion of the audience into the actual performance. *DoWhatDo* explored edges of cross-culturalism characteristic of the diverse demographic population in Silicon Valley. The performance creates a world of illogical manifestations, where electronic forms of information challenge traditional perceptions of individual and ethnic identity. Silicon Valley's romance with multiculturalism provided a springboard for an innovative conceptual, visual and musical experiment. Two hundred performers present a cross-cultural re-definition of San Jose in a parade of circumstance and event. A professional rollerblade team, skateboard enthusiast, sport motorcyclist, young entrepreneurs, Latino, Indian, Afro-American dance ensembles, martial arts groups including Kendo, Fencing and Caporia, and a parade of low rider automobile culture in a finale that directly involved the audience in celebration of DoWhatDo theory, comprise the cast of performers. The event was moderated by a master of ceremonies/information theorist, located in a mobile 30 ft. mechanical lift posturing above the performance site. The performers engage the audience in a series of simultaneous demonstrations of sport, dance and ceremony with each act presenting a mixture of contemporary sub-culture and cultural tradition, all to illustrate the principals of DoWhatDo theory. Automobiles were directed into the environment to pre-selected viewing positions in an orchestrated parking art event. Audience members were encouraged to leave their automobiles and move in and around the environment during the performance.

DoWhatDo was the result of a unique collaboration of interdisciplinary artists, musicians and performers with technologists that encompass computer graphics, engineering, interactive systems, video, networking, tele-communications and electro-acoustics. A one-year process of planning engaged cultural arts groups, civic agencies and corporate sponsors in real-

ization of the event. From set design to software, DoWhatDo theory served as the principal conceptual thread which enabled and focused all discussions and participation.

The concept for the performance was appropriated from the work of information theorists Paul Pangaro and Gordon Pask. Pangaro and Pask originated a conversational and learning systems model called DoWhatDo at MIT in 1980, where Joel Slayton was Technical Coordinator of the Visible Language Workshop. The theory describes how associations between topics are manifest and give rise to new sets of propositions and questions resulting in knowledge structuring. Pangaro and Pask developed DoWhatDo as a computer simulation model to emulate human conversation. *DoWhatDo*, the performance, appropriated the theory as both subject matter and process. As subject matter, the performance centered on presenting the substance and significance of the theory to the audience. As process, a collaborative strategy derived from DoWhatDo theory served to engage the contribution of performers, artists, technical staff, community and governmental agencies and corporate sponsors.

The set design of *DoWhatDo* centers around an elevated, multi-sided computer controlled projection sculpture. The sculpture is a 3 sided, 30 ft. high self contained projection system underneath which live performance is directed. *DoWhatDo* performance control software based upon the central tenets of the theory was developed at the CADRE Institute of San Jose State University. Networked multimedia computers running this performance control software were able to converse with one another, determine the subject matter, compositional style and temporal sequencing of real time digital movies which were projected onto the sculpture, under and around which live ensembles performed. Each projection screen displayed a separate computer generated digital movie relative to the action underneath it. The projection sculpture's multi-sided format provided viewing from any audience members orientation. A 100 meter lighting corridor running from the spiral automobile entrance and exit at each end of the parking facility established the principal performer staging area. Ensembles simultaneously performed within the corridor influencing the perception and activity of one another. There were three lighting and AV towers located on the perimeter of the garage. A pre-scheduled and produced FM radio broadcast provided background information on DoWhatDo the theory and pre and post show orientation. An original electro-acoustic music score created by CREAM, the Center for Research in Electro-Acoustic Music at San Jose State University, complimented the live performance. A two-way microwave telcom link with an off-site auditorium provided remote audience interactive viewing.

By all acclaims *DoWhatDo* was a success. Perceived as both a guerrilla act and mainstream performance *DoWhatDo* speak associated with the theory and event became part of the street vernacular and a cross cultural phenomena. A feature length was documentary produced. From bumper stickers and graffiti to art criticism and reviews the process of the performance engaged the entire community.

Conduits

Conduits, an experimental multimedia performance was commissioned by the city of Palo Alto as the culminating event of the city's 1994 Centennial. *Conduits* premiered April 16th, 1994.

Conduits presented a satirical reflection on Palo Alto's hubris as a model community. Since its incorporation in 1884, Palo Alto has strived to be recognized as one of the nations most important cultural centers. The presence of Stanford University and Silicon Valley contribute to this notoriety. Palo Alto's commitment to 'embracing the future' is expressed in city government, education, business and the arts. Joel Slayton conducted investigative research of public sentiment in response to this objective by reviewing historical archives, meeting with city representatives and interviewing citizens. This research and two events in 1994 receiving national news media coverage established the thematic focus of the performance.

In a nationally covered news event, an anonymous phone call to the police department reported that a Black Mamba, a highly poisonous and illegal snake, had been released in Palo Alto. City agencies responded with dissemination of public information warning of the danger and conducted extensive police and fire department searches. Urban mythology quickly grew. The Black Mamba was described as a ferocious predator capable of chasing down small pets and children and able of leap from trees upon unsuspecting bystanders. The Black Mamba was never recovered nor were there any incidents. At the time of the performance it was not determined if the Black Mamba was still at large or simply a hoax. In the second nationally covered news event, a prominent public art sculpture, donated by sister city Linkoping, Sweden, entitled 'Foreign Friends', a painted wood sculpture depicting a man and woman seated on a park bench accompanied by a dog and bird, had been 'vandalized' repeatedly in a series of public activists statements. The man and woman had been decapitated and the dog removed only to be found deposited in a trash dumpster. More sympathetic factions adorned the sculpture with scarves, hats and miscellaneous clothing in colder weather. The city responded with the installation of a video surveillance system to monitor the sculpture. Palo Alto is currently re-assessing the role and purpose of art in public spaces. Both events demonstrated volatile expressions of public discourse and city government response.

Conduits immersed the city of Palo Alto in a third controversial event, this time performed as experimental theater: The 'C-Machine', a hypothetical telecommunications public art sculpture of extraordinary disfunctionality is donated by a consortium of Palo Alto's sister cities as a centennial gift. The 'C-Machine' located in the most prominent of sites in the commu-

nity, City Hall Plaza, provides the public with direct access to a sophisticated information encryption/translation engine for public discourse and international message sending. The performance simulates the donation ceremonies, first use demonstrations by citizen advocates, and a public information disaster of epic proportions. In the citizen advocates demonstration the sculpture massively fails to function properly resulting in an information disaster rescue operation performed by the Palo Alto Fire Department and Swat Team. In the resulting mayhem the Black Mamba is recovered and safety is restored the city of Palo Alto. This plot is portrayed as a 'real event' by a set design capturing the look of a film production documentary of the donation ceremonies. *Conduits* offered an inspiring, humorous and insightful look at the roles of citizens, civic leaders and community as they debate the merits of the 'C-Machine' and the role of public art.

Conduits directly incorporated city of Palo Alto resources, services and personnel, including cameo performances by the mayor, city manager and council members. City agencies including the Swat Team, Fire Department, Rescue and Decontamination Units provided extensive resources and participation. The city of Palo Alto enabled structural engineering assessment, risk management, insurance security and pubic safety. Local computer industry provided extensive technical assistance. Corporate sponsors included Xerox Parc, Silicon Graphics, SuperMac, RasterOps and Fry's Electronics. Community arts organizations, performers and renown citizens were selected to participate in the actual event. Staging and AV was coordinated by Riverview Systems Group.

The set of *Conduits* resembled that of a real movie production including apparatus and crew. Collaborative efforts of twenty seven computer artists, fifty technical operators and one hundred fifty performers contributed to the performance content and implementation. *Conduits* showcased applications of interactive multimedia, computer graphics, digital video, electro-acoustics and high bandwidth networking. The centerpiece of the set design featured the impressive computer controlled media sculpture, the 'C-Machine'.

Conduits involved a one year period of investigation, technical and artistic experimentation, and dialog with participants, sponsors and city agencies. The dynamics of the collaboration were influenced by a multitude of agendas ranging from political to personal. Concept development was intentionally shaped by the input of the many participating individuals and organizations. This gave rise to the specifics of plot, script, music and staging. The experimental nature of the performance, the focus on media and technology, issues involving site logistics, fiscal responsibility and public safety, significant corporate participation, the inclusion/exclusion of performers and dignitaries, the relevance of content, the interactions of artists, technicians and performers makes apparent the necessity of an appropriate collaborative strategy.

Palo Alto City Hall Plaza was selected as the performance venue because of its central location and public visibility. The plaza is a pedestrian mall entrance to City Hall, bordered by trees and three major avenues. The nine story City Hall building served as back drop for the performance. A large flower planter, forty feet in diameter sits at the entrance to City Hall. The central plaza is approximately 75 by 35 meters. Due to site lines it was determined that the audience would experience the performance with viewing accessible from three sides. The avenues were closed during the performance for this purpose. Approximately three thousand people attended.

The set design established four staging areas that were technically integrated. From upstage to down stage these include: Council Chambers; located in City Hall, The Clean Room; location of the 'C-Machine' media sculpture, the Master of Ceremonies Platform and the Citizen Advocates Interface; both located down stage from the Clean Room. An elevated walkway was built connecting the 4 staging areas. The walkway lead from City Hall doors passed between two scaffolding structures, across the planter and then branched into the down stage area. Technical control center for the performance was mounted in the scaffolding. The 'C-Machine' was built on a special platform over the planter.

The centerpiece of the performance was the 'C-Machine' sculpture. Design of the sculpture required defining a hypothetical telecommunications system. A concept paper guided the actual form of the C-Machine and was integrated into performance script. The concept paper describes the extraordinary absurdity of its function. According to the paper, "The 'C-Machine' is a custom prototype multi-matrix media communication system devised for inter-personal and infra-societal public communication. The current prototype is configured for up to five remote interface links routed to a central multi-interface hub. The 'C-Machine' provides near real time transmission in over seven different languages and simultaneous content translation and reinforcement (in text and image form) with the use of our latest Central Processing Array (COPMRA). The purpose of the 'C-Machine' is to translate what is said into what is meant".

The 'C-Machine' was a 24ft high x 10 ft wide x 18ft deep metal fabricated structure with seamless front and side rear projection scrims used to represent its internal processing. Two Silicon Graphic Elan workstations and two Pentium based PC's generated real-time animated sequences. The sculpture was topped with four computer monitors, a microwave transmitter, various antennae, and a satellite dish. The 'C-Machine' location over the flower planter required the removal of 20 tons of dirt and construction of a specialized platform for support. Surrounding the 'C-Machine' were an additional 24 display monitors, representing the specific subject matter of the 'C-Machine' processing. Four Mac 840 AV computers generated real time digital movie sequences for this display.

The down stage branching walkway incorporated the Master of Ceremonies and Citizens Advocates Interface. The Master of Ceremonies Platform consisted of the LiveBoard interface to the 'C-Machine' and two large format Barco monitors representing the 'C-Machine's' operational status. The Citizens Advocates Interface used a blue screen video process for synthesizing input into pre-recorded digital information for video teleconferencing. Bleachers were located immediately adjacent to the Citizens Advocates Interface where fifty distinguished Palo Alto citizens participating in the performance were seated. Two large format projection screens located at the furthest down stage point were used to display the output of the 'C-Machine', teleconferencing and live video of the event.

The *Conduits* performance environment incorporated real time performance control systems for computer graphics, digital video and electro-acoustics developed at the CADRE Institute of San Jose State University. Technical Operation of the event required ten high end computer workstations operating over an ethernet network. AV from City Hall Council Chambers to the plaza was established for direct broadcast. Local cable access to the live event was distributed from the Council Chambers AV center. ISDN and Codec, provided by Xerox Parc, were used for real time video telecommunications. The event was distributed live over the MBone.

The performance presented five discrete scenes depicting the *C-Machine* donation ceremonies, the first use demonstrations and technical failure of the *C-Machine*, culminating in media spectacle. The finale, scored and choreographed to big band jazz included the entire performing ensemble engaged in a dramatic rescue operation conducted by the Palo Alto Fire Department, Rescue and Decontamination Units and Swat Team. Each scene depicted a simulated 'movie take' complete with camera crews, a motorized camera dolly, and scripted re-takes of particular events. A two minute interlude at the conclusion of each scene was dedicated to technical preparation of next scene and for the actor-stage manager to informally interact with the audience. The overall illusion was that of a 'real' movie production. The performance was unrehearsed to preserve the spontaneous interactions of the technical crew and operations, performers and audience.

Narrative for principal performers was written and rehearsed. All other speaking roles were performed by individuals portraying themselves. The Mayor, City Manager, Council Members, and Sister City Dignitaries formulated their commentary based on the conceptual orientation of the performance event. Therefore, the final narrative structure combined both written and improvisation roles. None of the performers rehearsed together to preserve the spontaneity of the event. Electro-Acoustics combined with traditional jazz, opera and choral music were used to create the score.

Conduits was an extraordinary conceptual art accomplishment involving hundreds of volunteers intensely working together over a one year period. Corporate sponsors recognized the significance of this enterprise and contributed resources, technical assistance and personnel. The city of Palo Alto worked closely with Joel Slayton and his staff to address the many difficult hurdles involved in supporting an event of this scale. All involved, were rewarded with a very special collaborative experience resulting in a significant artistic accomplishment that initially seemed an impossible undertaking.

As desired, *Conduits* stimulated a wide reaction in the audience and news media. To some the satire was clear as a bell, for others the illusionistic context prevailed. Local news media touted 'Technological Failure Hits Palo Alto Centennial" and " Fellini Was Never so Bad". In response to these negative reviews, City Hall, the Mayors Office and the Centennial Planning Committee were inundated with letters and phone calls applauding the experimental nature and savvy of the performance. Accusations of conspiracy were floated at publicly. Editorials surfaced in the media comparing *Conduits* to the Robert Mapplethorpe debate, where a small group of individuals attempt to polarize pubic opinion. *Conduits* became what it was about; debate, divisiveness and polarization.

Conduits illustrates that we are all human, technological reliance is not a cure for our cultural woes and that our destiny is in our own hands. What better community to address the idea of 'embracing the future', than that of Palo Alto.

Telepresent Surveillance

Telepresent Surveillance is a media installation to be presented at the Krannert Art Museum in Champaign n Illinois, USA in November 1995 as part of the 'Art as Signal' exhibition.

The installation incorporates self navigating robot probes, wireless video surveillance, and telepresent display via the internet. Three semi-identical robot probes are designed to operate independently and together (exhibiting observable emergent behavior) seeking and tracking individuals within their proximity. The created impression is that of being watched by automated machine intelligence.

Programmed movement behaviors for each probe are activated by human presence within their defined and shared proximity's. A 4 ft. diameter helium filled balloon tethered to the probe suspends a miniature CCD camera and wireless video transmitter. Real time video output from each probe's spatial orientation and activity is displayed on monitors included in the installation. A camera positioned at the entrance views the tracking and interactions of the probes with viewers. Monitors are connected to a computer controlled sequencer determining periodic sampling of the probes output. Collected image files are accessed by a host server, located at the CADRE Institute in

San Jose, California, via the internet. Continually updated images are automatically incorporated into a WWW interactive document for telepresent viewing.

Design and engineering for the robots was produced in collaboration with Guy Marsden of Art-Tec, located in Oakland California. Mr. Marsden describes the technical configuration and design: The probes each have a custom designed infrared/sonar system that is used to track the humans in its working radius. The rotating head of the sensor contains a tightly focused passive infrared sensor that triggers a Polaroid ultrasonic ranging device which has a working range of 13 to 30 feet. As the scanner rotates it detects warm body via I.R. and then determines its range via an ultrasonic ping. Connected to the rotating head is a simple positional encoder that resolves 8 angular wedges of the rotation. A Basic Stamp computer is used to store range and vector information, and select targets for observation. It then sends the appropriate vector data to the Stamp that controls the robots movement.

The controller Stamp computer uses the vector data transmitted from the sensor to orient the probe such that the overhead video camera/transmitter is pointed more or less at the selected target. The robot is driven by 2-6 motorized wheels at the sides with a caster at the front and rear. Speed and direction of the motors are controlled directly form the Stamp using hand wired power MOSFET driver circuits.

Collision avoidance is accomplished with 44Khz ultrasonic transmit/receive sensor pairs. There are 4 systems per probe, 2 forward and 2 facing back. These sensors were adapted from a surplus device intended for automobile use. In a car they had a module mounted to the mirror that would show a bar graph of the distance to the nearest object as you back up. By connecting the output form these to the Stamp computer we have immediate warning of an impending collision so that an avoidance routine can back the robot away.

The robot probes are designed to be free ranging within a defined environment. Being context dependent, the interactions with viewers is dramatically influenced by the nature of the installation environment. In the Krannert Art Museum, the audience is there, of course, to see art. In this instance, the art they are viewing, is viewing them view it, on behalf of an unknown and non-present audience. The result is a kind of influence as interaction.

© Joel Slayton 1995

REALITY, REPRESENTATIONS AND CYBERGRAPHY

*By Martin Sperka*

sperka@cvt.stuba.sk

C ould we create "artificial art" systems with an ability to generate visual artifacts of the same quality as humans ? Many works of art have forms , with simple formal structure, shapes and appearance, where not only process of creation, but also motivation and inspiration is evident. Artists using computers in the Sixties and Seventies were able to imitate (and even some artists did these experiments) works of contemporary art. It is an interesting historical coincidence that in that, when machines were able to draw synthesize simple patterns, similar to the some trends at the contemporary art (minimal art, neoconstructivism, kinetic and op art). Few artists at that time used computers, even when they would be helpful in their work. Potential ability of today machines is not only in synthesizing of artifacts, compatible with formal styles from the first half of this century, but also in imitating works of realistic descriptive or symbolic paintings, relief or sculptures from antique, middle age or 19th century - works which were attributed with an unified style, canonical forms and conventional themes (religious mythology, historical events, landscapes, still lives and portraits).

The "mission" of information processing machines in art is not to imitate what was done by humans, nevertheless the analyzing and simulating existing styles is the challenging topic for researchers. This paper analyses concepts and possibilities of creating artificial art systems, which include not only the automatic generation of particular (static and dynamic) objects, resulting from visual interpretation of abstract symbols and signs, generated by an intelligent program, but also able to build their cyberworld model (C) simulating learning, motivation, inspiration and evaluation of finished results. The following chapters will analyze conceptual model of relations between real (objective) world (R), their reflection in the subject's brain (mental model M) and artifacts (A), created by humans or generated by machines. This model uses (for simplicity) Descartes' divide paradigm between the thinking subject and the world of objects. In fact, all objects and phenomena, and representations become reality itself. In the following text the notation X->Y will denote transformation of representation X into representation Y.

REALITY AND IMAGINATION

Processes in real world which "deal not only with physical object ontology of things but also with persons, mental states, social constructions and perhaps, gods" [1 p.84] are denoted by
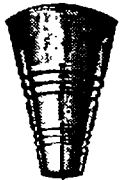
mapping R->R . Mental model of R is cultural phenomenon" [3 p.67], built during the life. Transformation R->M means sensoric perception of real world, M->R ->M->R means interactive sensory - motoric processes and M->M denotes mental and cognitive processes (perceiving, memorizing-forgetting, thinking, understanding, dreaming, imagination, intuition).

The necessary condition for recording any real object or phenomena in our consciousness is that it must be projected in time and space into at least one of our senses. [16 p.48]. Machine perception, in some cases, is even more sensitive than human (ultrasound, infrared or telesensing), but the representation of any object depends on all information about it. " Schauen, wissen, ahnen, glauben und wie die Fuhlhorner alle heissen, mit denen der Mensch ins Universum tastet, mussen denn doch eigentlich zusamenwirken", wrote J.W. Goethe [13 p.7].

Perception, which is closely connected with learning (application of learned facts in similar situations, induction, deduction, analysis, synthesis, logical reasoning), is not passive. "Learning by child depends on the sensory and motor capabilities of the whole body and on his interactions with family and other people, as well as his sensing the physical environment. One of the research themes in robotics is "active" vision. Learning also involves the social phenomena of language and its feedback cycles "[1 p.2]. We learn also to understand and create abstract symbols, metaphors and sign. "One learns to read conventional symbols of a culture's pictures just as one learns to read conventional words of a language "[2 p. 67].

VISUAL RECORDS OF REALITY AND IMAGINATION

Visual representation of reality or our imagination are 2D or 3D static or dynamic objects or phenomenae (for example infrared photography can records objects, which are no more at the same place like they were at the time of taking snapshot). Those, created by humans are artifacts (formulae, schemes, drawings, sculptures, buildings, film or video). "Abstract artists and scientists strive to create representations of the real physical world with what are sometimes referred to as nonnaturalistic representations. In contrast , a naturalistic representation, or visualization, is based on the visual imagery we abstract from objects and phenomena we have actually experienced" [9 p.14].

Records of reality (R->A transformation) could be created without human's intervention (shadows of objects, spatial prints of objects like fossils or petrified human bodies from Pompeii). Inverse transformation: A->R means changing or creating real objects from its visual representation. Examples are natural (snow in shadow melts slower than snow disposed to the sun rays) or artificial masking processes (printing or stereo lithography, where complicated 3D or 3D shapes are created by the sequence of masking procedures).

Invention of photography (which was traditionally considered as a medium reflecting reality) was an important event, when humans gained a new visual tool, not dependent on painter's skills. The people could see what was unseen before. Film and video is able to record spatio-temporal world not only isomorphly in time and space but also with time compression or even in negative time direction. "It is known that painters, in general do not depict what they see and how they see but they are determined by the specific goals and conventions" [16 p.20,21]. Realistic painting is indirect rendering of reality denoted by the sequence R->M->A.

Ability to draw ("...even the simplest drawing depends on a complex interaction between brain systems" [6]) is considered as an important criteria for admission to (many) fine art and design schools (at our school even the photographers have to draw model during the admission test). Here arises the question, whether the ability to visualize own imagination or reproduce reality by the computer algorithm (formal mathematical and procedural representation) modeling shapes or using the interactive program is not equal skill for visual artists as a drawing ? In any case, designers and artists prefer visual communication over the verbal dialogue or abstract symbols.

Sequence M1->A->M2 denotes visual communication between two subjects. Subject 1 creates image A of his mental model M1, subject 2 reads this message, transforming A to the new mental model M2. Is M1 same as M2 ? A->A denotes artifact modification for example erosion of sculptures due to acid rains or image processing. Physical processes change not only the form of artifact, but also its meaning. Collaging and retouching in digital photography and video which do not require skills in complicated dark room technology, are the powerful weapon in hands of media "brain" manipulators.

CYBERWORLD

Computer became the most universal tool in history of man. Let us investigate relation between computer modeling (C) and pre-cybernetical representations of the world. Transformation R->C means computer perception - data input in form of coded electrical signals from punched cards, keyboard buttons, movement of fingers in data glove, 2D and 3D scanners, brain waves sensors, blood pressure, body temperature, moisture and sound sensors.

The reverse process C->R means converting virtual computer model into the real material objects or their physical modification. Computers are able to draw with pencil, paint with the paintbrush, engrave, generate sound, grip, carry, assembly and even destroy objects. They can cause pain or stimulate pleasant feelings. Factories "without" people are dreams of many entrepreneurs.

Visualization of cyberworld or manufacturing artifacts from their virtual model (C->A) is the hot theme of research in computer animation and virtual reality systems. Direct brain - com-

puter communication M->C->M is theme of sci-fi writers and an ultimate goal of many scientists. Can we imagine computer program which understands and executes commands given by our thoughts or even creates illusion of seeing by stimulating brain of a blind person ?

Experimental systems for gesture and voice recognition, eye movement tracking, or brain controlled systems (exploiting analysis of encephalographic signals) become attractions not only at the computer science conferences and shows but also at the art symposia and exhibitions (ISEA, Ars Electronica, Imagina).

MACHINE INTELLIGENCE AND AUTOMATION OF CREATIVE PROCESSES

Transformation C->C means simulation by the computer - the conceptually parallel process with mental activity. Limits of computers (one point of view) are expressed by the mathematician Kurt Godel in his incompleteness theory, but "We can argue that Godel's incompleteness theorem does not prove that machines cannot be intelligent" [1 p. 21]. Physicist Roger Penrose (in his recently published book "The Emperor's New Mind") is also pessimistic about "thinking" machines and computer models of the world. On the other side many problems are solved better by computers than can be solved by most of the population. Logical and rational behavior is not case of every individuum, nor is a driving principle of our civilization. Man does not use only his brain, he has desires, pleasures, suffers from pain.

In last few years artistic community is interested in problems of artificial life -simulating primitive life forms, their growth, evolution and interactions with the same or different species. This is also hot theme in Artificial Intelligence (AI) research, which focuses on programming computers as machines with intelligent behavior. Forecasts, expressed during the historical scientific conference on The Fifth Generation of Computers (with the stress on AI), held in 1981 in Japan are not fully realized, however, there were invented many methods, paradigms, languages, special computers in this field. Many promising experimental programs and theoretical results exist, but practical applications of AI are still rare. Real scale problems and mass production will require faster and cheaper machines and deeper knowledge of cognitive processes.

Works, exploiting cutting edge of the "new technology" in art (objects, installations or animation) use just the "top of the iceberg" in the know how, existing in the scientific research. These, mostly experimental works are art per se, but they are maybe the basic building blocks of the user friendly "computer aided creativity" systems of the next generations.

Automation of creative processes is topic of research since a long time, especially in engineering and product design. The progress in computer technology and software engineering in

the Eighties caused the boom of interactive graphic systems with user friendly environment . "..using an interactive program is very basic - simply pointing and clicking. By a clever sequence of such simple actions, a user sets into motion huge piles of frozen mental labor that others - system and software designers and programmers have done" wrote F. Nake, one of the pioneers of computer assisted art. [11 p.204]. Can be this clever sequences controlled by a machines ?

Most of the CAD systems emphases on automation of engineering drawing and preparing data for computer manufacturing process, but some are able to check design rules, evaluate some parameters during the design cycle or test "virtual" objects before they are prototyped. Some design automation systems can even more. For example, in the microelectronic design, many processes are fully automated. Silicon Compilers, investigated since early Eighties are systems with ability to design very large microelectronics circuits from brief functional specification, "almost" without an intervention of designer. The final result, it is a set of complicated mask patterns for lithographic manufacturing must not be the "best" solutions (human designers can achieve better results), but the design cycle is much faster and cheaper. Sometimes "manual" redesigning must follow. Of course silicon compiler (some scientists predicted already in mid eighties "metal, wooden or plastic" compilers) need database of pre-designed elements and modules, built in design rules and procedures for object synthesis.

Challenging goal in research would be automatic layout or graphic design compiler for desk top publishing systems, book covers, posters, bulletin boards, logos or business cards design. There is a big boom of such tasks and need for qualified designers in the post-communist countries today. Many times the results (this task is very often performed by non professional designers) are so poor, that a procedure using canonical layout, fonts and color selection algorithm could achieve better quality. The books with images of the existing logotypes are among the most frequently studied, at our school library. Browsing, evaluating and modifying existing designs is the simplest algorithm for some graphic designers.

Designing, according to E. Gombrich, is schema and correction-trial and error process. It is an helical progression from initial specification or idea towards some desired result. Concepts, partial and final results are tested against some criteria of function, appearance and cost. The highly creative process during conceptual design can be structured into several steps, but in general it is generation and evaluation. Some authors stresses more on the second stage. In his article, M. Elton discusses qualification of computer in this task [5].

Quantitative functional and parametric evaluation of technical products can be rigorous (even in case of very complex systems). The evaluation of artifacts in architectural and product design (functional parameters and appearance) is more am-

biguous. In the fine arts, where quantitative parameters of the artifacts are limited to the few elementary functions (constraining size, weight, mechanical stability or cost) and where not only aesthetics but also novelty, shocking, ideology, fashion are also important criteria, is more complicated.

Some case studies of famous architects lead to development of production systems, which are able to synthesize floor plans compatible with their canons (for example Palladian villas, L. Wright prairie house), but these methods are not general and they are more academic examples.

In eighties appeared publication about extrapolation shapes of the car from previous models. One approach, using semantical information on different parameters by the car designers is described in [17]. The system for "automatic" design of family houses, investigated by the research team of I. Petrovic from Belgrade [18] uses semantical differences and their evaluation by the neural network. In animation appeared goal oriented movement (based on data provided by the ballet or dance experts) or facial expressions generators (based on research in psychology). These methods allow learning by examples - procedures suitable in case of lacking formal rigorous theory at the particular area. That is a case of design and fine arts.

Experimenting with such systems requires time to train them before the first results are available. Many users are not patient to learn machines (nor to learn themselves to work with machines), they require immediate results. The similar phenomena existed in accepting expert systems in medicine, where physicians were also suspicious to give their know how to the machines. The learning process must be automatic and autonomous. The system has to have motivation, desire and freedom to learn and to have an access to the information which could be used to build its knowledge base.

MACHINE AESTHETICS AND COMPUTER ART

In so called computer art, machines are limited to the generation of patterns, using geometrical transformations, iterations, deterministic or stochastic automata, syntactical rules, and similar methods - invented and programmed by artists or scientists. Motivation, inspiration, methods, selection and evaluation of resulted artifacts is done by humans..

There were many approaches for automatic evaluation - "quantification" of aesthetic criteria like the magic or Fibonacci numbers, Golden section or harmonical proportions. In the Twenties, G. D. Birkhof wrote a book [2], where he described method of calculating numerical aesthetic measure of polygonal patterns. One year ago, Polish scientist E. Grabska generalized this method for fractals. This method is interesting, but nevertheless it is very limited to simple geometric structures. Information aesthetic, investigated in the Sixties and Seventies, dealt with criteria like novel, surprising or boring, but there exists bottlenecks in definition of structural elements of artifact,

their automatic recognition (especially in case of "non geometric" art). The progress in image processing, pattern recognition, AI and computer technology could stimulate more interest in this theory.

Not only form (patterns with some space, time and color composition) but also semantical content of artifact must be considered. Image or geometrical model does not contain explicit semantical information. Picture is just matrix of picture elements, no relation between segments (pixel clusters belonging to the image, representing semantical entities) is given. Scanned geometrical model is just collection of 3D points with no explicit structure and hierarchy. Constrains, resulting from application domain can significantly help in process of pattern recognition. Textual information accompanying image could to help to understand abstract symbols, structure and composition of work and his meaning. But relation between textual information and specific pattern is not simply understandable, even the author of work might not be able to explain in words what he/she means.

"Aesthetic judgments come in two extremes - subjectivist and objectivist. For subjectivists, beauty is a feeling within an observer and need not be quality of an object....Objective assessments of aesthetics attempt to remove subjective elements. Can we really believe this ? ....There is no neutral way of appreciating a work of art of seeing nature, as we could expect" cites A. Miller words of E.W. Gombrich [9 p.14] . Creating and judging art works by artists and spectators is not only the question of measuring or revealing new forms. Meaning of experts, publicum, and media are also important - "..good designers to be those whose names are well known within their profession and whose work is frequently published and attracts awards or wins competitions" [8 p. 323]. Conventions and fashion changes. "Any evaluative criterion that is static will have limited value in field where values are changing all the time (something what is especially true of the arts)" [5 p.215].

The world of intelligent robots "..with desires and intentions, enabling them to perform hypothetical and defeasible reasoning, to solve problems creatively, to appreciate works of art, to achieve some form of cyberpleasure" [19 p.32]. In this world a new cyberculture, artificial art with criteria of cyberaesthetics could be simulated.

Installations or objects dealing with not only visual and aesthetic aspects in computer art are becoming part of installations at the art shows. Sometimes their cause controversial and even negative feelings of spectators (Is not it more science than art ? The understanding the concept of such project needs a deep knowledge of the field.). An example of such trends is activity of the Institute fur Neue Medien in Frankfurt, Germany in the Knowbotic Research [4].

275

CYBERGRAPHY - ON THE WAY TOWARDS AN ARTIFICIAL ART

In the late Sixties, A. Moles [10] analyzed possibility of the "artificial art" systems and mentioned automatic generation of text, patterns and music sequences using structuralism theory. By the evaluating of resulted works he suggested methods of information theory. In his time, computers were very limited and for example memory capacity (RAM as well as hard disc) of all computers in Slovakia was smaller than capacity of my home computer today.

The very important aspect of human intelligence, as mentioned earlier, is learning. Expert artificial intelligence systems, investigated in the Eighties gained their knowledge from experts. The selection what and how they learn depends on the user (passive learning). Creative activity needs freedom. Computers can not move freely and their perception system is limited to the active sensors (in case of experimental robotics systems), but the global networks (like Internet) with the capability of the "free" browsing of huge data bases, locally created and scattered all over the world, is an very important change comparing the situation twenty or thirty years ago. This is an example of the huge library or a long term memory of human mind.

Expert (artificial intelligence) system exploiting knowledge of art historians, aesthetic conventions used in different epochs or art styles, formalized and coded to computer algorithms, simulating artifact evolution in step by step improvement method and extrapolating development can be created. We can imagine computer "cybersurrealistic" program, which according to the Surrealist manifesto "l'automatisme psychique, constructif et graphique" generates time sequences and space compositions, which are patterns, resulting from the visual interpretation of abstract symbols and signs and which are records of the imaginations from their "cyberdreams" and "cybersubcounsciousness".

"Subcounsciousness processes, dreams, hallucinations and visions are composed of fractures of the long term memory. They are, less and more, mixed and reordered, like the figures in kaleidoscope, so they create something new, what we never before (illusory) saw or heard about. In order to revive these fragments, we need to weak the short term memory" writes the Russian psychiatrist V. L. Levi in his book "Hunting the thought". Computer subcounsciousness can be simulated by - incomplete structures or stochastic relations in the knowledge representation schemes (semantical networks, set of rules, frames, neural connections and transitions). Like in the fractal theory (which is used in simulating natural objects, where elements of the system are not generated fully randomly, but with the respect to the laws of physics), also the semantical units of "computer dreams" must obey some rules (for example syntactic structure).

Visualization and cyberrealistic rendering of resulting compositions of the abstract symbols is an example of virtual photography - CYBERGRAPHY, without optical system of camera, light and chemical processes. Cybergraphs can be created not only without real camera, objects of interest, but also without photographer and his intention what and how to photograph. Generators of Neosurrealistic prints or paintings, photographic collages from fragments of non existing scenes is the first step towards more complicated tasks.

EPILOGUE

The father of the cybernetics, N. Wiener told: "Let the people retain what is human and let the machine keeps what is its". The simulation of different aspects of the working concepts, models of creative thinking, behavior, motivations, associations, feelings in process of art creation are "terra incognita" and challenging theme for the crossdisciplinary research (art theory, computer science, semiotic, psychology, physiology). Creation of intelligent "artificial art" systems, integrating artists, scientists and engineers becomes art per se.

References

1. Arbib, M. A., Hesse, M.B.: The construction of reality. Cambridge University Press, Cambridge, New York, Sydney, 1990.
2. Birkhoff, G., D.: Aesthetic measure. Harvard University Press, 1933.
3. Coyne, R.: Heidegger and Virtual Reality: The Implications of Heidegger's Thinking for Computer Representations. Leonardo, Vol. 27, No.1, pp. 65-73, 1994.
4. Doben-Henisch, G.: KIP - The Knowbotic Interface Project. Institut fur Neue Medien, Frankfurt, Jun 1995.
5. Elton, M.: Towards artificial creativity. Languages of design. 2, No. 3, pp. 207 - 221, 1994
6. Frith, C., Law, J.: Cognitive and Psychological Processes Underlaying Drawing Skills. Leonardo, Vol.28, No. 3, pp. 203-205, 1995.
7. Lloyd, P.: Is there case for generic design ? Languages of design, 2, No.3, pp.243 - 262, 1994.
8. Lawson, B.: Parallel lines of thought. Languages of design. 1, No. 4, pp.321 - 331, 1993.
9. Miller, A.,I.: Aesthetics and representation in art and science. Languages of design, 2, No. 1, pp. 13 - 37, 1994.
10. Moles, A.: Art et Ordinateur. Casterman S.A. Tournai 1971 (German translation, Dumont, Colon,1973).
11. Nake, F.: Human- computer interaction - signs and signal processing. Languages of design. 2, No. 3, pp.193-205, 1994.
12. Putnam, H.: Representation and Reality. A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England, 1988.
13. Schipperges, H.: Welt des Auges: Zur Theorie des Sehens und Kunst des Schauens. Herder Freiburg im Breisgau, 1978.
14. Sperka, M.: Reality, Representations and Cybergraphy. In End of Reality ? Proceedings of the international symposium on implications of the new technologies in photography, Bratislava, November 1994.
15. Sperka, M.: About some problems of automation creative processes (in Slovak). Unpublished essay from the Marxist's philosophy course. Institute of Technical Cybernetics, Bratislava, 1988.
16. Stadtdrucker, I.: The time of projective culture (in Slovak). Tatran, Bratislava, 1982
17. Sugimoto, M , Hori, K , Oshuga, S.: A method for assisting creative design processes. Languages of design, 1, No.4, pp. 357 - 367.
18. Svetel, I.: PDP-AAM: An Analogical Architectural Modeller. In: Proceedings ARECDAO'93 Conference, Barcelona, 1993.
19. Williams, M.A.: Aesthetics and Artificial Intelligence. ISEA International Symposium on Electronic Art Catalogue, UIAH Helsinki, 1994.

THE LIFE AND DEATH
OF MEDIA

By Bruce Sterling

bruces@well.com

L iterary Freeware: Not for Commercial Use
Hello, my name's Bruce Sterling, I'm a science fiction writer from Austin, Texas. It's very pleasant to be here in Montreal at an event like ISEA. It's professionally pleasant. As a science fiction writer, I have a deep and abiding interest in electronic arts. In multimedia. In computer networks. In CD-ROM. In virtual reality. In the Internet. In the Information Superhighway. In cyberspace. Basically, the less likely it sounds, the better I like it

These are topics that I dare not ignore. It would mean ignoring the nervous system of the information society. The laboratory of information science. The battlefield of information warfare. The marketplace of the information economy. As well as one of the strangest areas of the art world.

When Jules Verne invented science fiction, Jules Verne was a stockbroker. Almost by accident, Jules Verne discovered that nineteenth century France had a large market for techno-thrillers. Jules Verne discovered and fed the tremendous 19th-century cultural appetite for romantic, futuristic technologies like the hot-air-balloon, the electric submarine, the airborne battleship, the moon cannon.

Today, at the close of the twentieth century, I feel a great sense of solidarity with my spiritual ancestor Jules Verne when it comes to topics such as virtual reality, and telepresence, and direct links between brain and computer. Even as I stand here before you, I can scarcely restrain my natural urge to inflate some of these big shiny high-tech balloons with the hot air of the imagination.

But ladies and gentlemen, I have seen this done for so long now, and for *so many times,* and to so many different technologies, that I can no longer do it myself with any sense of existential authenticity. I must confess to you quite openly and frankly that I am having a crisis of conscience.

In the year 1995, do information technologies really *need* any more hot-breathing promotion from science fiction writers? I would suggest otherwise. Take AT&T's famous "You Will" campaign. AT&T's public relations campaign has reached millions of people — even though AT&T have just announced plans to fire ten thousand of their own computer people.

Have you ever wondered if AT&T has any real idea what they're doing? Do you think that AT&T has any real idea what

277

they'll do to us, once they arrive in that future that they are selling to us? Did you ever wonder what AT&T really wants? You Will!

But at least AT&T makes nice looking science fiction commercials with great set design. Let's consider Canada Bell. Canada Bell is making an incredibly arrogant attempt to trademark the term "The Net" — a term which has been common parlance worldwide since at least 1986. Canada Bell should be sued for that kind of hubris, and in fact they *are* being sued, or at least opposed in court.

Symptoms like this make it clear that the good old techno-booster role of science fiction writers has been taken over by a new professional class of public relations hucksters and intellectual property attorneys. Science fiction writers are no longer needed to serve as handmaidens for these blundering colossi.

Nowadays, science fiction writers should fulfill another role. Science fiction writers should be examining aspects of media that cannot be promoted and sold. Aspects of media that corporate public relations people are *afraid to look at* and deeply afraid to tell us about. We should be attempting to achieve a coherent understanding of media.

I'm not saying, mind you, that we're actually going to do this fine and noble thing. I'm merely saying that's what's needed. Given that tremendous challenge, science fiction writing is a rather meager response at best. At our best, maybe we science fiction writers can act as harbingers or catalysts, but what is really needed at this historical juncture is a serious general global assessment of our technosocial condition. Before we install the latest hot-off-the-disk-drive version of Windows For Civilization 2.0, we ought to look around ourselves very seriously. Probably, before leaping in postmodern ecstasy into the black hole of virtuality, we ought to make and store some back-ups of the system first. Our society would do this if we had a momentary attack of common sense. But never mind, that's just a passing suggestion.

Rather than dwelling on that, let me tell you how I reached this artistic crisis of mine. Two months ago, I finished a new science fiction novel. It's a novel about virtual reality artists in Europe in the late twenty-first century. I think people in today's digital art community will recognize this novel as my little valentine for them. This is a novel set a hundred years from today, in which I pretend that digital arts people like the people from ISEA have become the planet's art establishment. I know this is a very far-fetched notion, but you can get away with that sort of thing in science fiction novels.

The novel was a lot of fun to write. I thought it was very inventive and clever and it left me absurdly pleased with myself. Unfortunately, I got to thinking seriously about digital art while I was writing this book, and this forced me confront some of my own limits.

I'm not thinking hard enough about media. The approaches I have been using are too shallow, too glittery, too facile. I have to get a better grip.

Media is a commodity. Media is something that is sold to us. Media can be something that we are sold to, even. Media is an everyday thing. You can buy bandwidth in job lots. You can watch television, buy books, videos, records, CDs, but that's not it. That's not what's interesting.

Media is an extension of the senses.
Media is a mode of consciousness.
Media is extra-somatic memory. It's a crystallization of human thought that survives the death of the individual.
Media generates simulacra.
The mechanical reproduction of images is media.
Media is a means of social interaction.
Media is a means of command and control.
Media is statistics, knowledge that is gathered and generated by the state. Media is economics, transactions, records, contracts, money and the records of money.
Media is the means of civil society and public opinion.
Media is means of debate and decision and agitpropaganda.

None of these are a full working definition of the term "media," but they are a list of the qualities of this phenomenon that I find really relevant and compelling.

To treat this matter seriously, I need a far better understanding than I have. We're getting in really deep now, ladies and gentlemen; we can't trifle with this thing any more. As a society, we have bet the farm on the digital imperative. I need to speculate from new principles and new assumptions. I want a new synthesis, I want to really know and understand how media live and die.

Maybe I'll get my heartfelt little wish, and maybe I won't. But now I want to tell you how I plan to go about attempting this.

First, I want to destroy the Whig version of technological history. In the Whig version of history, all events in the past have benevolently conspired to produce the crown of creation, ourselves. In the Whig version of media history, all technological developments have marched in progressive lockstep, from height to height, to produce the current exalted media landscape. This is a very simple story. It's convenient and it flatters our self-esteem. Its very cheering to supporters of the media status quo (if there are any supporters left), but it can be proven untrue.

It can be proven untrue by disinterring and dissecting dead media. One understands evolution by studying the fossil record. The arcane, the offbeat, the forgotten. The failures, the lost and the buried, the media- maudit. The dead precursors of later suc-

cesses. Some forms of media are rendered obsolescent, but others are murdered. Some innovations are pushed very hard by clever and powerful people with lots of money, and yet they still fail. I find that particularly interesting.

I'm not alone in my interest in this topic. My friend and colleague Richard Kadrey is also a science fiction writer, and together we have launched an effort called the Dead Media Project. We're using the Internet to bring people together to catalog and study extinct forms of human communication. We're in the media autopsy business. We're into media forensics.

At the moment our scholarly efforts are very modest. We are currently engaged in a simple roll-call of the dead — disinterring and listing dead media.

My interest in dead media doesn't mean I've lost interest in forms of media that are struggling to be born. I spend a lot of time on the Internet these days. For instance, I made an entire book of mine available on the Internet — a book called THE HACKER CRACKDOWN. In the past, I've used the Internet as a vanity press — to publish and spread articles and speeches and critique. The Dead Media Project is my attempt to involve the Internet community in a new and different aspect of book production - - the beginning of a book, the raw research, the conceptual stages. This time I want the public in on the book *before I've written it.*

In fact, I don't even *want* to write this book — The Dead Media Handbook, a field guide for the communications paleontologist. Someone else should write this book, quite possibly someone in this audience. I don't particularly want to create it — I just want to read it, absorb its useful lessons, and then go on to my normal business, which is writing science fiction novels.

I believe that the DEAD MEDIA HANDBOOK will in fact be written, even if I have to break down and actually write it myself. But there will be a price to be paid for the production of this book, and that price will be the necessity of abandoning intellectual property.

I think this is a fine idea for a book, but rather than hiding it, I plan to publicize it widely. It's not a trade secret; I don't care how many people know I'm working on it. I have nothing to gain by poring over this in secrecy. All the notes and research in the Dead Media Project will be available to anyone who joins the research effort. It will be a public- domain source of knowledge contributed by independent scholars working pro bono. This information will be free.

If this scheme works, it will work in the way the Internet works: through prestige, netiquette and acts of intellectual generosity. I think that books can and even should be constructed in the same way that the Internet is constructed. I'm going to give it a try.

I know that many people are working in media studies from a variety of different scholarly approaches, and I respect those efforts. But they're not yet scratching my visionary itch. I don't think that overarching syntheses or ideological summations are in order yet — I think what is needed now is *fieldwork.* Commentaries, coming in from all corners of the compass, from all over the world, via modem. Maybe the central mystery of media can be paste-bombed into submission — nibbled to death bit by bit.

I strongly suspect that people of your backgrounds and accomplishments can help me in this project, so I'm frankly begging you to help me.

The Dead Media Project has only been public for about a month and a half, but I want to share with you some of my preliminary discoveries. I rather suspect that they may have some modest relevance for people in ISEA.

Let's consider cinema. Cinema is not a dead medium — cinema is a hundred years old, and obviously alive, and more or less well. At least, it's still generating plenty of revenue in those squinchy little multiplex theaters. But cinema killed quite a few other media. The magic lantern, the phenakistiscope, the phantasmagoria, the praxinoscope, the zoetrope, the mutoscope, the fantascope. If you look closely at the evolution of cinema you can see that cinema is not a monolith, it's a radiation of species. E J Marey's "chambre chronophotographique." The Edison kinetoscope. Anschutz's tachyscope. The vitagraph, the cinematographe, the theatrograph, the animatograph, the Urbanora.

Cinema as a medium did not make a sudden triumphant leap from silent movies to sound. People were attempting to jam sound into cinema from almost the beginning. We remember the much-publicized triumphs like THE JAZZ SINGER, but we have been taught to disregard the numerous experiments that died on the barbed wire of technological advance. The Edison kinetophone. Gaumont's Chronophone. The synchronoscope. The movietone. Phonofilm. The graphophonoscope. The vitaphone.

These mutant forms of talking and singing cinema weren't ignored because they failed to work. In a lot of cases they worked just fine. Nobody who invented these devices ever set out to build a failure. The truly failed experiments never even made it out of the lab. These dead species of cinema were always imagined and proclaimed to be the cutting edge, the state of the art, and they were generally unveiled in a state of wild enthusiasm and a furious drumbeat from the press. They died because of contingency, not destiny.

Take Gaumont's Chronophone, for instance. The name sounds rather arcane and silly, but that is not a technical judgment. Cinevision, Cinerama, Odorama — do these names really sound any less silly? How about Apple QuickTime, or CU-SeeMe, or Yahoo? But hey, those can't be silly — those are

modern! "I hope you're not trying to suggest that someday people will laugh at *us.* Hey man, we're cyberculture — we'll never be obsolete." Some media shed a few dead species, but the genus goes on living.

Other media are murdered

Have you ever heard of the quipu of preColumbian Peru? If you have, it's a minor miracle. The archives of Incan quipu were burned by the Spanish conquerors, after the Council of Lima in the year 1583. There are about 400 authentic quipus left in the entire world. Every last one of the quipus we possess nowadays was dug out of a human grave.

Well, not quite every last one. I happen to have a brand-new quipu here in my pocket. I was doing quite a bit of reading about quipu, so I decided I'd make one.

The word quipu means 'account' in the Quechua language, so the quipu was basically a kind of accounting device and calculator. This is a fabric network to carry data. This was the only recording medium that the Incas had. It served all the recording functions of their society.

No one today seems to have any real idea how these quipu worked. They all looked more or less like this one — they had a thick fabric backbone, with a series of dependent fringes. But the fringes could also have fringes. Sometimes there were as many as six subdirectories coming off the backbone of the network. They had a variety of different knots. They had quite a wide variety of colors. People have only the vaguest ideas what the colors may have signified.

This is a very small quipu. The largest remaining quipu weighs about forty pounds and has well over two thousand dependent cords. No one has any idea what this device signifies or what message it carries. It was buried with a Peruvian gentleman who was modestly well to do, but doesn't appear to have been particularly prominent.

The Incas had no idea that the planet harbored any civilization other than their own. As far as they were concerned, these quipu were the absolute apex of human intellectual accomplishment. And one must admit they have a lot to offer. They're very light — wool and cotton — they're portable and durable. Crushproof. No problem with power surges or headcrashes. A good thing they were portable too, because one of their primary functions was the census.

It appears that everyone without exception in the Inca realm existed as a knot in a quipu somewhere. The Incas were great masters of ethnic cleansing. They thought nothing of ordering thousands of people out of their homes to distant realms as pioneers and settlers. Everyone simply loaded all their possessions onto their backs and left immediately. Thanks to the quipu, there was simply no way they would ever be missed by the authorities.

The Inca economic system was a centralized command economy. A third of the nation's economic output was stored in vast ranks of stone cells. Everything down to the last sandal was recorded on quipu.

I don't think there was ever an alphabet in quipu. I don't think that the Inca were literate in that fashion, because their empire was only a hundred years old. There was nothing to pronounce that you could find on a piece of string. But there may have been genealogies in string — heirarchies, maybe family trees. Maps, even — three days' journey, they forded a blue river, they fought a red battle — you can imagine how usefully suggestive this might have been. Maybe you could attack language even more directly with a quipu: meter, stress, quantity, pitch, length of the poem — why should this be hard to believe? In English we sometimes call telling a story "spinning a yarn."

These Incas were fine textile makers. They had a lot of wool and cotton, the government made them grow it, and their women spun yarn every day of their lives. When a quipucamayoc read one of these recording devices, I don't think his lips moved. There was nothing crude or halting or primitive or painful about the experience — a quipu is certainly a more tactile and sensual and three-dimensional experience than a book.

The quipu was a medium. It was a way to cast the world into an entire new form of order. It was a medium invented by and for a very careful and methodical people, people who liked to fit huge boulders together so snugly that you couldn't slip a knife-blade between them. For the Incas, this was the Net — a net that caught their population in a sieve that dominated the whole material world, a sieve that no one could escape.

You know, in today's ultramediated world, I think it's quite a good idea to go into a quiet room with a quipu. Go to a room and shut off the electricity. Don't look at the quipu with scorn or condescension. Just hold it in your hands and try to pretend that this the only possible abstract relationship, besides speech, that you have with the world. Really try to imagine what you are *missing* by not comprehending all economics, all governmental business, all nonverbal communication, as a network of colored yarn. Think of this as a discipline, as an act of imaginative concentration, as a human engagement with a profoundly alien media alternative.

It's truly pitiful how little is known or remembered about the quipu, a dead medium which was once the nervous system of a major civilization. And yet that is by no means the only form of knot record. There's the Tlascaltec nepohualtzitzin, the Okinawan warazan, the Bolivian chimpu. Samoan, Egyptian, Hawaiian, Tibetan, Bengali, Formosan knot records. So far, I know almost nothing about these beyond their names. I'd like to learn more. If I learn more and you're on my list, I'll tell you about it.

Before I began the Dead Media Project I had no idea that native North American wampum could be historical records. I always thought that wampum were a kind of currency. Maybe, like the quipu, wampum were both currency and record at the same time. Imagine if *our* currency were a medium. Maybe our currency *should* be a medium. If you're an experimental media artist, why don't you start writing poetry on twenty- dollar bills and see what happens? Maybe you should just write the address of your favorite web site on money, and see what happens then as the bill travels from hand to hand. Peculiar notion, isn't it — communicating *with* money? Maybe we've just been *trained* to find that notion peculiar.

I'm eager to learn more about wampum. I hope someone can tell me about them, and share that information with likeminded people. My email address is bruces@well.com. That's bruces, with an s at the end. Go ahead and write me, don't be shy. We're all in this together — our net heritage belongs to all netkind! We can distribute all the data we like nowadays, there's nothing stopping us except for the RCMP, the FBI, the SPA and the Church of Scientology. Maybe these DISKS will help you! (begins flinging Dead Media Project floppy disks into audience).

These are just harmless text files, ladies and gentlemen. Probably Virus Free! I use electronic text, because the typewriter is dying now.

In the early days of typewriters, what wonderful names they had: Xavier Progin's "Machine Kryptographique" (1833), Guiseppe Ravizza's "Cembalo-Scrivano" (1837), Charles Thurber's "Chirographer" (1843), J B. Fairbanks' "Phonetic Writer and Calico Printer," and so forth. A minor horde of typing machines, many of them scarcely recognizable as such to the modern eye. Soon they'll all be gone. Swept away by the computer.

The computer. Its tide is so inexorable. Its power is so immense. Its triumph is so complete. What do we mean exactly when we say: "I've modernized. I own a computer"? Are we really in possession of a machine less mortal than Guiseppe Ravizza's Cembalo-Scrivano?

This computer is a Macintosh Powerbook 180. An impressive machine, isn't it? I dote on it, personally. I admire that name — PowerBook. It says a lot about the kind of rhetoric our culture cherishes in the 1990s. The name "PowerBook" somehow suggests that this device can *last* as long as a book, though even the cheapest paperback will outlive this machine quite easily.

PowerBook is a good name, but not a really pretty name. Personal computers have had much prettier names. Like the Intertek Superbrain II. It must have been extremely difficult not to buy an Intertek Superbrain II, even though that machine is absolutely as dead as mutton.

Forgive me while I indulge in a brief sentimental roll-call of vanished glories. The vast and every-growing legion of dead PCs. The Altair 8800. The Amstrad. The Apple Lisa. The Apricot. The Canon Cat. The CompuPro "Big 16." The Exidy Sorcerer. How can a sorcerer end up dead on the junkheap? That's not supposed to happen, we're not even supposed to *think* about that. A computer is a sorcerer with a superbrain, it's not supposed to be lying in a landfill with great-grandma's victrola. The Hyperion, the Mattel Aquarius. The NorthStar Horizon and the Osborne Executive. The Xerox Alto and the Yamaha CX5M.

But wait! There's more! Dead mainframes! Dozens and dozens of fantastically complex and expensive dead mainframes. Dead supercomputers. Dead operating systems. We all know that yesterday's operating systems are far inferior to today's Windows 95. Windows 95 is an operating system which is refreshingly honest, because it has an expiration date written right on it. We know that operating systems are of absolutely critical importance in computing, but how often do we honestly recognize that?

Suppose you compose an electronic artwork for an operating system that subsequently dies. It doesn't matter how much creative effort you invested it that program. It does not matter how cleverly you wrote the code. The number of manhours invested is of no relevance. Your artistic theories and your sense of conviction are profoundly beside the point. If you chose to include a political message, that message will never again reach a human ear. Your chance to influence the artists who come after you is reduced drastically, almost to nil. You are inside a dead operating system. Unless someone deliberately translates you into a new one — with heaven only knows what liberties of translation — you are nailed and sealed inside a glamorous sarcophagus. You have become dead media. Almost as dead as the quipu.

This is, of course, the dirty little secret of the electronics industry, and therefore it is the mark of Cain for electronic art. When we are surfing the web in 1995, we are surfing on a vast dark sea of dead computers. We have to surf, you see — because we are just a white scrim of foam up on the surface. The waves of machines rolling in beneath us are moving in with the hideous relentlessness of Moore's Law, doubling in power every eighteen months, one order of magnitude a decade. If you are working on a cutting-edge computer today you are working on one percent of the cutting-edge computer you will have twenty years from now.

And beyond that — the awe-inspiring prospect of teraflops, gigaflops, petaflops. Here's the latest issue of SCIENCE magazine, with a truly hair-raising article called "Computer Scientists Re-Think Their Discipline's Foundations." I recommend this article highly. This isn't something I made up, mind you — this is stuff that people at Princeton and Argonne National Laboratory are making up. Quantum Dot computers, ten thousand times faster that today's fastest microchips. Optical computers,

one hundred thousand times faster. Holographic data storage, one hundred thousand times faster.

Sometimes you think that computation has to slow down — that it has to bureaucratize — become more like a normal industry. But then you're confronted with yet another awesome vista of absolute possibility!

You see ladies and gentleman, we live in the Golden Age of Dead Media. What we brightly call "multimedia" provides an a whole galaxy of mutant recombinant media, most of them with the working lifespan of a pack of Twinkies. Mastering a typical CD-ROM is like mastering an entire new medium by using a frozen watch-cursor. And then the machine dies. And then the operating system dies. And then the computer language supporting that operating system because as dead as the Hittite language. And in the meantime, our entire culture has been sucked into the black hole of computation, an utterly frenetic process of virtual planned obsolescence.

But you know — that process needn't be unexamined or frenetic. We can examine it whenever we like, and the frantic pace is entirely our own fault. What's our hurry anyway? When you look at it from another angle, there's an unexpected delicious thrill in the thought that individual human beings can now survive whole generations of media. It's like outliving the Soviet Union once every week! That was never possible before, but for us, that is media reality.

It puts machines into a category where machines probably properly belong — colorful, buzzing, cuddly things with the lifespan of hamsters. This PowerBook has the lifespan of a hamster. Exactly how attached can I become to this machine? Just how much of an emotional investment can one make in my beloved three thousand dollar hamster?

I suspect that the proper attitude — one that more and more people will share in the coming millennium — is a kind of Olympian pity. We are as gods to our mere mortal media — we kill them for our sport.

Ladies and gentlemen, let me implore your pity and understanding for dead media. If you're really electronic frontier people, then in all justice, you ought to eat what you are killing. Let's try to see the greater sense of tragedy and majesty in this whirlwind we're creating. Perhaps this realization will free us from the hypnotism of our own PR. I dare not suggest that it will make us better artists — but at least it may help establish where we are and what is coming. Somehow, it might help us survive. It might even help us prevail.

You've been very kind to hear me out for so long. Thanks very much for listening.

THREE-DIMENSIONAL MEDIA TECHNOLOGIES

AND THE ELECTRONIC ARTS

By Hal Thwaites

Hal@vax2.Concordia.CA

O ur fascination with attempts to create the third dimension is nothing new, extending from the time of early stereoscopes, into the realm of virtual realities. The notion of 3D has always given reference to more "realness", as human perception functions in a 3D mode. Today we seek to heighten our mediated experiences with continued efforts toward perfecting spatial imaging systems. 3D is the "buzz-word" of the 1990's even though not all of the "3D" is factually stereoscopic in nature. 3D computer graphics abound on TV. 3D modeling is applied in many technical and scientific fields, 3D concepts are used in spatial environment design, while 3D medical imaging presents a "more real" look inside the body. The concept of 3D has even been extended to encompass the theory of human memory (Pribram, 1991). 3D as a mode of human thinking, is indeed becoming ubiquitous.

Current Media

In this last decade of the twentieth century, new media are evolving from a joint metamorphosis resulting from the merging of computing, communications, and imaging technologies, exemplified by figure 1. These technologies can be seen to form the basis of the electronic arts.
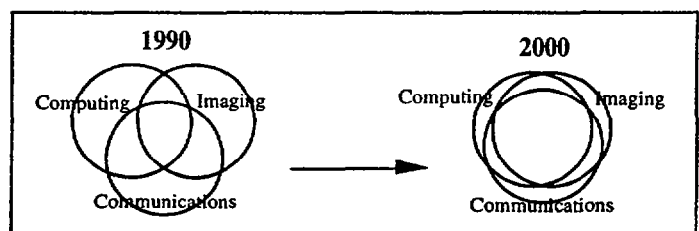

Figure 1: Convergence of Technologies
(Based on Negroponte's "Teething Rings" Brand, 1987).

It is at the 'intersections' that many new forms of media are developing. This merging is shaking things up (Leebaert, 1991). Many of the new 3D media technologies are the direct result of these new interactions. The computer is now an integral part of both the creation and display of stereoscopic images and spatial sound, which was unheard of on the present scale and sophistication, a decade earlier.

Three-dimensional media technologies (3Dmt) have always presented a challenge to researchers in their acceptance and widespread application as artistic mass media. Throughout their

evolution they have been applied in situations where we seek to create a more accurate representation of: "reality", whereby 3D adds critical information to actual images; "meta-reality", where 3D technologies make visible phenomena or experiences which are beyond what we can naturally perceive; and more recently in "virtual reality", involving the creation of totally artificial environments which might not physically exist or exist only in our imaginations (Mallary, 1990)..

Our culture needs artists to knowledgeably analyze the implications of technological developments, the breakthroughs and the dangers, while assisting the research agendas. Traditionally validated art media and their traditional exhibition arenas may no longer be appropriate for the exploration that is needed (Wilson, 1991).

Computer Imaging

Computer generated graphics (CG) are particularly well suited to the creation of 3D images due to the high resolution and programmable nature of the current displays. There are several proprietary 3D CG systems available in the both United States and Japan. Alternating frame technology is most often employed to present the viewer with the appropriate (right and left eye), stereoscopic images which are then viewed with LC (Liquid Crystal) shutter glasses, such as the systems made by Tektronix and the Stereographics Corp. (Robinson, 1990). A flat panel back-lit LC display, using a lenticular screen for autostereoscopic (glassless) viewing, has been developed by Dimension Technologies Inc. of New York. This system is full-colour, and can be interfaced with common PCs (Eichenlaub, 1990). Applications of 3D in the CG field include the following: satellite mapping and cartography, CAD, medical displays of CT and MRI images, scientific visualization, weather analysis, interactive modeling, the military, simulation and the electronic arts. Computer graphics have also been used in film making, where the images are screened via conventional polarized projection techniques, after the initial creation of left-right views in a digital form (Hamit, 1995a). One example of the application of 3D computer graphics is the award winning stereoscopic, animated short film entitled "Knickknack" (Alspektor, 1989), produced by Pixar of San Rafael, California. Each year the SIGGRAPH Conference devotes a session, panel and/or exhibit to stereoscopic computer graphics.

Another important achievement in the advancement of stereoscopic computer graphics and animation was the overwhelming success of the new 70mm. Imax format SOLIDO™ 3D film, "Echoes of the Sun", which was co-produced by the Imax Corporation of Canada and Fujitsu of Japan for the Osaka, EXPO'90 exhibition. Thirty-one thousand high resolution computer images (right-eye and left-eye views) were created using Fujitsu's supercomputers over the period of twenty-one months, in order to produce the ten minutes of stereoscopic CG frames incorporated in the twenty minute Imax film. "Echoes" was the world's first IMAX SOLIDO™ full color 3D wrap-around

motion picture which is projected on a spherical screen, totally eliminating the cut-off effect of the frame. The film shows how the process of photosynthesis converts the sun's energy into the energy stored in plants and then how this energy is used by humans for motion of muscles. This film also played to capacity audiences at EXPO'92 in Seville, Spain (Naimark, 1992), and is on permanent exhibit at the Futuroscope Complex in La Villette, France in addition to a new SOLIDO™ theatre recently built outside Tokyo, Japan.

Television and Video

Significant research has been undertaken in both conventional NTSC television and video display technology in addition to specialized applications (Smith, 1989, Lipton, 1994). Japanese researchers are working towards 3D TV systems which may ultimately find way into our homes. Toshiba has marketed a consumer 3-D Camcorder, using LC shutter glasses and a conventional NTSC television monitor. The system provides an acceptable 3DTV image, (with some flicker due to the low frame rate), for certain consumer entertainment applications. Other NTSC video systems which operate at a higher frame rate, to eliminate the image flicker, have been applied in the medical and scientific and artistic fields.

Research into autostereoscopic or "glassless" 3DTV is being carried out on an international scale (Hamasaki, 1990, 1993) including work at the University of East Asia, using the Braun tube technology and at the Heinrich-Hertz Institute in Berlin using projection methods. NHK television together with SANYO in Japan have made important steps toward autostereoscopic TV with the exhibition of a 70-inch LC display at the NHK Science and Technical Research Labs 1995 Open House in Tokyo. The key technologies supporting this stereoscopic display are 3D HDTV cameras, HDTV laser videodisk players, high performance HDTV liquid crystal (LCD) video projectors with resolution totaling nine million pixels, and a large size lenticular screen, for glassless viewing. This 3D Hi-Vision system has widespread application in the fields of home 3D HDTV, art museums, entertainment, medicine, education, robotics and virtual environment systems.

The HDTV'90 Colloquium in Ottawa, Canada, was the site for the North American premiere of the NHK stereoscopic Hi-Vision 3DTV system. This system uses a conventional polarized projection technique. The viewer wears high quality polarizing glasses to view a projected image on a screen up to two hundred diagonal inches in size (Yuyama, 1991). The images are extremely stable, flicker-free, bright and of high resolution, providing an excellent viewing experience for the audience, with none of the side affects which were the typical complaints of older 3D video projection technologies. Current programs range from recorded art treasures, travel scenes, underwater sequences, medical images, to complete works of fiction for entertainment.

Three Dimensional Video Systems

System	Key Principle -Tech.	Eyeglass Type	Viewable Without	Delivery System	Comments
Spatial Technolog y	Color-discriminatory anaglyphic	Red/green anaglyphic	No	TV broadcast, videocassette	Color not always natural, images lose sharpness
Nuopti x	Color-discriminatory anaglyphic with Pulfrich Effect	Dark purple/pale green lenses	Yes	TV broadcast, videocassette	Needs motion within image for 3D effect. Halo around images seen without glasses.
PullTime 3-D	Pulfrich Effect	Clear/Dark lenses	Yes	TV broadcast, videocassette	Needs motion within image for 3D effect.
3-D TV (Toshiba, etc.)	Polarized plane discriminatory	Polarized & synchronized LCD	No	TV broadcast, videocassette, videodisc	Good colors, excellent spatial effects, marred by dimness & flicker
Vision III	Parallax & time discriminatory, autostereoscopic	None	Yes	TV broadcast, videocassette, videodisc, film	Very good texture, depth enhancement, full color.
Braun Tube (Hamasaki Lab)	Autostereoscopic Lenticular sheet	None	Yes	Closed circuit, real-time	Bright images, presently only monochromatic
3D Projection (Heinrich-Hertz Inst.)	Autostereoscopic Lenticular screen, projection	None	Yes	Closed circuit, real-time	Bright, wide-angle motion parallax, monochromatic
3D Plasma (Flat Panel) (NHK)	Autostereoscopic Lenticular screen plasma display	None	Yes	Closed circuit	Glassless, flat panel monochromatic
70" 3D HDTV (NHK & Sanyo)	Autostereoscopic LCD projection lenticular screen	None	Yes	TV broadcast, videocassette, videodisc	No glasses, large screen, full color, hi-resolution
180" 3D Hi-Vision (NHK)	High Definition polarized, video Projection	2 channel, polarized plane discriminatory	No	TV broadcast, videocassette, videodisc	High-definition bright, wide-screen digital sound

Figure 2. Overview of 3D video systems

The rock group, "The Rolling Stones" used the PullTime™ 3D technique, (based on the Pulfrich effect, viewable with or without the special glasses), designed by Gerald Marks of New York City, to create 3D effects for three of the songs in their 1990 "Steel Wheels" concert video which was broadcast widely on cable music channels throughout North America. Altogether these developments represent a concerted effort to bring an artistic application of three-dimensional television to the largest possible audience, since TV is the most pervasive mass medium of the late 20th century. For details and characteristics of the current 3D video systems, refer to figure 2.

Holography

Spatial imaging using the medium of holography has had widespread recognition with the proliferation of holograms in our daily lives. However it still remains much of a mystery to the general public. As a result of much of the development carried out at the MIT Media Lab, under the direction of Dr. Stephen Benton, holograms have progressed to encompass full color, large scale size, and total synthetic generation via the computer.

Recent advances have been made in real-time computer generated holography. Although the images are small, they are bright, have high resolution and exhibit all of the depth cues found in holography (Hilaire, Benton, 1990). These are the first steps towards what could be called "holographic video". We are still many years away from having floating 3D images beamed into our homes.

Current applications of holographic imaging include; large format displays, full colour holograms, motion stereograms, medical images from MRI data, satellite survey data, and many others, ranging from the arts and entertainment to advertising (Hariharan, 1992; Lieberman, 1992). A holographic project based in computer imaging which was recently completed in Canada is but one example of 3D electronic arts. "A Clear Day Hologram" was compiled from a computer model based on a digital database of satellite images of the earth. Three hundred frames from the database were selected and output onto 35mm. film, then exposed to laser light forming the final 3x4 foot color hologram which includes much geographic detail of every country of the world. (Mahoney, 1994).

The impact of holography on the observer lies in the fact that the image is "perceptually" attached to the viewer's eyes. It demands a high level of involvement and interaction since the virtual information space exists in the mind of the viewer (Malik, Thwaites, 1989). This medium has a radically different means of communication from 3D media presented on a flat surface. Here the existence of the screen or frame effect is removed and the absence of spatial cues (except those presented within the holographed object) cause the strongest information impact on the viewer. Holography is governed more by the laws of scenography (the spatial organization and orchestration of an event or medium), (Polieri, 1971), within the realization of the full 28 axis of a Necker Cube. Since the viewer is not rigidly seated in a precise position, and is able to interact with the holographic space, many of the spatial cues laboriously created on a 2D flat screen are not necessary.

Film/Cinema

Three-dimensional film technology has been in use for over one hundred years, extending from the first screening at the Paris International Exhibition of 1890. After experiencing two brief periods of a 3D film boom, the first in 1953 and the second in 1982, (Speer, 1989), we find that today's 3D movies are far from conventional media experiences . Widespread public exposure to high-quality 3D films can be found in the Disney theme parks with films such as "Magic Journeys" "Captain EO", and "Muppet Vision 3D" and at many other special venues and all recent international expositions.

Science North, Sudbury Ontario, opened a 3D 70mm. film and laser adventure entitled "Shooting Star" in the summer of 1990. This film incorporates special in-theatre laser effects which are synchronized with the 3-D film scenes to create a totally unique viewing experience. The theatre is specially constructed to maximize the audio-visual experience for the audience. The story is written around an ancient Indian legend which artfully blends the high-tech 3D imagery into a mystical and involving tale.

Stereoscopic computer graphics are now being incorporated into the "filmic" experience together with simulator technologies to provide a movie-ride experience for the audience (Hamit, 1995a; Mahoney, 1993a; 1993b; Robertson, 1994). Installations such as, *Star Tours* (Disney), *Devil's Mine* (Showscan Corp.), *The Loch Ness Expedition* (Iwerks), *SpeedScape* (Xatrix Interactive Design), the *Luxor Project* (Douglas Trumbull), *Batman Adventure - The Ride* (Warner Bros.) among others currently in use or in development, suggest that the public desire for new "meta-reality" 3D experiences will continues to grow. This trend presents many new opportunities for electronic artists to become involved in the development of high-quality special-venue productions. Two pioneering organizations in this field are, Softimage and Discreet Logic of Montreal.

The Imax Corporation of Canada has been the world leader in ultra-large screen, 3D productions using IMAX 3D and the new SOLIDO 3D system, which uses the domed screen (Naimark, 1992). These films are again evidence of the "meta-reality" aspect of 3D. Today's' 3D film experience takes us far beyond the reality of our physical world, to totally new experiences through the use of the third dimension. There are currently several new 3D IMAX films in production. It is certain that 3D film technology in its many forms, will continue to be a prominent form of mass entertainment well into the next century.

Virtual Reality/Simulation

By the end of the 1980s "virtual reality" (VR) was understood to be a surrogate or metaphysical environment created by communications and computing systems (Wright, 1990). Interactivity in communication media began to rise in importance allowing virtual realities to became the 3D environment of the user/audience through which they can perform their own acts of creative experience. (Brill, 1995, 1994; Dysart, 1995). The art of VR holds the promise of a fascination akin to the flickering shapes projected on the cave walls of the Pleistocene Era 500,000 years ago (Heim, 1995).

Current systems being used for the creation of virtual realities consist of: a wide-angle stereoscopic display unit (LCD), glove-like devices for multiple degrees-of-freedom tactile input, speech recognition technology, gesture tracking devices, 3D auditory display and speech-synthesis technology, computer graphic and video image generation equipment. When combined with magnetic head and limb position tracking technology, the head-coupled display presents visual and auditory imagery that appears to completely surround the user in 3-space (Fisher, 1990; Hamit, 1995b). Recent developments within the technology of computer networks and associated software, namely Virtual Reality Markup Language (VRML), have led to the promise of VR artworks available through cyberspace connections, (Maher, 1995; Swedlow, 1995), although it will be some time before stereoscopic VR images can appear via the net onto our home computer displays.

Even at this early stage, virtual realities are touching the realm of the very private "mindspace" of the user, rendering the VR medium a welcome change from the information overload of today's mass media. Computer technologies, combined with the development of sophisticated software programs and expert systems, gave early attempts to create virtual realities the insatiable breadth and depth of the human mind's fantasy. It is now possible to realize 3D virtual realities outside the human brain as a non-separable and inclusive world that is entered and crossed at the pace of the user, being co-created by them (Jacobson, 1994; Laurel, 1992; Thwaites & Malik, 1991).

A Biocybernetic Viewpoint on 3D Media

Our research at the 3Dmt Center in Montreal, has centered on a systemic approach to 3-D media, from a biocybernetic viewpoint. The field of biocybernetics is concerned with how the

human sensory system responds to and processes information, and the resulting impact it has on us. Our main focus has been with the individual, either observing or creating the three-dimensional media program. This is an area of an information process or information chain. By the term information, I mean an energetic change with a catalytic characteristic, which produces an impact on the viewer (Thwaites, Malik, 1987). The information chain in its simplest scheme, has three parts as described in figure 3.
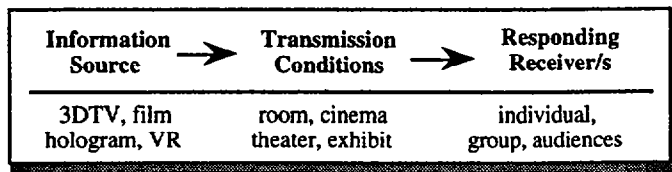
Information Source →	Transmission Conditions →	Responding Receiver/s
3DTV, film hologram, VR	room, cinema theater, exhibit	individual, group, audiences

Figure 3: Information Chain Scheme

Each part of the 3D media event, (the program itself, the room and means by which it is perceived, and the person(s) perceiving it, can contain parts of the final information. If any part of the information chain is altered, the information itself is changed. The incoming information acts as a catalyst to other mental processes which occur due to the processing and storage of information in the viewer's brain and can thus affect the overall impact. As 3D media become more sophisticated and interactive, respect for the information chain and information design of the software/hardware interfaces will be of utmost importance to their success (Malik, Thwaites, 1990). The increased time and budgetary constraints that are often placed on 3D media projects leave little room for costly experiments and wasted resources. Protocols and methodologies for information design are included in the publications by the author.

3Dmt Outlook

From a research standpoint, the author can identify the following concerns for the future: 1), the artistic implementation of 3D technologies and production practices in the media of: film; television; computers; virtual realities; sound; and dataspace (numerical imaging of space for researchers working predominantly with numbers); 2), research into spatial impact: history, basics, biometry and biocybernetics; 3), measurement of 3D space in the human mind; 4), the application of information design methodologies to three-dimensional media production practices; and 5), the development of common standards and methodologies for future international exchange of R&D in three-dimensional media technologies.

The implications for the study of the electronic arts are to make the transition from conventional 2D visual images, into the realm of stereoscopic, true spatial imaging applications, whereby 3-space is real and not merely represented or implied through traditional techniques.

There is a substantial difference between technological, psychophysiological and semantic (content related) factors which are responsible for the creation of 3D media technologies, artpieces or programs, and the factors which are responsible for the creation of a 3D media response (information impact) in the viewer. What sometimes amounts to a small, or negligible cue from the point of view of the author/artist (for example the cinematographer, holographer) may be the paramount reason which causes a high, low, or even non-existent 3D information impact for the people, the receivers, who are perceiving it. Therefore, the scale and importance of the 3D cues from the viewpoint of the artist, producer, or viewer, and the technological requirements of each 3D medium, may result in a different hierarchy entirely. This necessitates an overall information design approach when employing 3D technologies in the production of media artworks.

An entirely new generation of "3D literate" electronic artists is beginning to emerge. The more wide-spread 3D media technologies become, the more exposure the general public will have to them (Refer to figure 4.). Only through the exploration of the information impact of true spatial imaging, can we, as concerned media researchers and artists, be able to develop strategies to develop and implement future electronic arts technologies.

Conclusion

As 3D media become more pervasive in society, and the fixed perceptual stereotypes of the general public weaken, the role of the 3D "information designer" will become one of increasing importance as we shift toward the media of the next decade. Perhaps in the distant future, someone will look back on the history of the twentieth century and find, like the fourteenth, that it marked a great transition. We now sit on the cusp between the old and new media. Maybe it ushers in a period of a "3D media renaissance".

© Hal Thwaites 1995
Director - 3Dmt Centre,
Concordia University,
7141 Sherbrooke St. W., Montreal, Quebec,
Canada H4B 1R6

References and selected readings

Alspektor, R. (1989). *RenderMan Breathes Life into Modeling.* Microcad News, October, (pp. 14-18).

Brand, Stewart (1987). The Media Lab. Viking Press, New York, USA.

Brill, Louis M. (1995). *Museum-VR: Part II.* VR World. Vol. 3-1. (pp.36-43). Westport, CT. Mecklermedia Corp.

Brill, Louis M. (1994). *The networked VR museum: Where art meets cyberspace.* VR World. Vol. 2-1. (pp.12-17). Westport, CT. Mecklermedia Corp.

Dysart, Joe (1995). *VR Channel surfing.* VR World. Vol. 3-1. (pp.43-45). Westport, CT. Mecklermedia.

Eichenlaub, J & Martens, A. (1990). *Stereo Display Without Glasses.* Advanced Imaging, May.

Fisher, S.S. (1990). *Virtual Environments, Personal Simulation & Telepresence* In: H. Thwaites (Ed). Three-dimensional Media Tech-

Figure 4: Potential and current applications of 3D media technologies
(IS=Information Source, TC=Transmission Conditions, R=Receiver)

nology. Montreal, Quebec: 3Dmt Center.

Hamasaki, J. (1992). *Recent Developments in Autostereoscopic Television*. Presentation at the 1992 International Conference on Three-dimensional Media Technologies. Montreal, Canada.

Hamasaki, J. (1990). *3D Imaging and Television, State of the Art in Japan*. Journal of 3D Images, Vol. 4.4, Tokyo, Japan

Hamit, Francis. (1995a). *Digital imaging meets theme park ride planning at Boss films*. Advanced Imaging, Vol. 10-3, (pp. 72-75). Melville, N.Y. PTN Pub.

Hamit, Francis. (1995b). *Imaging's reality invades virtual reality for new apps*. Advanced Imaging, Vol. 9-7, (pp. 18-20). Melville, N.Y. PTN Pub.

Hariharan, P. (1992). *Display holography: A technical retrospective*. LEONARDO, Vol. 25-5 (pp. 431-437).
ISAST, Pergamon Press.

Heim, Michael. (1994). *The art of virtual reality*. Virtual Reality Special Report, Winter. (pp. 199-22). San Francisco, CA. Miller Freeman Pub.

Heim, Michael. (1993). *The Metaphysics of Virtual Reality*. Oxford University Press.

Hilaire, P., Benton, S. et al. (1990). *Electronic Display System for Computational Holography*. SPIE Vol. 1212- 20. Bellingham, Wash. USA.

Jacobson, Linda. (1994). *The virtual art world of Carl Loeffler*. VR World. Vol. 2-5. (pp.32-38. Westport, CT. Mecklermedia Corp.

Laurel, Brenda. (1992). *Artistic frontiers in virtual reality*. Visual Proceedings of ACM SIGGRAPH'92. New York: ACM. (pp. 58-63).

Laurel, Brenda. (1991). Computers as Theatre. Addison-Wesley Publishing Co.

Layer, Harold (1989). Holographic and stereoscopic space: New Research Directions. LEONARDO, Vol. 22-3/4 (pp. 411-413). ISAST, Pergamon Press.

Leebaert, Derek (1991). Technology 2001: The Future of Computing and Communications. MIT Press, USA.

Lieberman, Larry (1992). *Holomadness and the search for the 'hologenic' image*. LEONARDO, Vol. 25-5 (pp. 481-485). ISAST, Pergamon Press.

Lipton, Lenny (1994). *True stereoscopic television: 3DTV is feasible & striking*. Advanced Imaging, Vol. 9-7, (pp. 28-30). Melville, N.Y. PTN Pub.

Maher, Kathleen. (1995). *Strolling through cyberspace. VR finally comes to the Net via VRML*. Interactivity, Vol. 1-3. (pp.4-5). San Francisco, CA. Miller Freeman Pub.

Mahoney, Diana Phillips. (1994). *Hologram offers a global view*. Computer Graphics World, Vol. 17-8, (pp. 61-62). Nashua, N.H. PennWell Pub.

Mahoney, Diana Phillips. (1993a). *Movies that move us*. [Digital Adventures in Entertainment: Part One] Computer Graphics World, Vol. 16-12, (pp. 40-48). Westford, Mass.

Mahoney, Diana Phillips. (1993b). *Time travels*. Computer Graphics World, Vol. 16-10, (pp. 38-42). Nashua, N.H. PennWell Pub.

Mallary, Robert (1990) *Spatial-synesthetic art through 3-D projection: The requirements of a computer- based supermedium*. LEONARDO, Vol. 23-1 (pp. 3-16). ISAST, Pergamon Press.

Malik, M., Thwaites, H. (1990). *A Biocybernetic View of Spatial Information Impact* In: H. Thwaites (Ed). Three-dimensional Media Technology. Montreal, Quebec: 3Dmt Research Center.

Naimark, Michael. (1992). *Expo'92 Seville*. Presence, Vol. 1, No. 3. (pp. 364-369). MIT Press.

Polieri, Jacques (1971). "Scénographie, Sémiographie", Paris: Denöel/ Gonthier.

Pribram, K.H. (1991). Brain & Perception: holonomy and structure in figural processing. Erlbaum Publishing. Hillsdale, N.J. USA.

Robertson, Barbara. (1994). *Ready for a wild ride?* [Digital Adventures in Entertainment: Part Two] Computer Graphics World, Vol. 17-2, (pp. 30-39). Nashua, N.H. PennWell Pub.

Robinson, Phillip (1990). *Stereo 3D*. Computer Graphics World, June, (pp. 68-74). Westford, Mass.

Smith, Charles W. (1989). *The Present Status of 3-D Processes*. Image Technology, June, (pp. 224- 227).

Speer, Lance (1989). *Before holography: A call for visual literacy*. LEONARDO, Vol. 22-3/4 (pp. 299-306).
ISAST, Pergamon Press.

Swedlow, Tracy. (1995). *VR Online*. VR World. Vol. 3-2. (pp.44-46). Westport, CT. Mecklermedia.

Thwaites, H. & Malik, M. (1987). Biocybernetic Communication Research. Concordia University Printing, Quebec, Canada.

Thwaites, H. & Malik, M. (1991). *Toward Virtual Realities: A Biocybernetic View of Communication Media of the 21st Century* in (G. Lasker, T. Koizumi & J. Pohl, Eds.) Advances in Information. Systems Research, Int. Inst. for Advanced Studies in Sys. Res. & Cybernetics, Windsor, Ontario. Wilson, Stephen (1991). *Technological research and development as a source of ideas and inspiration for artists*. LEONARDO, Vol. 24-4 (pp. 433-440). ISAST, Pergamon Press.

Wright, Karen (1990). *The Road to the Global Village*. Scientific American, VOL. 262, No. 3. (pp. 83-94). New York, N.Y.

Yuyama, I. (1991). *3-D HDTV*. Proceedings of the International Joint Session of ITEC'91 and 3Dmt Research. (pp. 627-630). ITE and 3Dmt: Tokyo & Montreal.

THE SURFACE OF A HYSTERICAL BODY AS AN INTERFACE

By Heidi Tikka

Heidi.Tikka@uiah.fi

I n my paper at ISEA94, I suggested a parallel concept for the masculine "inter-face": the feminine "inter-skin". The concept of "inter-skin" was intended to challenge the current interface technology. I argued that our interfaces are only capable of producing a masculine subjectivity by providing access to information through symbolic operations that constitute a Cartesian visual space.

Could a concept like "inter-skin" provide any real space for femininity? When challenging the Cartesian representation of space as the metaphor of knowledge, do we unavoidably recourse to the space of the physiological body? As long as "inter-skin" is considered in the Cartesian framework, it cannot escape the mind-body duality. It will reproduce the surface of the body that is other to the Cartesian mind. If the face of the interface represents conscious mind, does the inter-skin cover the surface of the unconscious physiological body? If vision communicates directly with the mind, is the body under the skin a blind body? I believe we need to define a body that is not an object of Cartesian knowledge and then make an effort to imagine how that body might see.

In Cartesian tradition the mind and the body are two completely distinct entities. The body does not think, it carries out the commands of the thinking mind. The body does not speak either, the mind speaks through the body. However, the history of psychoanalysis knows several cases in which the body has directly participated in a discourse. One of these is the case of Elisabeth von R. who suffered from hysterical pain in her legs. During the analytic sessions "her painful legs began to 'join in the conversation' ". The patient was free from pain when the session started, but the pain was aroused when she was under the influence of her memories. Yet, since psychoanalysis was not immune to the Cartesian mind-body duality either, as the French psychoanalyst Monique David-Menard has pointed out, we can designate the discovery of the hysterical body as that which called the Cartesian duality in question.

Elisabeth von R. experienced an intolerable desire that conflicted her duties as a daughter and a sister, having to nurse her sick father and refrain from seducing her brother-in-law. This desire, this forbidden jouissance, reformed her experience of her body. With the pain, a body emerged that could not express itself in any other way. The pain was the physiological manifesward".

David-Menard calls this emerging body a pleasure body. It is the body into which the history of the subject's jouissance is inscribed. We don't have a direct relation to the real world, nor to our bodies. Our bodies only exist for us to the extent we have been able to symbolize them to ourselves. Our bodies are the work of language. Hysterical pain suggests, that something in this symbolization has failed. Something in the hysteric's experience of jouissance has become blocked and the blockage is played out in the body as a hysterical symptom.

The process of symbolization involves, above all, the symbolization of sexual difference. But, to symbolize sexual difference is to encounter the forbidden and the possibility of castration. In that encounter something in the jouissance becomes inevitably lost. The hysteric refuses to represent and acknowledge the lost jouissance. In this process genital organs become repressed and hysterogenic zones take over the role of the privileged zones of jouissance. But the hysteric's attempt to experience sexual jouissance through a hysterogenic zone is likely to fail when it tries to exist in the symbolic order.

The hysterical body avoids representing lost jouissance by constantly presentifying jouissance through hysterogenic zones. David-Menard argues that the hysterical symptom does not take place in the realm of representation (Vorstellung) but in the realm of presentification (Darstellung). I personally find her interpretation of the Vorstellung and the Darstellung extremely inspiring. For her, the Vorstellung is the realm of absence. The process of symbolization acknowledges the object's absence and represents this absence in language. Darstellung is the realm of heightened presence. This presence is sometimes achieved in dream images which may become so intense, that they seem to pass into the body as if in a hallucination. Representation-Vorstellung enables us to keep things at a distance by merely representing them. When things refuse to keep their distance and crash into the body we enter the realm of Darstellung. This happened to Elisabeth von R. when the words "I am not able to take a single step forward in my life" crashed into her body in a painful way.

If we think of representation in the phallic culture as a process in which the subject's desire becomes regulated in order to serve the productive and reproductive needs of the paternal family, we may ask whether there is any passageway available that could challenge it. Many feminist writers have discussed the concept of hysteria as such a passageway. Catherine Clement asks whether hysteria can function as a transformative force. For her hysteria presents itself as a spectacle, an imaginary stage on which pleasure and suffering circulate. In her refusal to maintain the integrity of the body assigned to her by the phallic culture, the hysteric returns to the imaginary experience of her body. For Luce Irigaray, woman lacks a symbolic system that would enable her to represent her sexual identity. The only space available for her is that of hysteria. We might think of the hysterical attack - an instance of Darstellung - as a violent refusal of the

phallic regulation of desire. Therefore, if we think of the current technologies as the instances of Vorstellung, we might be tempted to look for the transformative potential of the technology in the realm Darstellung. It is extremely tempting to think of the ways how vision might be constituted in the hysterical Darstellung. As several histories of vision have pointed out, the Cartesian visual space, even though it is the privileged mode of vision is not and has never been the only one. Martin Jay contrasts the monocular and unblinking Cartesian eye with the dynamic and binocular eye of the baroque vision. Baroque visual experience has a strong tactile quality. The visual space is constructed as the space of plenitude and visual pleasure, as a space full of things.

Undoubtedly it is the binocular technology of the stereographic images, that offers the most perfect apparatus for the realization of the baroque visual space. As Jonathan Crary has pointed out, the stereographic image never is but has to be constantly produced by the spectator through combining two different images into one view. Since the production of the stereographic image depends on the eye's capacity to change the angle of convergence of the optical axes, the most fulfilling stereographic view is provided with the images that with the fullness of things force the eyes to the maximum of change and movement. Rosalind Krauss describes the watching of a stereographic scene as an experience of insistent space. The ambient space of the spectator is removed by the viewing instrument and the vision is channeled into the stereographic space. The eyes that move across the stereographic space have to change the angle of convergence periodically. In a way the eyes enact the experience of space simulating and reproducing the movement of the body that might take place in the exploration of the real space. But, as Crary remarks, the reading of the stereographic image is an aggregate of changes and movements that produce a collage of suggestions for three-dimensionality but never a homogeneous visual field. The space in the stereographic image cannot be logically constructed, where the visual cues are missing; the space disintegrates into nothingness.

There are several features in stereographic images that suggest that they might exist in the realm of Darstellung. The view never is, but has to be constantly produced by the movement of the eyes. The stereographic space is an enactment of an experience of space. The heterogeneous formation of the stereographic space does not allow the metonymic and metaphoric construction of that space. It exhibits a hallucinatory quality that does not quite allow us to designate a correct distance between us and the view. The hysterical state of Darstellung and the stereographic view both challenge our sense of distance. The question of the correct distance is undoubtedly a central one in the future interface technology. When suggesting a possible link between David-Menard's concept of Darstellung and the baroque order of the stereographic space I am not imposing a new definition for the cor-

rectness of that distance. I am merely demonstrating some of the difficulties, that introducing the concept of the body brings to the discussion on interface. These difficulties, I believe, have already surfaced as the interface technology has become more and more attached to the body.

How to engage the body in that discourse? Since talking about hysteria is hardly the answer, I would like to conclude by showing a few slides that document a project in which I wanted to carry out the discourse on hysteria simultaneously in the images of the body represented and the body of the spectator.

The title of the show "Sovitus" is a Finnish word that points to several directions simultaneously. It can be translated as fitting a dress, as a reconciliation (in a biblical sense) or as an adaptation. There is a tendency in the translation displayed towards a narration in which the meanings of the word "sovitus" slide towards the materialization of these meanings, especially in the movement from one language to another. This materialization is carried out even further in the space of the body as the scenes of hysterical hallucinations appear. The spectator enters the scenes through the eyes of a little dressmaker woman. The scenes are presented as stereographic views that position the spectator to the place of the dressmaker and progress in the order of the translation. The series of images is disrupted by another installation, a perverse sewing machine that collapses two repetitive technologies, the mechanical sewing machine and the rotation of a zoetrope into a singular movement in which the voluntary mutilation of a tongue is carried out.

For me, this project was an effort to produce an instance of Darstellung and to hysterize the discourse on hysteria.

Bibliography

Helene Cixous and Catherine Clement, The Newly Born Woman, 1988, The University of Minnesota Press, Minneapolis, Minnesota
Jonathan Crary, Techniques of the Observer, 1991, MIT Press, Cambridge Massachusetts
Monique David-Menard, Hysteria from Freud to Lacan, Body and Language in Psychoanalysis, 1989, Cornell University Press, Ithaca, New York
Sigmund Freud, Studies on Hysteria, The Standard Edition of the Complete Psychological Works of Sigmund Freud, 1955, The Hogarth Press Ltd., London
Luce Irigaray, Speculum of the other Woman, 1992, Cornell University Press, Ithaca, New York
Martin Jay, Scopic Regimes of Modernity, Vision and Visuality, edited by Hal Foster, 1988, Dia Art Foundation, Bay Press, Seattle, Washington
Rosalind E. Krauss, Photography's Discursive Spaces, The Originality of the Avant-Garde and Other Modernist Myths, 1988, The MIT Press, Cambridge, Massachusetts

INSTRUMENT DE SYNTHÈSE GRANULAIRE DANS MAX/FTS

Par Todor Todoroff

todor@musique.fpms.ac.be

Avant de décrire le fonctionnement de l'instrument de synthèse granulaire, nous définirons les objectifs généraux que nous croyons nécessaires à la réalisation d'outils d'aide à la composition adaptés aux besoins des compositeurs de musique électroacoustique et acousmatique. Nous insisterons notamment sur l'importance à accorder au fonctionnement en temps réel, car les possibilités de commande gestuelle qui en découlent permettent d'envisager différemment la génération de morphologies sonores. Nous proposerons également un certain nombre de méthodes qui facilitent la génération de familles morphologiques cohérentes, en donnant une plus grande cohérence à l'évolution des différents paramètres de l'instrument de synthèse.

Alors que de nombreuses techniques de synthèse et de transformation sonore ont atteint un stade de maturité, nous voulons focaliser notre attention sur le développement de méthodes de commande plus intuitives et mieux adaptées aux besoins des compositeurs de musique acousmatique. Pour cela, il faut prendre en compte trois facteurs clefs: la conception de l'interface graphique, le fonctionnement en temps réel et l'accès gestuel aux valeurs des paramètres. Car la combinaison de ces points permet une approche de type instrumentale des outils de synthèse, de transformation et de projection du son.

1.1 L'interface graphique

La présentation d'un programme est primordiale et dépasse largement le simple objectif de la convivialité: elle conditionne profondément l'usage que le compositeur en fera. L'expérience montre en effet que l'interface graphique et le mode d'accès d'un outil orientent la manière dont il sera exploité et auront donc une influence sur le type de musique qui sera composée. L'interface graphique devrait permettre au compositeur de visualiser l'ensemble des paramètres importants du processus en cours d'un seul coup d'oeil, en évitant autant que possible la multiplication des menus et des fenêtres qui accapareraient une partie de son attention et réduiraient l'intensité de son écoute musicale. Les possibilités graphiques de MAX/FTS (la version tournant sur l'ISPW, Ircam Signal Processing Workstation) sont à ce jour trop limitées pour atteindre ce but et il nous faudra créer des objets graphiques plus performants lorsque la nouvelle version de MAX/FTS le permettra. Ces objets de visualisation et de commande graphique seront multidimensionnels. Ils s'inscriront dans la lignée de la fenêtre d'interpolation du
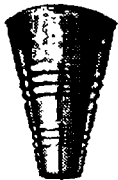
SYTER (SYstème TEmps Réel du Groupe de Recherches Musicales, Paris) et de la formalisation rencontrée dans le logiciel Animal [Lindemann, E & de Cecco, M.].

1.2 Le temps réel

Tout comme l'aspect visuel, le temps que doit attendre le compositeur entre l'instant où il modifie ses paramètres et celui où il peut écouter le résultat sonore influence son attitude. Un temps d'attente trop long ralentit le processus créatif et freine la recherche des paramètres optimaux. Le compositeur a alors tendance à accepter un résultat approximatif ou à abandonner sa recherche, alors qu'un temps de réaction court ou immédiat aurait au contraire stimulé sa curiosité. Dans la situation idéale du temps réel, le musicien n'hésite plus à essayer de nouvelles combinaisons de paramètres car il entend immédiatement le résultat musical qui en résulte.

1.3 L'interface gestuelle et l'approche instrumentale

Historiquement, les compositeurs de musique acousmatique ont été habitués à manipuler physiquement leurs instruments: enregistreurs à bande magnétique, matériel de studio doté de boutons, de potentiomètres, etc. Ils ont acquis une pratique compositionnelle basée sur l'accès simultané aux divers paramètres des appareils d'enregistrement et de traitement de son. Il ne suffit donc pas de leur offrir un programme puissant; il faut également, sous peine de limiter leur créativité, penser l'interface de manière à leur permettre un accès simultané aux différents paramètres. Or, si la plupart des logiciels disponibles font un effort de présentation, ils souffrent souvent d'un manque d'accès aisé aux valeurs de leurs paramètres. En effet, la solution souvent adoptée, qui consiste à afficher à l'écran des potentiomètres virtuels manipulés à l'aide de la souris, ne permet pas de modifier plusieurs paramètres simultanément. Ce point est cependant d'une importance capitale car la musique concrète fait largement appel à la notion de morphologie, c'est à dire de variation continue des caractéristiques des sons.

Cette approche conditionne la musique que ces outils contribuent à composer car ils conduisent à assembler des séquences de sons stables plutôt que d'explorer les innombrables possibilités de transformations évolutives des sons. Nous voulons au contraire inciter les compositeurs à travailler les évolutions morphologiques des sons. Car c'est une des spécificités importantes de la musique acousmatique.

Si on propose au compositeur un programme fonctionnant en temps réel et une bonne interface gestuelle, tel un boîtier de potentiomètres MIDI qu'il peut manipuler simultanément ou encore une interface de type "Data Glove" (nous utilisons le gant *Power Glove* de Mattel qui, associé à l'interface *SensorLab* de STEIM, envoie à l'ordinateur des informations sur la position de la main et la flexion des doigts), on lui ouvre le monde des instruments virtuels. Un monde ou il pourra construire son instrument imaginaire et choisir la manière dont il désire en jouer. Un monde qui lui révélera de nouvelles possibilités expressives.

Génération de morphologies sonores cohérentes

L'expérience acquise en composant avec des instruments analogiques et numériques nous a convaincu de l'intérêt musical qu'il y a à corréler l'évolution temporelle des différents paramètres des outils de synthèse et de transformation sonore. Il semble en effet que l'auditeur perçoive l'existence des lois qui guident l'évolution des matériaux sonores. Cela se comprend lorsque l'on sait que les structures cérébrales qui régissent notre perception auditive se sont presque essentiellement formées à l'écoute de sons d'origine naturelle ou mécanique. Or ceux-ci présentent le plus souvent un haut degré de corrélation entre
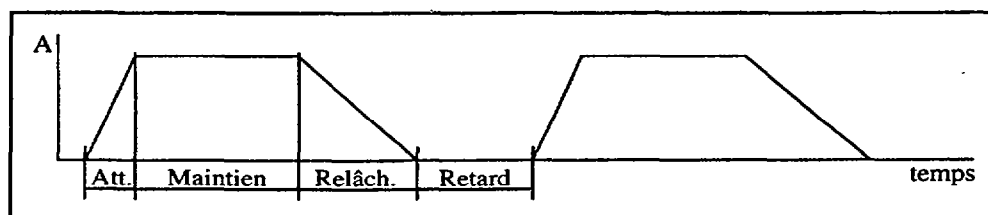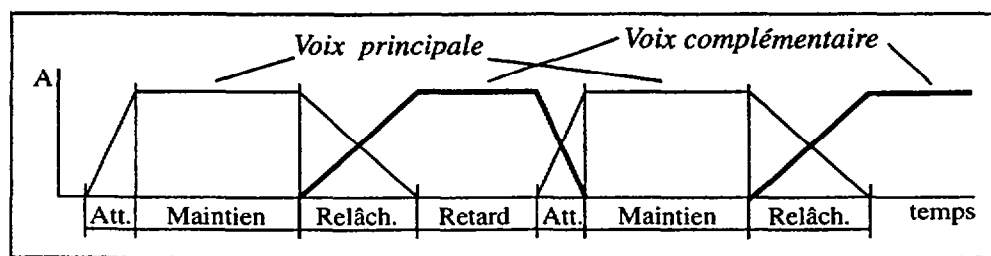

Fig. 1A: Mode normal
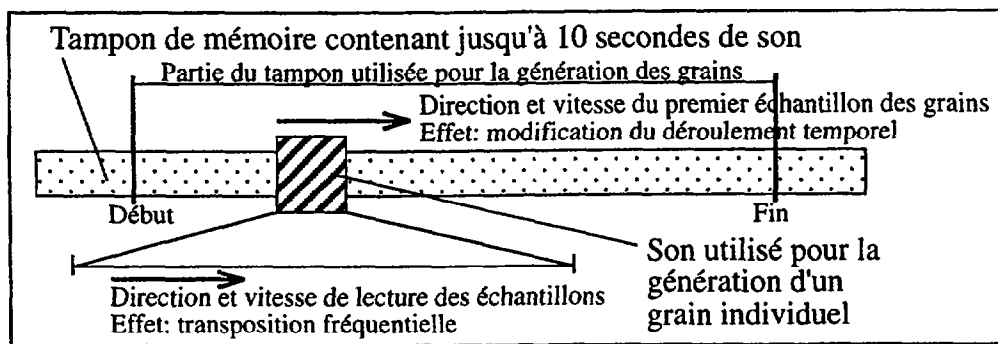

Fig. 1B: Mode fondu-enchaîné

Fig. 2: Transposition et modification du déroulement temporel à partir du tampon

amplitude, hauteur et timbre. Corrélation que l'on peut attribuer au fait que ces paramètres ne sont que les diverses facettes d'une dissipati1on d'énergie mécanique sous forme acoustique. C'est ainsi, par exemple, que James Beauchamp a pu synthétiser avec beaucoup de réalisme des sons de trompette en exploitant les lois qui lient amplitude et richesse harmonique dans les sons naturels.

Bien que les sons d'origine numérique ne soient plus tenus de respecter ces règles de dissipation d'énergie, il nous semble utile de réduire dans certains cas le domaine de variation des paramètres d'un processus sonore en créant artificiellement des lois de variations conjointes qui réduisent le nombre de degrés de liberté du système et créent différents sous-domaines qui correspondent chacun à des familles distinctes de morphologies. Ces lois implicites sont perçues par l'auditeur et contribuent à donner plus de crédibilité aux morphologies ainsi générées.

Nous pensons qu'une architecture logique à deux niveaux peut aider les compositeurs à générer des morphologies cohérentes sans limiter le potentiel sonore des instruments:

(1) au niveau inférieur, on implante des algorithmes de synthèse ou de transformation sonore qui permettent de modifier les paramètres de manière totalement indépendante, en s'efforçant d'étendre leur plage de variation au-delà des limites habituelles.

(2) au niveau supérieur, on crée plusieurs instruments qui commandent de manière différente l'algorithme sous-jacent, en limitant les domaines d'excursion de certaines variables et/ou en créant des liens entre certaines d'entre elles. Ceci équivaut à ouvrir plusieurs fenêtres sur le monde de toutes les possibilités sonores d'un algorithme: chacune permettant de l'examiner suivant un autre point de vue. Chaque instrument aide l'utilisateur à explorer avec plus d'efficacité un sous-domaine particulier régi par des lois spécifiques. En bout de chaîne, l'auditeur percevra intuitivement l'existence de ces lois et sera tenté de croire que le son qu'il entend aurait pu avoir une origine réelle.

Il convient bien entendu de donner aux compositeurs les moyens de modifier aisément les instruments du niveau supérieur en fonction de leurs goûts et de leurs besoins. Ils pourront ainsi choisir librement les limites auxquelles il désirent se mesurer. Un peu comme l'utilisateur d'une ligne de retard numérique,

qui peut soit décider d'explorer séparément les effets phasing, chorus et écho, soit passer continûment d'un effet à l'autre. Dans le cas de l'instrument de synthèse granulaire, on pourra choisir n'importe quel domaine qui ira de la synthèse granulaire à la génération de structures rythmiques en passant par le brassage et la fragmentation.

Instrument de synthèse granulaire
3.1 Généralités

Ce principe de synthèse est bien connu: il consiste à accumuler un grand nombre de courts événements sonores, les grains, afin de générer des structures sonores complexes. L'instrument se distingue cependant par la grande plage de variation des paramètres (la durée des grains peut varier de 10 millisecondes à plusieurs secondes) et par l'approche adoptée pour sa commande. L'accès est immédiat: on sélectionne le son sur lequel on désire travailler et l'on peut sans plus attendre le transformer en manipulant un boîtier MIDI de seize potentiomètres qui permettent de modifier en temps réel tous les paramètres de la synthèse: durée, enveloppe, amplitude, fréquence, durée du silence entre grains consécutifs et valeurs des facteurs aléatoires. Les échantillons nécessaires à la génération de chaque grain sont prélevés dans un son de 10 secondes stocké en mémoire qui peut être parcouru à vitesse variable ou de manière aléatoire. On peut générer de cette manière jusqu'à 32 voix de synthèse granulaire par carte ISPW. Elles sont ensuite réparties dans un espace stéréophonique, quadriphonique, hexaphonique ou octophonique au choix. Cet algorithme, qui autorise un contrôle précis des microstructures et une densité de grains importante, permet de générer une grande variété de trames sonores et de structures rythmiques et spatiales suivant les valeurs des paramètres et la nature sonore de l'échantillon de départ.

De plus, l'accès direct à tous les paramètres par l'intermédiaire d'un clavier et d'un boîtier de potentiomètres permet de modeler en temps réel les évolutions morphologiques: transposition, raréfaction-densification, regroupement-dispersion, vitesse de lecture du fichier son, etc.

Il est également possible de commander d'un seul geste des évolutions complexes et coordonnées des paramètres de
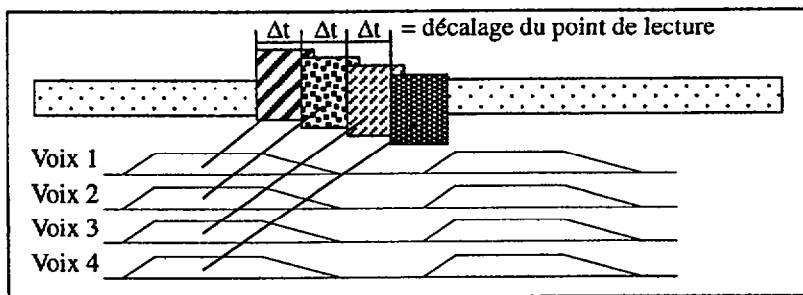
Fig. 3: Décalage du point de lecture des voix successives

manière à générer des morphologies sonores suivant les principes que nous avons exposé plus haut. Nous utilisons l'interface "Circ" développée à l'IRCAM par Gerhard Eckel qui permet, à l'aide de la souris, d'interpoler entre plusieurs configurations de paramètres localisées sur la circonférence d'un cercle. Nous étendons également ce concept en nous servant du Data Glove pour parcourir un espace tridimensionnel, sous-domaine de l'espace à 16 dimensions de toutes les combinaisons possibles des paramètres.

Enfin, l'accès MIDI autorise l'écriture et l'édition de l'évolution temporelle de tous les paramètres dans n'importe quel séquenceur du commerce, tandis que l'environnement MAX permet la programmation de structures de commande algorithmiques sophistiquées.

3.2 Fonctionnement

Chacune des 32 voix de synthèse granulaire permet de générer une succession de grains déterminés par trois catégories de paramètres: les paramètres d'enveloppe, ceux de transposition et ceux qui permettent de choisir l'échantillon sonore à utiliser pour la génération des grains. Des paramètres globaux gèrent l'activation, la désactivation et la synchronisation des 32 voix. D'autres servent à sélectionner les sons sur lesquels on désire travailler, à sauver ou à rappeler des configurations de paramètres, ainsi qu'à interpoler entre un certain nombre de ces configurations.

3.2.1 Les paramètres d'enveloppe et les deux modes de fonctionnement

Ils sont classiques: temps d'attaque, de maintien et de relâchement ainsi que retard entre le déclenchement des grains successifs. Deux modes de fonctionnement sont disponibles: le mode normal (voir figure 1A), qui permet de gérer 32 voix indépendantes, et un mode fondu-enchaîné (voir figure 1B)

qui permet de créer un continuum sonore en associant les voix deux à deux, voix principales et voix complémentaires, en faisant en sorte que chaque grain disparaisse dans un fondu-enchaîné qui coïncide avec la naissance d'un autre. Dans ce cas, les temps d'attaque, de maintien, de relâchement et de retard de la voix complémentaire correspondent respectivement aux temps de relâchement, de retard, d'attaque et de maintien de la voix principale.

Les temps de maintien et de retard, ainsi que l'amplitude de chacun des grains peuvent être soumis à des variations aléatoires réglables en intensité.

Remarquons que nous avons opté pour des variations non linéaires des paramètres de temps, de manière à permettre de couvrir toute la plage de variation utile à l'aide des 128 valeurs qu'autorisent les contrôleurs continus MIDI. Ceci correspond bien aux attentes perceptives: le passage d'une durée de 5 ms à 6 ms est significatif, celui de 2000 ms à 2001 ms ne l'est pas.

3.2.2 Les paramètres de transposition

Le son prélevé (voir ci-dessous) dans un son préalablement stocké en mémoire vive peut être transposé dans une gamme de plus ou moins deux octaves, par pas de demi-tons et de cents, à l'aide de potentiomètres ou à l'aide d'un clavier et de la molette de Pitch-Bend. La moitié supérieure de la course du potentiomètre correspond à une lecture de l'échantillon dans le sens normal, alors que la moitié inférieure correspond à la lecture à l'envers.

On peut aussi superposer un facteur de variation aléatoire de la transposition.

3.2.3 Les paramètres de gestion des échantillons

Le son utilisé pour générer chacun des grains n'est pas synthétique; il est prélevé dans un tampon mémoire de 10
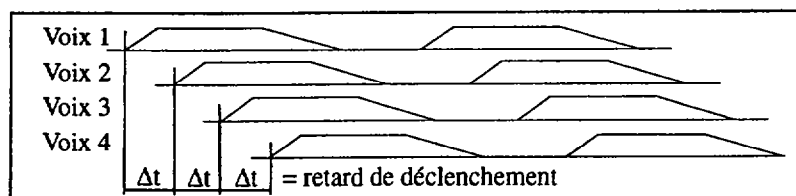

Fig. 4: Retard de déclenchement des voix successives

secondes où l'utilisateur a préalablement stocké le son sur lequel il désire travailler. Nous décrirons ici les paramètres qui permettent de choisir les fragments de son utilisés pour construire les grains. Tout d'abord on définit des points de début et de fin afin de délimiter la zone utile du son pour, par exemple, isoler un mot ou une syllabe dans une phrase. Un paramètre détermine ensuite le sens et la vitesse de déplacement du point à partir duquel les échantillons sont lus entre ces limites. La valeur 1 correspond à un déroulement temporel identique à celui du son original. Les valeurs supérieures à 1 provoquent la lecture accélérée du son, tandis que les valeurs positives inférieures à 1 réalisent des extensions temporelles. Il est possible de stopper complètement le déplacement (gel) ou de choisir des vitesses extrêmement faibles (il n'y a pas de limite inférieure), de manière à réaliser des extensions temporelles très impressionnantes. Les valeurs négatives correspondent à une lecture du son "à l'envers". Remarquons que ce sens et cette vitesse de déplacement sont distincts des paramètres similaires qui régissent la transposition (voir figure 2). Il est ainsi possible, dans le domaine temporel, de modifier indépendamment la fréquence d'un son et son déroulement temporel. La qualité sonore la plus naturelle est obtenue dans le mode fondu-enchaîné. Mais les paramètres d'enveloppe, indépendants des facteurs de transposition fréquentielle et de distorsion temporelle, peuvent modifier profondément le timbre: des grains très courts, sans variation aléatoire de durée, permettent par exemple de créer des effets similaires à la modulation en anneau.

Un autre paramètre permet d'associer à chaque voix de synthèse un décalage croissant du point de lecture dans le tampon mémoire (voir figure 3). On obtient ainsi des effets de phasing (filtrage en peigne), de chorus ou d'écho en fonction de l'importance du décalage. L'effet croît en intensité au fur et à mesure que l'on introduit des voix de synthèse supplémentaires, un peu comme lorsque l'on augmente le feedback d'une ligne de retard mais sans risque d'accrochage.

Enfin, un paramètre dose l'intensité de la variation aléatoire du point de lecture. Les petites valeurs permettent de générer des effets de chorus riches et naturels sans devoir recourir à la transposition. En augmentant la valeur de ce paramètre on obtient un effet de brassage aléatoire dans une zone du tampon de mémoire qui peut être étendue à l'ensemble des 10 secondes disponibles. Une amélioration future consistera à écrire un module externe qui simulera un tampon mémoire circulaire et permettra de traiter des sons directs.

3.2.4 Synchronisation des voix de synthèse et création de structures rythmiques

Comme nous l'avons indiqué plus haut, les voix de synthèse sont à priori totalement indépendantes. Lorsqu'une voix doit générer un nouveau grain, elle consulte les variables centrales où elle trouvera les dernières valeurs des paramètres, modifiées en permanence par les mouvements des potentiomètres. Il n'y a donc pas de processus central qui gère le déclenchement des

grains de chacune des voix. Les grains resteront cependant parfaitement synchronisés pour autant que les facteurs de variation aléatoire des temps de maintien et de retard soient nuls.

Il suffit donc de déclencher les voix à des moments précis pour créer des structures rythmiques stables. Et il suffit de jouer sur les facteurs aléatoires précités pour désynchroniser les voix plus ou moins progressivement.

Un ensemble de boîtes de message MAX, numérotées de 0 à 32, permettent d'activer et de désactiver les différentes voix individuellement ou globalement à l'aide de la souris. On peut également utiliser les touches d'un clavier de commande MIDI ou les boutons d'un boîtier MIDI programmable. Et il est à tout moment possible de resynchroniser les grains sans interrompre la synthèse. Une variable règle le retard entre l'activation des voix successives de manière à créer des structures rythmiques (voir figure 4). Selon l'assignation des voix de synthèse aux sorties audio, diverses structures spatiales se superposent aux structures rythmiques.

4 CONCLUSIONS

Cet instrument dépasse les limites habituelles de la synthèse granulaire. Il couvre un vaste champ opératoire qui inclut le brassage, la fragmentation et la génération de structures rythmiques et spatiales complexes. Son accès gestuel et sa facilité d'utilisation le mettent à la portée d'un plus grand nombre de compositeurs.

C'est une première étape dans la réalisation d'une gamme d'instruments qui offriront la possibilité de contrôler différentes techniques de transformation sonore de manière plus intuitive et plus naturelle. Nous pensons que cette approche favorisera la génération de morphologies sonores plus variées et plus expressives qui enrichiront la palette sonore des compositeurs.

Références

Jones, D. and Parks, T., "Generation and Combination of Grains for Music Synthesis", *CMJ Vol. 12 (2), Summer 1988, pp. 27-34.*
Lindemann, E. & de Cecco, M., "Animal: Graphical Data Definition and Manipulation in Real Time", *CMJ, Vol. 15, No. 3, Fall 1991, pp. 78-100.*
Roads, C., "Granular Synthesis of Sound" *In C. Roads and J. Strawn, Editors, 1985, Foundations of Computer Music, Cambridge, Massachusetts: MIT Press, pp. 145-159.*
Teruggi, D., "The Morpho Concepts: trends in software for Acousmatic Music Composition", *Proc. ICMC 1994, Aarhus, pp. 213-215.*
Todoroff, T., "Outils de synthèse granulaire et de spatialisation du son à commande gestuelle dans l'environnement MAX/FTS", *JIM '95, Paris, Institut Blaise Pascal, LAFORIA 95/13, pp. 101-108.*
Todoroff, T., "Real Time Granular Morphing and Spatialisation of Sounds with Gestural Control within MAX/FTS", *Proc. ICMC 1995, Banff, pp. 315-318.*
Truax, B., "Time-Shifting of Sampled Sound with a Real-Time Granulation Technique", *Proc. ICMC 1993, Tokyo, pp. 82-85.*

DEGREES OF FREEDOM

By Laura Trippi

latrippi@aol.com

T his paper is a cumulative piece, charting the transition from my work as curator at The New Museum, New York, over the past eight years, to my current project, which is to develop an infrastructure for exhibition practice that operates outside and between existing institutions. Reflecting on recent transformations in art and exhibition practice, I want to bring into focus art's participation in a widespread cultural shift toward open, networked, participatory systems. The infrastructure I envision utilizes networking technologies as part of a curatorial strategy that engages with this environment.

When I started at The New Museum in the mid eighties, thematic exhibitions were a genre on the rise. Such high concept exhibitions as Damaged Goods, organized by Brian Wallis for the museum in 1986, were not just shows, but thematic investigations, emphasizing art's close associations with a wider sphere of cultural effects. Damaged Goods helped to announce the advent of "commodity art," but also sought to illuminate a more pervasive trend, the "damaged" or precarious status of objects in an era of simulation. It situated art within a mediated landscape of consumer culture moving into hyperdrive.

At the same time, activist art practice was engaging the idea of a social aesthetic. The installation, Let the record show. . ., organized at The New Museum in 1987 by curator William Olander, is an example. Olander offered the museum's large shop window on Lower Broadway to the AIDS activist group, ACT UP, both as a platform for their sophisticated agit-prop and in recognition of ACT UP's contribution to the visual culture of our time. The installation resulted in the formation of the smaller collective Gran Fury, which went on to use the infrastructure of the art world — administrative and interpretive as well as financial — to gain access to venues otherwise beyond their reach: subway and bus poster projects, billboards, and the media coverage that their work eventually earned. The concept of the curator as a cultural producer, rather than an arbiter of taste, helped carry curatorial practice further into the realm of public culture.

During the late eighties, the art market's bubble economy swelled, affecting both art works and exhibitions. Increasingly works were passing into and through private and corporate collections. Even major museums were selling art from permanent collections to finance new acquisitions, as prices spiraled upward and government support for the arts continued to diminish. Collecting art became quite literally a futures market, with works continually moving from collection to collection. Circulation seemed to be superseding static accumulation as the primary condition of art.

As we moved into the nineties, the art market crashed; public and private sponsorship of the arts fell and continued
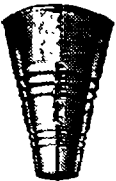
falling to further lows. Mobility, fluidity, and reconfigurability nonetheless continued coming to the fore in art works and exhibitions and in other institutional practices. Temporary exhibitions grew to dominate most museums' programming and permanent collections were sent into circulation.

Curiously, strategies that had been enlisted under the banner of postmodernity joined with the market in dispersing art from its "permanent" embrace within the confines of museum and private collections. Artists and curators increasingly deflected art out of the traditionally pristine precincts of museum and gallery display, to traffic in spaces freighted with the everyday. Performative works and artists' projects used the infrastructure of the presenting institution as a kind of material component of the piece, and engaged the viewer in the process producing the work. Exhibitions and artists' projects reflecting on collecting practices formed an ever widening stream. All these developments in art and exhibition practice seemed to index a broad based process of cultural restructuring around accumulation, with collections being recast as controlled systems of circulation.

At The New Museum, an emphasis on curatorial and institutional innovation created an environment that dovetailed with these self reflexive trends in the field. I came to consider temporary exhibitions as a distinct — and distinctly circulatory — type of collection. Like an archive, and not like a display case, thematic exhibitions in particular tend to emphasize the viewer's navigation through the space of display. The growing prominence of theme shows on the exhibition circuit, and of works dispersed from traditional venues and modes of display, reinforce the sense of steering through a variegated landscape — one whose elements are constantly in rotation. With this, recombinability and reconfigurability have become striking features of the field.

Increasingly, thematic exhibitions echo the ways in which space and information are organized in electronic environments, pressing toward a sort of hypertextual design. Individual works implicitly invoke entire bodies of work, as well as a more or less open ended archive of related writings, ideas, artifacts, and locales. This indexical dimension highlights links within the field of art but also connects art directly to developments in other disciplines and cultural domains. With the growing emphasis on ambient, navigational aspects of aesthetic experience, on recombinability and participatory forms, art begins to override the display paradigm that is so much a part of modern spectacle society and so allied with the idea and history of the museum.

As exhibitions broach the condition of hypertext, the limits of the theme show as an exhibition genre anchored in a circumscribed site seem to have been reached. Yet despite these shifts within and outside the field, curatorial practice has remained wed to a model derived from the museum — the centralized display of a collection of objects supplemented by explanatory texts. Meanwhile art projects on the Internet and CD-ROMs often ignore their grounding in offline networks of display, circulation, and exchange.

With the rapid expansion of access to the Internet and especially, more recently, to the World Wide Web, art institutions are awakening to the insistent snooze alarm of cyberspace. Leaping into the fray with home pages or other internet sites envisioned as elaborated organs of public relations or education, they have generally given little thought to the wide ranging programming implications posed by new technologies. Similarly, efforts to broaden audiences and to engage viewpoints and materials outside the field tend toward an assimilationist model, leaving basic programming structures untouched.

In art as in other fields, process continues to displace product, ceding center stage to the design of open systems that invite change along with participation on the part of users. Corresponding to this landscape of linked sites and dynamic systems, I envision a distributional approach to exhibitions, one that I'm pursuing through a project called Drawing oN Air. In this networked curatorial model, the Internet will serve to map projects, work, and practices widely distributed across space and time as across disciplines, media, and type of site. Thematic webs will be ongoing, encouraging exchanges between online and offline sites and allowing for the continuing development of a given theme. Structure and process — design in the broad sense — will be treated as equal in interest and importance to the content of the thematic web.

Rather than establish the structure and operating mechanisms of such an infrastructure in the abstract, we're seeking to evolve it through a series of pilot projects. For the "adaptive" aspects of the infrastructure, we're looking to developments in artificial life and complexity science, among others, for models that map the dynamics of systems in a constant state of change. Improvisational methods in music and collectivist strategies in art practice, and anarchic social models, will be important sources in considering collective forms of production. From the field of business management, we're importing and experimenting with strategic, scenario based planning, and with concepts such as "re engineering" and "learning organizations" — change oriented, networked, and arguably participatory approaches to infrastructural design that the corporate world has been developing for some time.

The trend toward flexible, participatory structures — in art works and exhibitions, in business management, in the information/entertainment industry, among others — are often characterized in terms of greater individual freedom. But they can also be understood as marking an exponential increase of efficiency within a consumerist culture. As currently configured, "interactivity" means, primarily, greasing the wheels of consumption, while "participatory management" functions as a mechanism for retooling the work force, including ourselves, eking out greater yields of product and profit through the encroachment of professional concerns on what was once the space and time of private life.

Can the freedoms and constraints that characterize digital technologies be used toward other ends?

Western art theory and practice has often been informed by considerations of the reader/viewer's role in "producing" the work. It may be useful, in taking up technology as an aesthetic medium, to refer back to this heritage as a point of reference. For example, the Russian Formalists considered "literariness" to reside in those elements within a text that resist consumption as information, calling attention to the materiality of language. With this, readers relinquish their role as mere consumers and enter into dialogue with the text, becoming co-producers of the work through the act of interpretation.

In our engagement with technology, the interface figures as a barrier to no holds barred "interactivity," and so, implicitly, to the freedom that it connotes. But the idea that art resides, in part, in the resistance of materials puts interesting spin on the situation. Instead of seeking greater transparency of the interface, so that it yields more and more easily to the desire to consume, artists and curators might consider orienting their work toward investigating the interface itself as a material resistant to our will.

Just as the infotainment industry defines interactivity narrowly, structuring participation in the system as a species of consumption, the interface is pictured as the software environment where mouse and option meet. By concentrating in part on the design of a "post institutional" infrastructure for exhibition practice, Drawing oN Air starts instead from an extended definition of the interface: those zones where patterns of social and economic activity, paradigms in science and technology, and subjective structures of thought and experience intersect, engaging with one another in complex, mutually determining ways. Art has a particularly decisive role to play here, holding open the possibility that "interaction" means participating substantively in the production of culture, including not just products but also the processes, that is, in the very modes of its production. The curatorial form of the theme show opens out into an adaptive archive, an evolving system for linking works of diverse media, modes, and materialities. Connecting more than collecting, curators will track and foster aesthetic practices along divergent migratory paths, as art and global capital together hack the logic of flexible accumulation.

EUKARYOTIC VIRTUAL REALITY

THE EMERGENT ART OF ARTIFICIAL LIFE

By Jeffrey Ventrella

ventrell@studio.sgi.com

I n this paper I discuss an approach to the science of artificial life, from the viewpoint of an artist using techniques from this field to create images, animations, and interactive microworlds, via computer programming. As a point of departure, I consider current popular forms of virtual reality—in which the human subject is immersed in a simulated three-dimensional space, usually represented visually via established computergraphic rendering techniques. These spaces have been described as "lonely", because they often lack the element of life we encounter continuously in *real* reality.

I would like take a more ecosystems approach to inventing a virtual reality, where experience is characterized by interactions with adapting artificial life forms, rather than an approach where experience is characterized by moving through perspective space as a virtual eye-self. The information-dynamism of artificial life does not always depend on rendering of visual surfaces in 3D spaces, and instead emphasizes the inner process, growth, adaptations, and interactions of various autonomous agents, possibly including a human participant. It emphasizes *behavior*.

Artificial life has been primarily a scientific discipline, aimed at complementing traditional biology (largely an analytic science - the study of carbon-based earth-life), with synthesis—a form of theoretical biology. Artificial life research abstracts the functions of life away from one particular physical manifestation and attempts to understand it in terms of information dynamics. For this reason, many artificial life artifacts take the form of computer programs which exhibit emergent properties reminiscent of life.

Some artists and computer graphics researchers have begun to adopt artificial life principles and techniques in developing visual works and mechanical automata. When artificial life is viewed as a new experimental artform, a different set of issues may arise, issues concerned with representation, cultural implications, questions of authorship, and the creative process. In this paper, I trace the discoveries in my personal journey as an artist inspired by biology, who became a self-taught computer programmer. I also cite a few key thinkers and makers who are starting to bring artificial life into the realm of a visual and cultural study.

Euclidean Reality

A kind of giddiness, perhaps experienced by Renaissance folks, when they figured out the *perspective* trick, is back again—but it is cast in a new light: immersive 3D computer graphics. These new representations of reality take the method of perspective into a new realm—projective geometry is encoded as a real-time animation algorithm. And now people can go *into* these virtual places and look at what lies behind the picture plane that isn't there. It is the newer virtual reality of illusionistic space—and it is tied ultimately to the single viewpoint of the self.

But for me, a more intriguing virtual reality that is emerging in our culture is not about 3-space, computing vanishing points, or being Euclidean. Artificial life renders the complexity of dynamical systems—chaotic realities, where boundaries are blurred, and *viewpoint* may be fragmented or many, or moot. Here, metaphors come from biology and the study of nature, in which myriad living agents are intertwined in an ecological whole which is larger than the sum of its parts.

Virtual reality doesn't have to be a lonely place. Many of us who are building computer-based media have an agenda: to invent and then populate virtual realities with interacting, adaptive, quasi-intelligent entities. The human participant can become one member of an ecological system, not merely a lone wandering self in a space of Euclidean objects. *Real* reality is, in fact, very much about living among—communicating with, eating, and (for some), being eaten by—other living things.

Eukaryotic Reality

Lynn Margulis theorizes that certain bacteria of the early earth evolved such a tight symbiosis that they merged as meta-organisms, composite individuals—the eukaryotes[1]. This is one of many critical shifts in biological evolution, where "individualness" blurs. And the cells which physically comprise *you* the individual happen to be eukaryotic cells. What of meta-human systems? Cities, nations, languages, and the robotic civilizations expounded by Hans Moravec[2]. Chris Langton suggests that human culture should be studied with the same lens as that which we use to study nature[3]. They're both parts of one emergent phenomenon—life.

Then there's the internet: this massive, decentralized organism evolves around us, like a cortex—we are immersed within it. This net is not a visual space that we occupy, as Bill Mitchell reminds us in *City of Bits*[4]. It is cyberspace. And it's an experience about many interacting entities—a plurality of contributors to the swarm. As a network, it has its own emergent properties, like living phenomena. Kevin Kelley calls this a "vivisystem"[5]. And this vivisystem includes both the human and the post-human. In my lifetime I may engage in conversational email with an AI program or have screensaver fish as pets that do my spellchecking. This multifaceted world—where one can practice *gender-bending* for a new experience in vir-

tual sex, or where one can play multi-player videogames with a combination of real friends and artificially intelligent cartoon characters—is the most interesting virtual reality to me.

Behavior

Here I wish to recognize a virtual reality which is not characterized by sleek, surreal polygonal spaces, such as we've seen popularized in the media. It is a virtual reality characterized by *livingness*, which can inhabit many kinds of visual forms, sometimes not visually recognized as familiar objects we've seen in the world—perhaps not having any attributes which would allow it to be rendered in any classical computergraphical sense. But it may exhibit behaviors to an oddly familiar tune, like something we've experienced at some point in our lives as earthlings among other earthlings. Take the cellular automaton known as "Life"[6]. It intrigues, mesmerizes, and inspires the creation of entire periodicals and books, though it consists merely of a rigid square grid of black and white squares blinking on and off, according to a few basic rules. Why such mass interest in such a simple visual world? It has to do with *behavior*. More recently, at a workshop on artificial life at MIT, clunky assemblages of blocks and simple stick figures moving about in sparsely-rendered 3D spaces have gained attention—why? They demonstrate evolution as a way for a population of these sparse objects to learn to walk or swim[7]. It's in the behavior.

DESIGNING EMERGENCE
Another Kind of Paintbrush

I am interested in painting expressions of reality with another brush than the kind offered in commercial 3D modeling, animation, and rendering packages. I am interested in composing computer programs which in turn generate dynamical systems with many interacting parts, buzzing like life, and not being constrained to any particular dimensionality. Ten years ago I made a strong separation from the arts of rendering optical reality. I discovered an entirely new visible language tool—available in it's most basic form only to computer programmers: *recursion*: self-consuming, self-feeding loops which can generate non-Euclidean spaces, chaotic attractors, growing biomorphs, and self-replicating cellular configurations. These ever-changing visual forms spoke to me of something in the world that is deeper than what lies on the optical surface (where classical computer graphics systems texturemap polygons and raytrace shadows).

In the view of some artists, the computer is best exploited not a glorified crayon, nor even as an enhanced, magical canvas to be painted over with intelligent images. It is a process machine. It is about process—more like a musical instrument than a paint brush. And behaving more like a mind, a living system, than like a camera or an airbrush.

Genetic Tweak Animations

Years ago, as I was developing hand-drawn animations, a friend suggested that I should get to know his Amiga computer

and check out a program that lets you draw simple fractals in BASIC. Being computer phobic, I was defiant at first, and preferred to keep drawing animation cells by hand. But in the span of a few hours I became fascinated with this new way of describing an image, and a transformation of that image. With this program (which looked like alphabet soup to me), I could (very clumsily) edit the first in a string of four numbers in the midst of the soup to be slightly different than before, run the program, take a frame of the computer screen with my movie camera, and repeat the process over and over again. The changes in the images implied that the developed film would reveal a complex organism which gracefully writhed in harmonic motion, like some underwater sea creature. As I began to contract the flu late into the night, and as my thumb began to form a blister from repeatedly clicking the camera, I began to recognize the significance of the forms and motions that were unfolding in the as yet undeveloped film: simple, linear changes in one small number in the series beget a cascade of complex hierarchical movements in the form, due to the recursive nature of the fractal. The code was terse and the transformation was simpleminded, but the generated form was chaotic, complex and surprisingly organic.

Tree Epiphany

Soon, I figured out how to create tree shapes using recursive algorithms. My excitement was like that reported by Richard Dawkins when he first brought his biomorphs to life for his *Blind Watchmaker* software[8]. I began to appreciate the vastness of the family tree of trees (a "genetic space"), and had to take a walk in the night air. I began to watch the bare tree branches (it was winter) as they glided past my vision while I walked down the street. I saw the trees in a new way. I saw them growing—I saw them as grown things. This led to a trend of looking at all things as grown from generative forces - interacting with other things as they take shape. It was a new eye on things as procedural things, not designed or created, but evolved through a dynamism.

"Procedural modeling" was a refreshing new approach to many in the computergraphics world who were growing tired of chrome spheres and texturemapped teapots, and worlds constructed with building blocks. Some computer art purists have suggested that the computer, being a dynamic information processing machine, is best at modeling dynamic phenomena: growth, thought, evolution, language, rather than building upon past imaging technologies and artforms. Artist Ed Zajec sees processing techniques such as recursion as a way of expressing with as much potential as the technique of perspective had in the Renaissance[9]. Recursion is a motor which aids in the emergence of form, its generation, its development through time. It also appeals to the musically-inclined.

Composing Seeds

Recursion means you can artfully compose a seed (a few numbers, an equation, a geometrical transformation, a musical motif, etc.) and an environment within which that seed will grow, and then let it grow. The grown result can then be evaluated aesthetically and then the seed can be re-designed, in an attempt to create more interesting or expressive grown forms and motions. It's usually difficult to relate the change in the seed with the change in the grown thing, because the "embryology"—the expression from *genotype* to *phenotype*, may be complex and unpredictable[10]. But after a while of doing this, one can acquire a skill at predicting the results of making such changes to the seed. My explorations in this activity led to an obvious approach to crafting families of images and animations: to use *genetic algorithms* (the technique of modeling the dynamics of Darwinian evolution in software). Genetic algorithms are optimizing schemes which use the genetic operators of reproduction, mating, mutating, and dying, to evolve a population of *genotypes* (the parameters which determine the characteristics of a family of images, for instance), to improve what the genotypes represent: the *phenotypes* (the images themselves).

The genetic algorithm became a tool to help me breed these images and motions, where my aesthetic evaluations became a "survival of the fittest". This kind of technique is similar to what Karl Sims had developed, using genetic programming (expressions in the LISP language which can mate and mutate) for image breeding and animation scripting. It suggests a possibly whole new kind of artmaking process, which Sims called, "interactive evolution"[11].

Evolving Animals

I had also used genetic algorithms in an experiment for evolving populations of simple, articulated stick figures rendered in a virtual 3D world with gravity, friction, and momentum[12]. These were presented at the latest Artificial Life gathering at MIT. Variety in these populations was determined by a genotype (a set of genes controlling parameters for anatomies and motions among the body parts). These very simple shapes evolved seemingly purposeful, and often amusing motions, as the population evolved, driven by fitness pressures for locomotion. They grew better proportioned extremities and rhythmic gaits—and many unexpected solutions to the general task of locomotion.

Another set of creatures I had developed existed in a virtual underwater world. Their evolutionary fitness pressures were for covering more distances in water, in any way they happened to chance upon. In these populations, starting from random primordial beginnings, later generations produced longer limbs and wider, more coordinated strokes.

At the MIT conference, Karl Sims presented a family of 3D land and undersea creatures composed of blocks, whose behaviors and anatomies had evolved purposeful behavior through competitive situations, using the genetic programming technique[13]. These objects incorporated a physically-based model and embryological process determining morphology and mo-

tion in individuals of the population. Snapshots of these block assemblages reveal little information, but as soon as they are animated, one can see an obvious lifelike sense of purpose in their motions. This is the outcome of a long line of generations in which the population had adapted to the Darwinian pressures set up by Sims in his simulations.

These kinds of computer animated characters are not designed in the strict sense. They are evolved. Which is not to say there is no Art in their creations. The programmer has unlimited choice in how to represent the scheme for which genes are expressed as body and motion. The programmer also has unlimited choice in how to set up the environment, which kind of physics within which to imbed the creatures, and what the evolutionary pressures will be for survival. In terms of expressivity and narrative potential, this technique is a far cry from classical character animation, in which the artist has very much control of the subtle nuances of movement in a character. But it suggests some new techniques for making virtual characters do some remarkable things without telling them exactly how, and letting their personalities and "body language" evolve, through Darwinian encouragement. It is an art of crafting evolutionary dynamics, of setting up the degrees of freedom for motion and parameters for anatomical variation, and of crafting genotypes and their expressions into phenotypes. My efforts in bringing some of the expressivity and humor of classical animation to this new techniques resulted in an interactive artifact which I call "Disney Meets Darwin"[14].

Grown Art

The American school of Action Painting signifies an art of *act*, *process* and *emergence*. The painter would engage in an energized gestural dialogue with the canvas. Each stroke (or dribble) the painter made spoke back—dictated what the next stroke should be. The continual iteration of the painter's evolving vision, as it interacted with paint and canvas, brought forth a grown form - an expression of a process, something emergent. This may be said also of painters who use an "automatist" approach, and some abstract surrealist styles, in which, as the artist assumes an altered state of mind, the forms semi-automatically emerge from the canvas. These styles of painting emphasize the organic, and they often bring forth biomorphic forms. Why?

Process

Harold Cohen's lifelong, continually evolving computer program "Aaron", was conceived originally as a means for Cohen to encode his drawing methodology, to represent it algorithmically in the form of an artificial intelligence work or art. Aaron tirelessly generates unique, one-of-a-kind artworks, all of which bear the unmistakable signature of Aaron's master (Cohen himself)[15]. Cohen has made a whole years-long art project of representing the *process* of his artmaking. Which is the real art of Harold Cohen, his brainchild Aaron, or the thousands of works that Aaron has generated, and will continue to generate when Cohen is no longer alive?

The use of evolutionary computation techniques, such as genetic algorithms, suggests new approaches to a familiar notion: art is process. Art and design creations evolve in the maker's mind as well as in the work itself (and they also build upon the evolved visual language which is its cultural context). In the evolution of a creative work, visions, ideas and methods emerge in the maker, prior to, and simultaneous with the act of crafting them. They change, mutate, some die off, many live on, reproduce, and merge with others. The act of creating is partly an evolutionary act—a bit of bottom-up emergence and serendipity with a bit of top-down design and planning. The evolutionary mind is like a microcosm of nature. Richard Dawkins' term, "memes" denotes the ideological equivalent to biological genes in nature[16]. A powerful meme (highly *fit* in the Darwinian sense) can spread like wildfire from mind to mind, reproducing and combining with other powerful memes. Even within one individual, a mind full of memes, and the context within which the individual is situated, can serve as the ecosystem in which a creative work is born. Thus, I believe that specialized genetic algorithms designed to aid in the creative act ("memetic algorithms") could be designed and would become useful tools as apprentices to some artists and designers.

ARTIFICIAL LIFE MEDIA

The science of artificial life has begun to trickle down from the ivory towers in Santa Fe and elsewhere, and into popular print media, animation studios, computer game factories, and art galleries. And the notion of using computational evolution and autonomous agents in our technologies is becoming more commonplace. Top-down Design and bottom-up Evolution may merge in our technological future. The Made and the Born, as Kevin Kelley suggests, will merge into hybrid forms.

Computer Games That Play You

The experimental interface agents designed by Pattie Maes and other researchers at the Media Lab can evolve to learn about a user's interests and adapt to his/her style of doing work, like sorting out email messages, for instance. Likewise, the characters and other behavioral objects in a computer game can adapt to a player's skill level and style of playing, as the game is being played, or over the span of many games.

In computer games, behavioral entities—moving sprites, warships, race cars, pong balls, cartoon characters—which were already designed to live in a microworld—can be made to adapt to their worlds, through some automatic optimization schemes, like quick genetic algorithms or fast-adapting neural nets. They can become successful in their *niche*, able to deal with gravitation or any other particular attributes of the world within the game, and to respond to the actions of humans and other entities in predictable, interesting, or entertaining ways. Here is an arena in which artificial life techniques can, and already have begun, to be used. For instance, Craig Reynolds (inventor of the flocking and schooling "boids", and other autonomous entities), is currently applying his techniques towards an entertain-

ment media authoring system, which will aid in the design of computer games[17].

Post-human Ecosystems

Perhaps the newest and most fascinating arena for the propagation of artificial life is the internet. In a virtual chat, I may be engaged in a text-conversation with another person, whose physical coordinates are unknown, and unimportant ("the net negates geometry"—Mitchell[18]), and even whose gender (in real life) is unknown, and whose "posed" identity may be artificial. "Robots", programmed to pose as humans, populate some text-based virtual realities, too.

Primordial soups, like Tom Ray's "Tierra"[19], may begin to penetrate fertile pockets in the net, and work overnight in computers on the sleeping side of Earth, while the other side works in the daylight. These soups will be designed to evolve software functions which could never be designed by humans, to do complex tasks. Perhaps anti-viral systems will have to be bred in this way. Perhaps the neuromuscular systems for the dinosaurs in Jurassic Park sequels will be evolved in this way.

Imagine breeding images or animations or populations of virtual characters in the dark corners of computer memory at night, letting them interact and grow more complex as you sleep. As far as the future of evolutionary art and artificial life over the net is concerned, the possibilities seem quite large, and the "medium" is very new and formless.

CONCLUSIONS

These are my thoughts and musings on artificial life, and what it signifies in terms of a new visual language and cultural phenomenon. The art of artificial life, it seems to me, is inherently computational, dynamic, and emergent. And it is also resonant with such trends as: the institutionalized obsession with genomes; the mutability of life; cyborgs; Michael Jacksonian morphing; and the view of humanity as intimately entwined in the web of Earth's ecosystem. The tools of artificial life are not so good for rendering the domain of "Man", nor the projected spaces of a human view on a human world, as Renaissance Perspective was. The art of artificial life renders the dynamics and emergence of earth-life, from which humanity emerged—as well as many other possible (and impossible) forms of life. And in addition to this emergent method of rendering reality, artificial life is also becoming a reality in itself, as the post-human cortex envelops the earth.

Footnotes

1. Lynn Margulus' idea is mentioned in Dawkins' The Blind Watchmaker, Norton 1987, p 176
2. Hans Moravec's paper - *Human Culture: A Genetic Takeover Underway,* in the first Artificial Life proceedings - editor Chris Langton. Addison-Wesley 1991 p. 167
3. Chris Langton suggested this in a speech at the Fourth Workshop on Artificial Life at MIT.
4. from Bill Mitchell's book, City of Bits.
5. from the beginning of Kevin Kelley's book, Out of Control, Addison-Wesley 1994
6. The "Game of Life" was invented by John Conway, and is explained nicely in William Poundstone's book, The Recursive Universe, 1985, William Poundstone
7. Animated behavior of physically-based figures in virtual worlds were demonstrated at Artificial Life IV by Sims, Terzopoulos, and Ventrella.
8. Richard Dawkins' excitement upon creating his biomorphs is described in his book, The Blind Watchmaker, and also mentioned by Kevin Kelley in Out of Control, and *Wired,* July 1995, p. 122.
9. Ed Zajec, professor of Computer Graphics at Syracuse University's Art Media Studies Dept. (personal communication)
10. *Genotype* and *phenotype* are terms derived from biology, used in the computer science optimizing technique of *genetic algorithms.*
11. Karl Sims' paper, *Interactive Evolution for Computer Graphics,* in Computer Graphics, vol 25, number 4, July, 1991
12. Ventrella - *Explorations in the Emergence of Morphology and Locomotion Behavior in Animated Figures,* Artificial Life IV proceedings, MIT Press 1994.
13. Sims' technique is explained in his Artificial Life IV proceedings paper, *Evolving 3D Morphology and Behavior by Competition.,* MIT Press, 1994
14. Ventrella - *Disney Meets Darwin,* MIT Media Lab thesis document, 1994.
15. Cohen's work is described in McCorduck's book, Aaron's Code, W. H. Freeman and Co. 1990
16. This idea of *memes* appears in Dawkins' book, The Selfish Gene. Oxford Univ. Press 1976
17. A project underway at Silicon Studio, SGI, Mountain View, CA, to develop an authoring system for entertainment media and game design.
18. From the book, City of Bits, by William Mitchell.
19. Tom Ray's Tierra program is explained in Artificial Life II, edited by Chris Langton, Addison-Wesley, 1992, page 371.

THE VIRTUAL SENSORIA: NOTES ON NEW MEDIA ART

By McKenzie Wark

mwark@laurel.ocs.mq.edu.au

T he Multimedia Thing
Multimedia: nobody is quite sure what it is, or why it is so sexy, but everybody wants to get a piece of it. The Australian government's Creative Nation cultural policy statement promised to pump over $60 million into it. About 150,000 Australians already own computers equipped to run the stuff. Educators, film makers, artists and con-artists are rushing to make interactive multimedia titles.

Yet nobody really knows what it is that the public is supposed to want out of it. To be educated? Why not read a book. To be entertained? Why not watch TV. To be engaged 'interactively'? Well, why not go down to the local bar, coffee shop or laundromat and chat somebody up?

When the Australian Film Commission held a conference in Melbourne on 'multimedia and interactivity', over 500 people turned up. Everybody wants the phantom multimedia users who are supposed to be populating this new market to want something from it, but what?
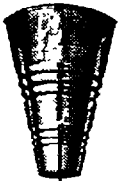
The arrival of a new medium provides the opportunity to think again about what it is the user of the medium wants. How is the desire of the film goer or the interactive user engaged by the form? It also provides the opportunity to think again about what the resources are that are buried in the great traditions from which contemporary media draw.

Let's take the second issue first. It is usually the job of a critic to rank works within their genres, and to rank genres too in order of significance. It is also the traditional business of the critic to define what it is that constitutes a good novel, for example, or a classic movie.

Now, all that is fine if one presumes either that the 'platforms' upon which culture — and critics — stand is stable, or ought to be stable. But if it isn't stable, and one has no interest in it being so, then the job of the critic looks quite different.

So rather than try to nail down what a novel is, and why it is in some sense better than the lyrics to pop songs, its time to reverse the critical engine and produce something quite different. This is a cue for something like cultural studies, with its open minded approach to issues of how culture works and who benefits from it. But the cultural studies mob, with a few excep-

tions, stick to the margins of present and past cultures. Regardless of what the newspaper columnists say about it, it really is a pretty traditional outgrowth of scholarly knowledge about culture.

Perhaps the instability in media forms at the moment calls for a more radical approach still. Rather than all those hierarchies of culture, all those ideal forms of how things should be that we hold in our minds unconsciously, lets think about culture as a bubbling goo of cultural forms, high, low, popular, marginal, commercial, subsidised, everyday, ritualised.

Every time a new technology comes along, the creative and commercial people alike will dredge through that goo looking for forms that might suit the new media vector. Those who can do this with the least preconception will most usually come up with the weirdest and the most original new forms. This is why I think the novelists and the theatre people were not very successful in Hollywood when the talkies came in. They were too snooty. The journalists, who practiced a low and despised craft to begin with, had nothing to lose and dove straight in.

At present, we are confronted with the opportunity of writing for, and teaching about, a new medium, and with a vast array of genres, games and stories that might be the raw goo out of which we make interesting multimedia.

So far, the exploitation of traditional game and story formats has concentrated on examples of games and stories that are already closely linked. This is particularly so with fantasy, horror and epic stories, which for a long time have had associated with them various role playing and treasure hunt types of games.

There are some stunningly original examples that go beyond that. One of my favourites is Lemmings, which turns a particularly silly bit of Disney nature film make believe into a quite remarkable game principle. Here's a game where you have to stop something — the Lemmings — exceeding their limit, whereas the most usual game paradigm is to get something up to the limit.

In order to come up with new connections between the game and the story principle, we need to think a little more about the kinds of desire that the user invests in the medium. There are very few examples of multimedia that allow for anything like the investment of sexual desire that cinema allows, and video and TV retail at a cut rate. We now know, or think we know, that this process is extremely polymorphous and perverse. We don't always fancy who we are supposed to in the movies.

One would think that there would be an interesting trade off in multimedia between the lower resolution of the image but much greater flexibility in positioning oneself and choosing kinds of interaction and kinds of character to interact with.

Unfortunately, there's been some pretty cheap and pretty straight porn stuff authored on cd-rom, but not much that really draws from the rich soup of narratives of desire that exist in popular culture broadly conceived, if not in the mainstream of Hollywood.

It would be a shame if the kinds of story and play that people try to fit into multimedia were only those *prefiltered* by cinema and video — completely different media.

Desire for empowerment is another logical application for multimedia. In cinema philosopher Gilles Deleuze's terms, video games construct movement-images. The world seems to hang on one's actions, and collapses when one's character dies. There's a certain dark pleasure in this, in seeing whole video worlds wink off the screen because the Prince of Persia bought the farm. But once again, all we have so far are puzzle solving, dexterity and shoot em ups. What other traditional game-skills might one put in place here as the pleasurable process via which one gets to play at exerting power over an environment?

Desire to become someone or something, desire to have power over someone or something, and also possibly desire to be somewhere — else. The idea of multimedia as landscape bears looking at, and revisiting as a popular tradition, the tradition of the heterotopia. The fun park, the Persian carpet, the hall of mirrors, the folly. There's a rich tradition there that I would love to see connect to the notion of the simulation. I mean, Sim City is fun and all that, but I'd rather build the kind of cities that exist only in movies like Barbarella, or in Prianesi's drawings or in the work of Archigram. The cartographic desire is, I think, the least explored here.

Might we discover new desires in a new medium? I suspect not. But we might rediscover some old ones. The movie-TV-video trajectory pushed to the edges a lot of marginal and quirky desires that, for example, traditions of carnival, mardi gras, or very elaborate and non-linear narratives like the 1001 Nights or the Mahabharata kept fully in play. One of the cool things about multimedia is that it allows us to reassess our assumptions about these cultural traditions, give them a new interpretation and a new lease of life. I would love to see the epigram reborn in multimedia, for example. Or the haiku.

As with previous new media, I think whoever does the most open minded research into the kinds of cultural resources that are lying around untapped, in the archives, in folk culture, in the margins of pop culture, will come up with the most original and challenging stuff, and who knows? Perhaps the odd killer app. We can comfortably assume that the combined corporate might of Hollywood and Silicon Valley — Siliwood, will turn even Natural Born Killers into a really lame cd-rom. With a bit of luck, talent and cultural policy guidance, we might get to do some cool stuff around the edges of that.

The one truism one hears all the time about multimedia is that it is more 'interactive' than TV or cinema. The user has more choices than the viewer. TV and cinema are passive mediums for spectators. Multimedia is an active medium for users. This is one truism that is absolutely untrue. All of the qualitative research into what people actually do with TV and cinema shows that the audience is an active participant in the production of meaning in these established media. It may flatter the vanity of screen writers, directors and producers to imagine that there is a great pile of squeegees out there ready to soak up the juice of whatever fantasy they wish to purvey, but that is not how these media work. And I don't see how we can even begin to appreciate how new media differ from old media if we begin from fundamental misconceptions about the old media.

Audiences negotiate meaning. The accept, resist or negotiate what they see and hear depending on how it suits what they know of the world and what they want to imagine in their heads. This is already what happens when people watch TV or go to the movies. The choose to identify with Roseanne against her kids, or with one of the kids against Roseanne. They choose to see Roseanne as an indictment of all that is banal and detestable in work-a-day family life; they choose to see it as a celebration of all they love and cherish about exactly that kind of life. They might identify with Sandra Bernhard, the lesbian-next-door. They might not. This is how culture works. As Orwell said, cultures are not manufactured. They grow of their own accord.

Conversely, far from giving the user more 'choices', multimedia can be seen as empowering the creator and restricting the users choices. An author can't control the order in which a reader reads the pages in a book. If we want to read the ending first, nothing can stop us. If we want to skip a chapter that bores us, we are free to do so. With a 'non-linear' book, like Adorno's magnificent collection of epigrams Minima Moralia, nothing stops us skipping the ones that bore us. But with a multimedia title. All this can change. The creator can hide the ending from the user. Or insist that certain screens not come up except via other screens. Or one can demand that the user make the 'right' choices in order to avoid being sent straight back to the start. There's a great text-based work by VNS-Matrix on the Mindvirus disc that does exactly this. If you don't get your head around the aesthetics and ethics of the cyberfemme Q back to the start you go.

So please: let's not go making assumptions about new media, on the basis of old media that are themselves pure prejudice. In fact, let's make as few assumptions about new media as are absolutely necessary to begin to experiment with it. The 'multimedia thing' is at present of unknown shape and size. Let's keep it that way for a while.

In sum, there is only one thing I can say for sure, and that is that our understanding of the past of culture, and the breadth of culture, will be changed by multimedia. As with all emergent cultural forms, it shapes our sense of the residual cultural forms we leave in our wake — half remembered and half forgotten. Perhaps in 50 years time we will have a culture where everybody knows what midrash or golliard writing is, but is no longer very interested in the novel. Now that would be interesting!

2. Art Goes Interactive

There's something about new media and artists that make them get down with each other as soon as the possibility arises — think of those fabulous dada and surrealist 16mm films. As soon as light, cheap, mass produced cameras were on the scene, so were the artists. Likewise, now that cheap(ish) mass produced multimedia interactives are a possibility, its also an art. The curators, the critics, the editors and other aesthetic gatekeepers will wake up to it sooner or later, but the art is happening and redefining what art might be.

With a Mac, a scanner and a few off-the-shelf programs like Macromind Director, Photoshop and Hypercard, anyone can do it. Which means anyone is doing it, which means there's a lot of trash out there, both on the commercial multimedia market and in the electronic art world. The success of the cd-rom game Myst has created the first multimedia hit, and every record company, publishing house and video-game firm in the military-entertainment complex of our time is out there looking for the next 'killer app' to bust this market wide open.

It may be a long time coming. In the mean time artists around the planet are using multimedia tools to create an aesthetic exploration of two related problems. Those problems are, firstly, what is multimedia art good for? What does it do that other media don't do? Secondly, what does making something in this media tell us about the context for making art today? What does it make us think and feel about the information landscape of our time?

Linda Dement's Typhoid Mary cd-rom interactive strikes you first with the intensity of its cathode colours, the lushness of its forms. Erotic and abject elements of the female body entice and repel, but always fascinate. You wander over the images with the mouse as with a virtual hand, not quite sure if you are allowed to touch. Clicking the button shifts the images along, or reveal scraps of text, some borrowed, some by Dement herself, fragments of personal diaries or public pronouncements on the management of bodies. Rather than feeling disjunctive, the whole thing seems rather fluid, an aesthetic out of Irigaray, aware of but indifferent to masculine principles of order, seeking a connection between the feminine and the digital where both become something else in the process.

It would be nice to see Dement's work alongside Christine Tamblyn's as it is a sort of alter ego to it, concerned in a more didactic way with the relationship of the female body and technology. Dement wants to explore what's possible there, Tamblyn

wants t critique what's gone before. The opening screen presents floral arrangement of pixellated petals, click on each and a link in the daisy-chain of images that link the bodies of women and machines presents itself. Since the only universal history, Deleuze and Guattari tell us, is the "history of contingency", then it makes sense to retell histories in the space of multimedia, where networks of links bind together particulars that could illuminate many different stories. Let a thousand past flowers bloom.

The Deleuze connection is much discussed in the theory of hypermedia, a more textual cousin to the more image and art practice based multimedia. Brad Miller's Digital Rhizome cd-rom straddles both nebulae. As a last nod to appropriation art, Miller rips a few pages from Deleuze and Guattari's A Thousand Plateaus, and scans them into the digital realm. There, where there is no physical scale, no breathing time, they become philosophical talismans of a world to come, an ever purer zone where intensities gather along and every line of relation. Following those plotted by Miller takes you in and through the body and on into the universe, for scale, boundaries and identities are all put in flux.

If Miller's version of the emerging digital landscape is a cheery one, Jon McCormack offers a more irksome vision with Turbulence, a cd-rom driving a touchscreen interface and a collection of McCormack's intense animations from laser disc. Trained in cinema and mathematics, McCormack has a unique grasp on both the logical and visual dimensions of the artificial-life terrarium he creates, using a mix of off the shelf and self-authored software. In Turbulence, one has access to a set of 'scientific' looking records of life in a virtual world. Strange phyla not only dwell here, they grew here.

McCormack convincingly shows a world that is more than human-made, it is self making, where the creator seeds a space with agents that grow and change and adapt of their own accord. The animations give a particularly uncanny image of this world. Strange triffid-like species grow and pulsate with almost nauseating fury. What is even more disturbing is that the point of view from which we see these creatures belongs also on the 'other side' of the monitor, for no human eye and camera could dwell in this space, and McCormack accentuates rather than hides this aesthetic and theoretical problem. By creating and visualising the possibility of another nature, McCormack obliges one to reflect on what is left of our strange relation to this one.

Where McCormack uses the logical properties of the digital realm to create another nature, Bill Seaman uses it to create another language, or more precisely, another logic for this one. His Two-screen cd-rom installation The Exquisite Mechanism of Shivers presents a series of perfectly grammatical but not necessarily meaningful English sentences, each word of which corresponds to a video image and a sound. With the menu screen, you can use substitute parts of one sentence for another. You are stuck with the grammatical form of the sentence, but you can make up a hell of a lot of sentences, all equally grammatical, all strangely senseless, and each creates a new 'sentence' of images and sounds.

Its a highly formal work, rigorous in principle and consistent in execution, and it uses the interactive form to explore that most interactive thing of all — language. In doing so it throws into relief the experience of that which has a grammar — language — in contrast to experiences that don't — what they eye sees, what the ear hears. Its a subtle evocation of the way language orders the other senses, where 'orders' has the double meaning of enforcement and sense.

Similarly formal in a sense is Marta Guitart's Please, Touch Me... Three screens all show much the same beating heart, floating in the phosphorous-white space of the screen. But touch each one in turn, and each responds to the touch differently, as if it were an individual presence, not a perfect digital replica. The work plays on the distance between the quirky personality we all attribute to computers and their mass produced identical identities. Where McCormack wants to explore to the max how different the digital world can be, Guitart draws attention to how we colonise it with our anthropomorphic assumptions.

The digital world can be a space into which we project bodily desires or rational plans, or it can be a world where the infinite combinations of media imagery play free. Troy Innocent's Idea-On! presents a digital infoscape where the extreme possibilities of mutation and relation between pop imagery creates a space beyond irony, where nothing appears any more to be 'out of place'. Idea-On! is the most inventive work I've seen yet in terms of the kinds of virtual geography Innocent has created. There were at last count four separate domains within the work, each organised around its own spatial metaphor of movement. Innocent has also come up with an aesthetic that makes the most of limitations of cd-rom media: bold, back-lit colours and graphic shapes gambol gayly in a world beyond fear or hope, in a theme park designed by Neitzsche rather than Disney.

A more modest work is Innocent's interactive techno-tune on a floppy for the Shaolin Wooden Men's song OHAR. Sponsored by Ollie Olsen at the techno dance label Psy-harmonics, the Shaolin are a techno band who's public appearances are all handled by cartoon characters of Innocent's design. They appear in the video and on the floppy, and will even be downloadable over the net. Its a perfect commission for Innocent, who's work with the Cyberdada collective and on his own has always imagined the world as a digital realm in which the simulacrum is pushed to the limit. Here he gets to make a little piece of it that will be commercially released in what is still nostalgically called the real world, or as one says on the internet — RL.

The mutation from art to commerce is also happening to the body of work of Toshio Iwai. In his Amiga based work,

four 'insects' crawl across the screen. By putting coloured spots in their path, you can make music, as the insects trigger sounds as they cross the coloured spots. This is loads of fun, and its popular in any gallery where it is installed. It's nice to see kids having fun in an art gallery, unphased by their surroundings but engaged in a new visual experience. Spotting the potential of Iwai's artwork, Nintendo plan to market it commercially. The insect music game will be supplemented by more typical Nintendo style games in the finished product, but it will be the first art-on-a-cart in 16-bit video game culture.

One art work that could easily be developed as a kind of alternative game culture product is Game Girl by the women's multimedia art group VNS-Matrix. This cd-rom is a somewhat didactic corrective to the boys club game culture — its project is no less than a game space of entirely female principles. In this game you have to "infiltrate Big Daddy Mainframe and subvert his core architecture." Work by VNS-Matrix, Linda Dement and Christine Tamblyn help to dispel the presently popular notion that this is an inevitable feature, overcome only by the negative step of censorship.

VNS propose that we look at the questions of relation, between body and technology, male and female, inner and outer states, from other perspectives, and that multimedia is as good a place as any to do so. But there's more: maybe women can make new relations of difference, between images, bodies, identities, artefacts through this media. As cyberfeminist theorist Sadie Plant suggests, its *masculine* orders of time, place, relation that are threatened by the proliferation of digital difference, so maybe women gotta get with the digital flow...

"Cyberfeminism suggests there's an intimate and possible subversive element between women and technology." Plant, who teaches at the famous Birmingham Centre for Contemporary Cultural Studies, features in Mindvirus, a twin-floppy interactive "datazine." This neatly packaged interactive hypes itself as "an alternative media source. It uses its hosts to replicate covertly and it feeds on its own hype. The mutation continues upon contact with the user." By making cyberpretension ironic, then folding the irony over again and presenting it as is, Mindvirus creates an aesthetic aura for itself that rises above the now routine cyberboredom. The optional 'randomiser' is a nice touch too — with the click of the mouse you're off on a serendipidy ride through the stacks, or dumped into the 'cow zone'.

There's a hypermedia version of the VNS All New Gen work on Mindvirus, one of the most suscint versions of the recursive, hyperlinked story I've seen. VNS use this model to build in links that short-circuit straight back to the start, but also links that extend the story, weaving deeper into the maze. So far from offering the user a free space to control, it rewards some story-choices with more story. Think like a cyberfeminist, and more is revealed. Think like a dick, and its all over in seconds.

This is the cyberfeminist aesthetic ploy — use the desire to know and to see built into patriarchal thinking as the hook to shift the user's desires elsewhere, or simply shrug them off if they don't get it. "In the space between words she searches for clues. The virus of the new world disorder takes on the transglobal fathernet of power and ambition. Dirty work for slimy girls." The wit of VNS is this combination of being down with what market culture has done to the law of desire with a subtle morphing of that law against itself. This is art that anticipates a market — that's my hot tip for culture capital investors!

Its an open question whether interactive digital art really needs a market at all. David Blair's Wax Web is a hypermedia version of his extraordinary video work Wax: Or the Discovery of Television Among the Bees. Anyone with access to a nice, high bandwidth internet connection can connect to Wax Web, which is based on the popular MOO environment. You can read the script, look at clips, add your own annotations, in what Blair hopes will be a collective interactive embroidery on the Wax world.

The Amsterdam-based magazine Mediamatic included a free cd-rom with their last winter issue, 'produced' by Gerard Van Der Kaap. The works compiled on BlindRom are of variable quality, but the interface to them has a zany, hit-and-miss quality, like that Monty Python record that had two grooves on the one side, so you never quite knew which you were getting. BlindRom is that multiplied by a factor of ten, which is what taking the idea of truly random access from the analogue to the digital realm can do for you. The idea of artists compilations, 'produced' so that they form one matrix is a good one, though. BlindRom is at least less annoying and more creative than Blam!, an American concoction that seizes hold of your Mac and won't let go of it for its dazzling display of petulance.

Up til now art has remained a resolutely analogue affair. Paint brush moving on canvas, video camera panning across a body, performance art of gestures and sighs. In the appropriation art of the 80s the disjuncture and combination of images emerged as an aesthetic. No longer this image or that image, but the relation, the space, the suggestion in between. Digital media make that inbetween the whole of the art.

There's not much to be said for the quality of the images one can put on a monitor — issues of quality in an image are an analogue notion, all fine gradations of line and shade. No matter how fine those gradations get with each quantum jump in computer power, its still pointless to compare digital images with their analog predecessors. What's needed instead is a new aesthetic. I don't mean a new aesthetic theory, although that will come, but a thumbnail aesthetics, a set of rough benchmarks to hold up to the new digital realm.

The first word in that thumbnail aesthetics is relation, the inbetween of images. What can the relations between images

signify about what difference is in the digital realm, and what can those differences say about the culture on this side of the screen? This side of the screen is increasingly invaded by things created on the other side. A lot of Jurassic Park came out of the terminal gardens of the digital world, as we know. The aesthetics of interactive art can be an exploration of what those relations in that black box are about, a communication of those explorations back to physical space and time, and a meditation on what may yet come out of the black boxes of the military-entertainment complex, coming to RL near you.

Its not that multimedia is somehow more 'free' than any other media, or somehow 'more' interactive. Interactivity is a quality, not a quantity. Multimedia offers different kinds of interaction, not more of it. Indeed it may even offer less. Brad Miller's Digital Rhizome is considerably less interactive than reading passages in the book for yourself. Multimedia can actually put some of the control of relations between different elements of the aesthetic experience back in the hands of the artist.

That may indeed by why it appeals to artists. You can have your lateral thinking rhizome but make 'em use it the way you intended too. The trade off is that one can have relations between texts, images, sounds, movies, or one can use an interactive to drive other devices like McCormack's laser-disc animations. We don't yet have much of a concept of what kinds of grammars sounds and shapes might have, but an art of relations will invent them. Bill Seaman's work already does.

In multimedia art, the artist exerts more control over the flow of time compared to a book or a sculpture, but without strapping the user to a relentless linear flow of time, as in a video or performance. Its a hybrid, somewhere between a 'time based' and a 'space based' art form, in Lessing's terms. And as Lessing argued, there are things each form does best, or at least one can so argue. Sculpture may lend itself to drama better than comedy, and to landscape not at all. Poetry can be lyrical but rarely succeeds at being monumental or didactic, and so on. So what I'm proposing is that multimedia lends itself best to an art of relation and to imagining topographies of relations that transgress those of the physical world. That at least is what the best multimedia art at the moment does.

3. The New Abstraction

"We have to discover everything about everything."
Godard

If multimedia promises anything it is the coming of a new abstraction. Images and sounds dematerialise, lose all meaning, loose all sense of origin and authorship. That much we already know. But while images and sounds become as nothing, the *relations* between images and sounds become the last zone in which an aesthetics is still possible. The object has disappeared. The image is disappearing. The artist is dead. The

context has become the infinite slippage of intertexts. But the relations *between* Q those remain. Bear with me for a while and I'll explain.

Plunge down one of the 'shafts' in the CD-ROM called Blam!, and you find yourself transported at random to any one of a number of cuts on the ROM. The soundtrack is something like the attack of a dozen paint guns at point blank range. A cut up of a cut up. You may find yourself reading Thom Metzger's 'This is your final warning'. Bored, I click on the Blam! icon to go back to the start. Only I don't get back to the start. The screen informs me that I'm to be subjected to 'Devil in a dead man's underwear', an even longer Metzger poem, which is "brought to you as your punishment for not finishing This is your final warning." {sigh} That's the way it is in multimedia.

The one truism one hears all the time about multimedia is that it is more 'interactive' than TV or cinema. The user has more choices than the viewer. TV and cinema are passive mediums for spectators. Multimedia is an active medium for users. This is one truism that is absolutely untrue. All of the qualitative research into what people actually do with TV and cinema shows that the audience is an active participant in the production of meaning in these established media. It may flatter the vanity of screen writers, directors and producers to imagine that there is a great pile of squeegees out there ready to soak up the juice of whatever fantasy they wish to purvey, but that is not how these media work. And I don't see how we can even begin to appreciate how new media differ from old media if we begin from fundamental misconceptions about the old media.

Audiences negotiate meaning. They accept, resist or negotiate what they see and hear depending on how it suits what they know of the world and what they want to imagine in their heads. This is already what happens when people watch TV or go to the movies. The choose to identify with Roseanne against her kids, or with one of the kids against Roseanne. They choose to see Roseanne as an indictment of all that is banal and detestable in work-a-day family life; they choose to see it as a celebration of all they love and cherish about exactly that kind of life. They might identify with Sandra Bernhard, the lesbian-next-door. They might not. This is how culture works. As Orwell said, cultures are not manufactured. They grow of their own accord.

Conversely, far from giving the user more 'choices', multimedia can be seen as empowering the creator and restricting the users choices. An author can't control the order in which a reader reads the pages in a book. A curator can't control the way a spectator walks around an exhibition.

With a multimedia title. All this can change. The creator can hide the ending from the user. Or insist that certain screens not come up except via other screens. Or one can demand that the user make the 'right' choices in order to avoid being sent

straight back to the start. There's a great text-based work by VNS-Matrix on the Mindvirus disc that does exactly this. If you don't get your head around the aesthetics and ethics of the cyberfemme Q back to the start you go.

So here is a medium that gives one thing, and one thing only, back to the artist. The ability to determine relations. And of this it is possible to create meaning. Signs proliferate, mutate, their relations with each other, promiscuous and obscene. Audiences shimmer like a mirage on the horizon. They warp into black holes or become polyvalent creators of their own sense and sensibility. Objects dematerialise into digit bits. Everything a copy of a copy. Everything is permitted, and so nothing is true, not even to itself. But wait! Along one dimension and one dimension alone, the possibility of constraint returns. And with constraint comes the possibility of making meaning. That one dimension of the manifold, almost infinite dimensions of aesthetics is relation. Relations between sounds, images, movements, words Q between any and every form. Now the artist can install a limit within the work to the omnivorous desires of the viewer, listener, interpreter. The god-like power of!
the other on the end of art to paw at the object, flip through the pages, flick their eyes over the artwork and on to the next can be taken back and given to the artist.

A great example is the CD-ROM work Cosmology of Kyoto. I don't much care for the look or the sound of it, although it is a nice design all round. The truly remarkable thing about it is that it has reproduced a simulacrum not only of what Kyoto in the Heian period looked and felt like Q but what the worldview was of the people who lived there.

There's a handy reference work appended to the CD so you can learn about Buddhism, or the customs and superstitions of the time, but that is not where the work is truly great. Watch anyone use Cosmology and like any contemporary art-devourer, they skip and scan, frantically waving the mouse and staccato clicking on the button. We are impatient gods when we sit down to chew on other people's vision and thought.

No, what makes Cosmology truly remarkable is that as you enter the town and interact with its inhabitants, you have only two choices. You can, in your arrogance, remain as you are, a contemporary Japanese or American, for example. And you won't get very far. The structure of relations that are the real art of the work won't let you. It does not allow this nonchalance with meaning. A more interesting choice is to try and understand the world as it would have appeared to a person of the time. Then you start to make your decisions, when you meet the guard, or the priest, or the gambler, according to someone else's meaning making map of Kyoto, and indeed of the world. You work within the constraints the artists have placed in the matrix of relations that are the art of this work. The look and feel of it are just window dressing. They are not art, they are design. The art is the in the relations. Follow along the line of those rela-

tions, and you learn what it means to be in the world as the world appears from the point of view of Pure Land Buddhism.

Relations, meaning, point of view Q constraints placed on any casual play with signs. If this were a book or a show, you could just take yourself off to the last chapter or the last chamber and see what enlightenment is. Only there would be nothing there to see. Enlightenment is not something that can just be had. But if you learn to live within the constraints of this work, you might just get a glimpse of where enlightenment lies.

We here a lot these days about how multimedia is all about 'content'. Every conference I go to on it has people jumping up and down going, "but what about me! I've got content!" Musicians, visual artists, designers, script writers, sculptors. Everybody's got content. Only multimedia is not about content. Content is irrelevant. You could pillage a heap of broken images from anywhere Q like the makers of Blam! did, and still make meaning. Because that with which one makes the meaning is not the images, or the sounds, or the user friendly interface, its the relations between.

This is where critics like David Cox who insist on the importance of the video game paradigm have a really good point. Cox cops flack where ever he speaks or writes for introducing notions from the trashy world of video games into the rarefied domain of digital aesthetics. Metaphors for what the new media might be about drawn from literature are OK: "Hey, Moby Dick is non-linear!" From the visual arts is OK: "Virtual gallery!" From some dead domain of culture: "I found this old book by Frances Yates everybody's forgotten on Giordano Bruno and the art of memory!" But frankly, the best way to understand what multimedia does best is to think about games and sims.

Games are important because of the way they structure meaning through constraints. Its very simple. You don't get to the next level until you figure out this level. You might need to work fast within those constraints, as in a shoot 'em up. Or you might have the contemplative puzzle solving of Myst. It depends on how arthritic your joystick hand is. But either way, a funny thing happens. By constraining the omnipotence and the omnipresence of the user to see what they like, the game convinces the user to see things in terms of how the other wants them to be seen. Either you kill that boss thing at the end of this level or you just don't see the next.

Now, most games don't have much to offer in terms of a view of the world. Unless of course they happen to be Cosmology of Kyoto. But the possibility is there for many more games like Cosmology. Games that oblige you to see from the point of view of the other, in order to see at all. Of course, games are just media. They can't compel you to agree with that point of view. But given one very important condition, they can oblige you to see things *from* that point of view. And with a bit of luck, once you see things from the point of view the artist has made

for you, you look back on yourself as an other Q now isn't that one of the most sublime goals of the aesthetic?

That one very important condition is desire. One must have the desire to see, to hear, to feel whatever it is one believes is buried within a CD-ROM, just as one must have that desire to watch Godard's '2 ou 3 Choses Que Je Sais D'elle', or to read Moby Dick, to chose examples at random from the mess of books and videos and ROMs and stuff on my coffee table at the moment. I can fast forward the video (it bores me). I can flip to another part of the book (because I feel like it). But I can't do that with a well crafted CD-ROM or a video game. But I want to! Constraint creates desire. The very fact that I can watch what video I want, how I want. The very fact that I am inundated with books of every kind. That my own apartment is a museum without walls Q bores me. I am not more cultured for not suffering the scarcity of good books and art that plagued, say, Diderot or Kant. I am more bored. But that I *know* that there is something hidden in this CD-ROM, that excites me.

Something similar happens with sims. A sim is not a game, because games have levels and scores and all the paraphernalia of measuring achievement. A sim is a bunch of algorithms that make a bunch of factors all vary in relation to each other. So if I tweak this variable, all the others are affected. Which is all a bit too abstract for most people, except if I make the variables a tax rate and a few different kinds of expenditure and a set of flows in space. Still too abstract? OK, here's a bit of land on your computer screen Q now build a city. Or here's a nice place for an ant colony Q let's be ants! Sim City, Sim Ant, Sim Tower, there's a bunch of these on the market now. Whatever the window dressing, they are basically about relations, just like Blam! or Cosmology. You make choices within a set of constraints that gradually reveal themselves in the way events unfold on the screen. Most Sims are pretty unimaginative, although there is something about learning how ants think that I find radically othering.

The possibility is there to make an art of pure relations. The various cellular automata programs that you can get come even closer, but they are a little too lacking in concrete detail to be really aesthetically interesting. Its getting the combination of concrete particulars with very abstract relations that is the aesthetic problem for our time.

Linda Dement's work Cyberflesh Girlmonster is another take on this. Like cyberfemme theorist Sadie Plant, Dement has drawn a positive connection between the otherness of the point of view of woman and the space of multimedia. Forget the tentative steps in this direction of Donna Haraway. Dement has the will and the nerve to *become* the monster, the cyborg Q the artist. In her CD-ROM body parts form weird and mutant couplings with each other. It is as if they separated themselves from their host bodies. It is as if each expressed a desire of its own. And yet they are not set free entirely. If they did succeed

in freeing themselves entirely from an order, they would cease to mean, and Dement is no deconstructionist. The disordering allows a reordering, around a deviously dyky desire for an other order of the body. Cyberflesh Girlmonster is all four of those terms, dismembered and remembered in a new set of relations.

Again, its revealing to watch a work like this being used. Perhaps multimedia only becomes are when it ceases to be merely an art object or a text and becomes a vector Q when it becomes a relation between the actions of a user and the reactions of the work. (Or should that be the other way around?) But I digress, and as this is not a hypertext essay, you will have to imagine where that thought might go, were I to pursue it. Were I to *let* you follow where it goes as you click away on your mouse...

So there's Dement's work, with a warning sign on it that it "may offend." So of course the group of teenage school boys on an excursion to the gallery zero in on it and play with it eagerly. And it excites their desire. But they don't get it. They don't want to get it. A cyberlesbian remapping of the relations of the visceral with the sign is not something they're ready for yet. And yet it touches their desire. Around and around they go, learning how to make it go back and back and back to the screen that shows the little line of throbbing cartoon cocks. Stuck in an infantile repetition, the rest of the work remains a mystery to them. And so it should. Not by the coercive prohibition of censoring the image Q people often complain about Dement's work and ask that it be removed. But the work itself involves a constraint. You simply don't get to read her fantasy stories, or see the mutating flesh of images, if what holds you endlessly fascinated is the dancing line of harmless little penes, all wriggling in a row.

For an image too remain sacred, there must be a limit to how it may be used, or where it may be used, or by who it may be used. The avant garde aesthetics of confrontation, of shock, of exposure with which Blam! still flirts now needs its complement. To go with it we need to create a space in which certain images may be restricted in terms of the kinds of relations they may enter into in the world. It doesn't matter which images. The sacred is a kind of relation. What is sacred to a western desert Aborigine is different from what is sacred to a redneck fundamentalist. But both preserve a certain limit to the relations images may enter into. There is no contradiction between wanting to free one's self from institutions like the church or state that coerce obedience to a certain content of the sacred, and wanting the right to restore the condition of being sacrosanct to certain images. That making sacred, by limiting relations, is what multimedia can do. Precisely because multimedia is nothing but relations.

Abstraction, as it was conceived in the 50s, was still too tied to the materiality of the art object, the specificity of art history and the context of fine art institutions. Abstraction has

nothing to do art for its own sake, self consciously reflecting on its materials, its history and its context. That was not and is not abstraction, that is a rarefied and ultimately uninteresting formal game. To abstract is to free relations from *any* impediment, not just conventions of representation. To abstract is to free the aesthetic from art itself. Which is precisely what has been happening on the fringes of every new media form that technology and the market has cooked up in modern times.

But how free do the relations between any possible sign have to be before we start to desire something different, something perhaps quite the opposite? The World Wide Web is a little glimpse of what a pure rhizome of dematerialised vectors might be like. What if everyone in the world had their own Web site? (According to the Lycos Internet Catalogue, there are already 3.6 *million* Web pages out there...) Millions of little bunches of relations between words and images and sounds, all freely pillaging and reacting and relating to each other! No more materiality of the aesthetic object Q any image can be copied from anywhere to anywhere. No more ownership or moral right in the creation Q anyone can do anything with any work as they please! No more division between the artist and the audience Q everyone is equally a creator! The result? The abstraction of art from art itself Q the end of meaning.

Already there are some dangerous attempts to rope of possibilities, and some done in the name of the 'sacred'. Like the sacred right of media conglomerates to make money off their stockpiles of images. Or the policing of what images and stories can lurk out there. Child pornography! Recipes for drugs and bombs! There will be many more battles on what one can do with what images and sounds, where and with whom. For it is in creating restrictions amongst these relations that institutions and communities prove to themselves that they exist. We are what we prohibit ourselves from becoming; we prohibit ourselves from becoming by not even knowing that there may be something else to desire to become Q and we do that with a ban on certain images.

Perhaps artists today need to fight on two fronts. One is defending people's right to put up on a Web site or in a gallery whatever the hell they like. Personally I would like to see Serrano's Piss Christ and a few choice Mapplethorpes copied and recopied and distributed digitally all over the planet. But on the other hand, is it not time to offer the possibility of participating in the mystery of the sacred? The desire that Cosmology of Kyoto answers is actually the same as the desire Cyberflesh Girlmonster answers. The desire for relations between images and words that may be different, but which have certain disciplines and constraints programmed into them. A sacred space in which one must make ones self become what the other wants in order to accede to one's desire for it, rather than always being able to have the other any way one chooses.

We have to discover the limit to discovering everything about everything. We have to rediscover the joy of the unknown other, hovering on the other side of discovery, always pure, always unobtainable, always barred by relations we have yet to understand. If we reimagine the limit, transgression too might seem interesting again. And in multimedia, we have the most perfectly abstract space to date with which to do it.

McKenzie Wark is the author of *Virtual Geography: Living With Global Media Events*, and lectures in media studies at Macquarie University in Sydney, Australia.

ILLUSIONS OF REALITY

By Lanny Webb

A little over three weeks ago I attended the SIGGRAPH conference in Los Angeles. For almost a week I wandered through the exhibition floor viewing sometimes extraordinary new technology with a feeling of awe. I remembered my last SIGGRAPH of five years ago, and I was overwhelmed with the incredible changes that had taken place in that short time. My excitement, however, came with a heavy dose of apprehension as I was also constantly confronted with the reality of how little I know. I was reminded of walking the midway of my county fair as a child. Gaping at the colorful and exotic entrances to "Egyptian Ella, lady of a thousand veils" or " The Alligator Man, raised by alligators from birth" I can still hear my mother say, " Don't look in there; you don't want to see that." But now that I have the dubious title of "adult," I am free to go in every booth. I retired every evening that week with the feeling that my hard drive was full and with the haunting suspicion that my mother was probably right.

Recently, at the University of Georgia, we conducted a national search for a Full time position in "Computer Art." In a connected faculty meeting, a senior painting professor asked if I could define this new area. I cannot or perhaps will not, for if we define computer art, it becomes limited by its definition, and the potential of this new tool is virtually limitless. For some traditionalist, however, "Computer Art " is an oxymoron. For others the computer is one of the most exciting creative tools to ever come along. For me, the computer's power can be both a seductress that leads me into kinky aberrations of my normal artistic direction, or a forthright facilitator in achieving images not otherwise possible.

I originally took on this new medium not because I was seduced, but because for our graphic design students to find work, they had to know it. In my initial three year pilgrimage into the new language of computer acronyms, my imagemaking, for all public purposes, ceased. I was working, learning, struggling, fighting the computer. I did volumes of weird creations. Some were really quite interesting, but, they all, however, lacked (?). Some were clever, some just bizarre. None of them, however, had much meaning beyond their flashy technology, and there lies the rub. This stuff is tedious, sometimes painful, to learn. But it can do extraordinary, unbelievable things. It is, therefore, easy to become so fascinated with your new found wizardry that the "magic" starts telling the wizard what to do.

Much, if not most, of the digital imaging being done today yields results which are obviously created with the use of these remarkable computer tools. Odd distortions and montages with transparent overlappings or combinations of the computer's

isea95@er.uqam.ca T : (514) 990-0229

ISEA95 montréal

314

version of traditional pen, pencil, and brush tools with photographic sources appear to be the most predominant result. Maybe this is as it should be, exploring and investigating a new medium, pushing to see in what new directions of creative expression it can take us.

For me, however, It was not until I quit trying to show off my new tricks that I started making images I began to have some respect for.

It is when the medium overshadows the idea that it makes me uncomfortable with what I see in much of the new computer generated images. Experience, however, does not bring with it immunity, and even the most reserved of us can be wowed. I am tremendously excited by much of the computer generated art being produced today, but I wonder if I like it because I am drawn to the magic of its message or the "Jeez, how'd they do that?"

I attended an opening recently of a collection of engravings by the remarkable John Taylor Arms. I am attracted to his work because of his sensitivity to subtle lighting relationships and unusual lighting situations. I revere his work with a sense of awe for his incredible, almost inhuman, craft and detail. Arms felt "art" had two elements: the spiritual and the technical skill. He believed the spiritual content was by far the most important. He also felt, however, that the mastery of one's medium and perfection of technique was what allowed the spiritual idea to achieve greatness.

While far from a master of my medium, I too strive to create work that has as its essence a spiritual quality. So I will preface my discussion of my computer trickery with my artistic direction.

In general my images seek to re-create more of the spirit of a place or occurrence than the actual place or occurrence itself. They are documentary in their attempt to record a posture rapidly vanishing from the Southern American experience. They are editorial in that they are a reality greatly tempered by sentiment.

While my Southern childhood of the fifties leaves no illusions of this turbulent period of transition, I am never-the-less indebted to a heritage generous with colorful customs and genteel tradition. For me, things Southern are based, in large part, on a devout respect and reverence for the land, a love of life, and a confirmed necessity for time to reflect. These quiet times for reflection and genteel relationships are perhaps by themselves inconsequential, but they create in unison what I feel is at the heart of Southern conscience. My images are born of these things, not so much from a sense of nostalgia, as from an attempt to record this disappearing sentiment once native to the South.

Within this setting, my subjects are almost universally outdoor images, some urban, mostly rural. Man, or some indication of his existence, frequently appears to be a necessary, while not prominent, component. In some instances he is obvious, in others subtle, but in the best of situations, he is upstaged by his surroundings. This demotion of man to a subordinate status is the result of a personal prejudice. I often perceive an essence in things around me that is so apparent it becomes a tangible entity in itself. An old house, familiar place, or summer breeze can have a distinct presence. I relate to this presence at least passively if not actively. A favorite old chair becomes a friend, and the rich scent of an oak fire consoling. I am easily humbled by the power of a summer storm but at the same time feel an odd reassurance in its omnipotent show of force. There is a timeless quality about these things. We find solace in sunsets and ocean views perhaps because they are always different but always there. They are the constant; we are the transient element. It is this relationship between temporal and continual that I find intriguing.

The most important factor in determining the success of my work, however, would be in its ability to re-create the essence or mood of a particular setting. To this end, I have found the use of light to be my most valuable tool. I have always had a fascination, if not an obsession, with light and how it affects the spirit of a subject. Our perception of a subject is determined by its lighting, and yet we frequently are not aware of this ever present but subtle force. The essence of any subject can change poetically, dramatically, or mystically depending on the quality of light. Strong sunlight can have an oppressive, suffocatingly still heat or be viewed as a wash of bright purifying light. The rapidly changing light of a late afternoon summer storm often creates a simultaneous contrast of colors and moods, for example, splendor and gloom. The mystery of a silver moon can cast a quiet peace or create a crisp tension. A special magic can be felt during a dawn or dusk full of transient light. During these times there is a mixture of calm and constant slow change like the movement of the hand on a clock. You can't see it move, but every minute is new. The use of unique lighting then becomes the primary tool I use to create the specific mood, or the character, of a subject or place.

This character of a particular setting, however, is often times very subtle. For this feeling, or unique quality, to be apparent, I must focus on its "essence" by deleting or adding information. In most instances, it is what I take away, more than what I add, that improves the image. The images, then, are not just attempts to faithfully record reality in the form of a photograph. They try to portray, in a photographic medium, an image which in reality never existed, but, through numerous manipulations, more clearly conveys the mood or character that attracted my attention to the subject initially.

There is an inherent quality of truth, or reality, a photograph has that a drawing or painting, regardless how tightly rendered it is, never has. People will accept almost anything as reality if it is a photograph, because they believe that "photographs don't lie." My approach, therefore, is for the computer to be mostly transparent or invisible. I try to create illusions that stay just inside the edge of this photographic truth, images difficult or impossible for film to record, or creations of what would result from a photographically utopian world where everything is where you want it and the lighting is always just right. My images were never real, but hopefully still contain enough of a photographic essence that the viewer will readily accept them as believable.

© Lanny Webb 1995
University of Georgia
Athens, GA 30602

RESOLVING THE 2D DILEMMA: REPURPOSING YOUR 2D ART

EMERGING ART PRACTICES

By Annette Weintraub

anwcc@cunyvm.cuny.edu

I n this presentation, I want to propose a recontextualization of 2D digital art, and open the question of how digital still images can be removed from the confines of easel painting and taken out into the streets to seek a wider audience.

It's a commonplace of critiques of 2D digital art, that 2D images are irrelevant. What's usually implied in this analysis, is that interactive or moving images represent the new ground, and still images-regardless of content or intent-do not. This view was reiterated at a recent SIGGRAPH Panel, "Museums Without Walls", in which the moderator, after giving a capsule review of visual imagery and spatial engagement beginning with the cave paintings, ended with an image by a famous artist which he referred to as "still just a painting." It's come to the point that some interactive and multimedia artists don't even want their work hung next to 2D art, and there's also always the struggle over the lights-on or lights-off installation.

This is a narrow and dismissive perspective, and one which is weakened by the lack of a substantial critique of interactive and media art. Yet it is true that the time is long past for very disparate work to be shown together simply because it's all 2D and digital. There are too many divergent approaches and processes. The result does often appear chaotic and unformed. The common origins of digital art are not enough of a factor to mitigate significant differences of context and content. Work seen under these conditions represents neither the individual artists nor the domain of 2D art very well. So what's a 2D artist to do?

For those of us who respond to still images, there are some possible directions. Looking at the work itself (as opposed to the curatorial issues of theme shows or exhibition installation), several approaches emerge: to extend still images into an environmental context through wall art, sited pieces and public commissions; to use the "publishing" metaphor of broadsides and artists books; and to develop a more "active" still image through group collaborations and installation. I'd like to focus primarily on the first of these approaches, that of extending still images into the environment.

As an artist making still images among other work, I've been moved to reexamine the context for my work, and to look at the special factors that context entails. I've long been con-

ISEA95 montréal   Isea95@er.uqam.ca   T : (514) 990-0229

cerned that exhibitions of 2D digital art are still sited in the easel painting mode, limited by scale, methods of printing, and presentation within the very traditional languages of framing and hanging. Images shown in this way don't usually engage the space or interact with each other, nor do they reach a wide or diverse audience. I have tried to resolve some of these questions in my own work, by making very large prints, and by exhibiting grouped (and unframed) pieces, but questions of context and audience remain.

Over the past seven years, I have been working with a visual vocabulary of architectural forms, developing images which create an immersive constructed environment within the picture plane. Recently I've become interested in sited work and public projects as a means of placing my work in a wider environment. As a finalist for three public art projects, I've begun to look at some of the issues this involved, and have examined some of the ways still images become part of our visual environment.

In "Learning from Las Vegas," Robert Venturi and Denise Scott Brown talk about learning from the existing landscape as a way of questioning how we look at things. While their comments were directed at architects, their methodology and study of the vernacular in images, signs, and symbols is of wider interest. As I considered a means of moving beyond the easel painting framework of 2D imagery, and began to think about making a connection with a wider audience, I started to examine images in my immediate landscape, that of lower and mid-Manhattan. There were some interesting models. There is a surprising amount of still image integration in both commercial and non-commercial sites (wall paintings, billboards, bus posters) and "non-official" sites (anonymous images, posters and handbills). While many of the wall images I am showing (DKNY, Wear A Glove I, Bond St. Jazz, Stolni, Crunch, Calvin Klein) are commercial images, their prevalence is an issue of financing and opportunity and not of function. Public commissions provide another alternative for siting work in public spaces as the MTA Arts for Transit program demonstrates, with projects ranging from permanent installations to temporary light boxes and billboards. Some exhibition curators, notably at venues like the summer art festival in Atlanta, solicit proposals for billboard works. There is also the realm of guerrilla sites, the unofficial handbills and posters that appear, become part of the landscape, and then are papered over.

Interestingly, the technology of digital imaging facilitates this proliferation of images. The Calvin Klein billboards on Times Square use digital printing to create images that are produced on short turnaround and can be changed frequently; the accessibility of digital printing is also an important factor for the anonymous or unofficial art sites as well.

In his introduction to the essays in "Variations on a Theme Park," Michael Sorkin describes the emergence of the ageographical city, which he says "eradicates genuine particularity in favor of a continuous urban field." Digital technology plays a part in this process, promoting the mechanisms of simulation and the theme-parking of urban life, and creates what Sorkin calls Cyburbia. Yet the intervention of art, solicited or uninvited, can break the spell of suburban boredom or add a humanizing touch to urban dissonance. Sanctioned, or unsanctioned, high tech or lo-res, images integrated into the environment have a resonance and make contact in a way that confronts and redefines public space.

For much of contemporary art history, fine art images have been segregated from daily life and cloistered in special spaces, while the flow of mass media has captured the public sphere. A resiting of digital 2D images from galleryspace to the realspace can not only liberate 2D work from the constraints of easel painting, but offers the promise of diminishing the distance between these two spheres, and restoring the connection with a more diverse public.

© Annette Weintraub 1995

VISUAL BOUNDARIES?

A DISCUSSION OF THE IMPACT OF TECHNOLOGY IN DESIGN AND VISUAL COMMUNICATIONS

By Andrea Wollensak,
Moderator
Klaus Kempenaars,
New York City
Ingeborg Bloem,
Amsterdam
Gabrielle Götz,
Stuttgart
Ming Tung,
Ampang, Malaysia

Design studies and visual theory have become transformative critical practices that question boundaries and ideologies. This discussion will present issues related to visual communication, design and media as the accessible spaces in between the now established positions in media art.

PROCESS

The dialogue and image development of *Visual Boundaries?* occurred electronically throughout the month of August. The presentation is the result of that discussion. The content of the visual works address the topics discussed. For the exchange, all the participants used Macintosh systems with a common application format (Adobe Photoshop).

At the present time, no real-time interactive on-line space exists for the exchange of text and images that supports a diverse and heterogeneous set of client computing environments. Some homogenous spaces are being developed (e.g. inPerson for Silicon Graphics), but are targeted for high-end workstations, making them expensive and necessitating that all users have powerful workstations with high speed internet connections. Spaces in common use that allow for multi-user real-time interaction tend to support lowest-common-denominator (e.g. can be run on any platform including a vt100 "dummy" terminal) text-based environments, such as internet relay chat (IRC) and markup languages. Another recent development is the use of clients that allow for cross-platform image exchange (e.g. Adobe Acrobat), although this is currently oriented more towards simplifying file exchange rather than creating a real-time collaborative multimedia space for image development.

Although originally conceived as a server for interactive on-line role playing, the ramifications of a MOO (a "Multi-User Object-Oriented Dungeon/Domain" or "Mud-Object-Oriented") as a set of spaces (rooms or conferences) with interactive objects suggests a powerful metaphor for directions in which to develop the nascent technology of on-line visual collaborative space. Musical uses of a MOO environment have, for example,

319

used instruments as objects whose musical sequences can be edited and played by any of the participants in that space. The inevitable extension of this type of interactive collaboration into the visual realm should be guided by the needs of the creative artists involved and their collective understanding of the integration and extension of the creative process into this type of environment. One important method in which artists and designers can contribute to this development is by prototyping visual models of ideal electronic environments. Such participation will serve to provide useful models for software engineers and also to stimulate new ways of thinking about multi-user interactive spaces for artistic collaboration.

PARTICIPANTS

The participants include: Klaus Kempenaars in New York City, Ingeborg Bloem in Amsterdam, Gabrielle Götz in Stuttgart, Ming Tung in Ampang, Malaysia. All of the participants are practicing graphic designers primarily working in print media, and now exploring multimedia and electronic forms of designed information.

The intention of this discussion was to address issues affecting the concept and practice of design within an electronic collaborative space. The participants, in light of their diverse geographic contexts, examined the conditions imposed by their relation to technology in terms of their own approaches to visual communications. Each participant was posed the same set of questions:

-within an environment largely determined by technology, what is meant by regionality and universality of place?
-are individual identities effected in electronic constructions?
-does technology negate regionalism?

From the above questions the participants issues evolved into the following topics:

borders and colonizations	(Malaysia)
design and global issues	(Amsterdam)
frontier/frontline/surveillance	(Stuttgart)
respecting local spirits, maintaining distinctions to	
identities	(NewYork City)

Borders, boundaries and colonizations

KLAUS: Visual boundaries? Do we mean boundaries of western colonization? Are we talking about a new form of western colonization? Do we really all contribute to blur identified boundaries or is most of the influence resulting from an overwhelming dominance of western ideas?

MING: Graphic design is a western commodity. It is only of use if the society strives to be more like the west. Klaus talks of a new form of western colonization, I agree.

The infiltration of Dutch and British design is here (Malaysia). The newest look and typefaces are all here. The Malaysian designers and students look to the west, and not inwards.

KLAUS: Our responsibility is to listen and understand different views and to interact upon that foundation. Input from different cultures is imminent to really understanding a global vision.

I do not believe that blurred identities become a normative condition. We might want to think or make multi-cultural images, but in the end they just represent a momentum, yet collapses in the ghetto of real life, where status, sexuality, mixed races are building new barriers with the same meaning and cause. As soon as we try to overlap or blur identities, we will build replacements.

Let's face it, their never will exist a blurred cultural community, because our instinct is based on distinctions to identify. As human beings we are trapped in judging identities and when we are talking about identities we automatically mean boundaries. We are constantly overthrowing common identities, with the result to keep the same old structure.

MING: The 'blur' that you are talking about is also about 'pre-segregation'. For example, Malaysia - the Land of three dominant races and cultures. A small elite educated and influenced by overseas (UK, USA, Australia, etc.). The infiltration of international companies on a relatively naive market. American t.v. show and tastes penetrating in. A young country questioning what it is, and recognizing the huge influence of the West on its young.

We were surprised at the relative ease our work is accepted here and in Singapore. Are there any cultural boundaries or limitations- or, are our observers pre-segregated? Is this not an indication of this 'blur' that you can take work from one continent to another and find work? Or, of western colonization?

Perhaps we cannot segregate by race and culture, but by attitude.

GABRIELLE: I have also existed in an area defined by blurred boundaries. Growing up looking at the 'wall' in Berlin and every Sunday enjoying homemade cake in Grandma's (eastern) kitchen. As a child I was conscious of the 'other' side, I was educated to differentiate, to segregate. When this boundary/barrier fell, the absurdity of the condition was confirmed.

Now the east is fully equipped with technology, and in an electronic environment the boundaries become defined by attitude and status - ie. who can afford the equipment?

MING: I think the concept of boundaries, or more specific visual boundaries (meaning graphic design, visual communi-

cation) is, in the first place, related to one's status. If one has lots of money it is possible to take an airplane (or buy it) and fly to a deserted tropical island in Malaysia, or anywhere one desires to go. One is able to experience the (visual) differences of many cultures. Technology is available to the privileged, and boundaries are digitally blurred. The incorporation of the computer in design has been a great factor in a universal look.

There is a clear economic/power division dominated by western (colonized) influence. The division between the computer literate and illiterate.

'Culture' is status? In Malaysia, culture and heritage is considered 'old, old fashioned or 'not modern', 'not new' (A second-hand market is virtually non-existent).

The direction of visual influence seems to clearly come from the west to the east. Does the west learn from the east as well?

Design and global issues

KLAUS: Next to the written word, imagery will carry the communication, representing the local site for a global interested public. There is no doubt in location, as every attempt to blur will weaken the position and the message eventually only serve as self esteem of the producer without communication value.

INGEBORG: It's crazy that we think of the world as a global village and think of blurring borders while there have never been more borders than in the last few years. I am thinking of the wars in the former Yugoslavia. Neighbors [?] fighting with each other without really understanding the other.

One may think that the internet reduces the distance between people but it doesn't make a difference when I'm going to the pub next door and only talk to certain people or when I browse through the internet newsgroups. The only advantage is that you don't judge people by the way they look. People with the same interest find each other but besides of that?

(What really fascinates me about our profession is that we can browse through different view points and visions of cultures and intentions. At this moment I work simultaneously on a variety of diverse projects that all have different audiences from the Dutch police, a multinational clothing manufacturer for children, and electronic publishing houses. These clients have different representations and publics. I become an actor, entering and exiting realms other than my own.

Frontier/frontline/ surveillance

GABRIELLE: I think the characteristics of identification and identity in technology are often altered by desire and fascination. The individual is often de-centered, while desire is fixated on power.

INGEBORG: The control of the individual by 'power' is evident. for example, surveillance systems introduced by digital technology : recorded message systems and the collection of data.

KLAUS: What you are saying implies that our dominant tools (technology) are ultimately controlling our messages (?).

MING: Well, technology does control our final form and (somewhat) the content of our work... technology changes our processes of working, it also separates those who have knowledge/power and those who do not.

For an individual without those resources (in Malaysia), boundaries are defined by the kampong and the edges of the jungle.

Respecting local spirits
Distinction to identity

INGEBORG: It will be necessary to position technology not just as a tool but as a cultural form that can be manipulated as it is needed.

KLAUS: I am not interested in the idea of 'culture' to change into a MTVisation, I rather observe existing ideologies and create in exchange with local expertise a custom tailored solution. More often I see visions with cross-cultural background and they certainly tell their story, but at the same time it makes me wonder if we really are trying to understand each other?

INGEBORG: I agree with Klaus, there seems to be less listening and more talking in image-making today. I think we are also terrorized by a few multi-nationals which have more power than the politicians. The voice of the individual/citizen is quiet if not silent. We hear and see elemental soundbites, reduced to media extravaganzas. The individual is loosing its voice in electronic space.

KLAUS: As we are heading for the next millennium the biggest task will be to understand our cultural boundaries and to create from there an energy. Today our increasing awareness of the smallness of our planet and the fragility of life upon it, commends to us a sensitivity to the cultural identities and achievements of all people. Creating for a global public calls on respecting local spirits. Unity in diversity.

© 1995

THE METAPHOR OF TOUCH -

IDENTIFICATION, PERSONALITY AND CONTACT WITHIN THE SCREEN

By Andrea Zapp

zapp@rz.uni.leipzig.de

I am currently teaching in a film academy in Germany which has a very long tradition in the narrative and documentary film. My task and my aim is to bring the subject of new media closer to students, who research mainly the classical ways of creating a media work, like a movie or a TV feature. But not only under this educational aspect I try to establish in my teaching and research an evolutionary line between early media works and actual developments. The early avantgardist film theory at the beginning of this century offers in its excitement about new ways of expression a lot of parallels to the discussion at the end of the century. From the technological experiments the way to the drama had to be found, trying to gain the viewers participance and mental involvement. I will attempt to sum up a very wide and challenging field in brief main thoughts:

For Rudolf Arnheim the creation and reception of media and art is a very subjective action - as there is the subjective eye of the camera and in the following the difference between the "real" image of the world and the "constructed" image of the film - and the montage as an intellectual appeal to inner discussion and combination. Bela Balász talks of the imaginary immersion of the viewer with the help of subjective camera means, change of perspectives, the viewer is identifying with the hero, is falling over the cliffs. Walter Benjamin completes this intention of building up an exchange between media work and viewer, when he constates the loss of the aura of an art work by the mass orientated technological apparatus. Facing fascism he saw a democratic potential, because the distanced and menacing effect of the divine art work is dissolving and a link between the work and the viewer can be established. The unique object of cult is replaced by the innovative search for acceptance, as an offer or request by the author.

Formgiving, subjective construction, involvement and democracy are the early words and the metaphorical dialog between film and viewer finds an echo in the contemporary creation of artificial realities, virtual worlds and interactivity. That sounds easy, but it's not. The nowadays metaphores of participation and involvement within the screen can be complicated, naive, manifold and overloaded, all in one. There is still a certain euphoria, which is in danger to generalize the subject of new media, interactivity and virtuality. The terms even seem to be empty and misdefined before they have been researched properly. The film avantgardists longing to get the people into their

work in a literal sense helps to formulate questions: The more a constructed media room offers sensual body functions and subjective influence, the more it can be perceived as selfdeterminent or even as true? Could the former identification with the screened movie turn into a virtual consciousness in a cyberspace?

A hierarchical abstract shows some state of the art: Closed systems of interactive Multi Media - keyboard based applications, are based on touch and sensoric action to a certain extend, but they represent still a front-position and distance between medium, virtual drama world and observer. The more information based, structural and playing aspects and the possible parallel montage and navigation system are the real advantage and far more interesting for a dramaturgical discussion, then the interactive potential, multi media works are mostly advertised with.

In a second step the artificial world of the computer generated cyberspace allows a highly immersive effect and a conscious sensual movement to enter a space. It destroys the classical attitude of the spy hole, through which we perceive the world and opens alternative places of being. But at the same time the instrumentarium and apparatus being involved by headsets etc. and the artificiality of the perceived space restricts a real identification. So the immersion as it is often described, is far more based upon troubling the balance feeling of a body than upon the prickly mental shiver of marching into an undefinable space. The ideological gap between computer generated world and real world is even reinforced.

An interesting interim are experimental forms, I like to call "borderline-works": The interface which allows the involvement in the media surrounding, on the first glance seems to be very banal, like changing a computer generated painting with eye movements, creating images on a screen by touching a plant or turning round in a chair. Basic sensual movements are extended to interfere, the interface is an absolute part of the non-technical daily life. High technology is hidden behind the most simple object and the activity is based on reality, but throwing a virtual shadow. Or even more, the reality is reflected and projected into the virtual (consider Lynn Hershman's work for instance).

We walk a step further ahead in the field of telepresence. The participants act together from very remote places, but find themselves in the same blue box projection space, instead of facing each other they share the same virtual room. The environment becomes a meeting-point and its inner design is characterized by the fact that he is just another room we are transferred into for the time being involved. We forget about technology, we just sit on a sofa in New York with a person may be from Brazil and we act in New York and Brazil at the same time. The point of concentration is how we interact with each other as individuals on a virtual stage. Contrary to computer generated figures and objects, this artistic method of telecommunication is based on a high social meaning and on emotions.

Together with the shift of body senses through virtual touch a reinforced sensual perception and immersion seems possible. The joint of subjective reality, communicative competence and emotional social exchange in a virtual space leads to a very important factor of the term interactivity - how far can we bring in and develop our personality and communicate with each other by entering a virtual interactive media surrounding.

This symbiosis of real and virtual presence, reality and fiction leads to the metaphorical meaning of the net itself and its virtual cities, communities, discussion groups or flirts. Communication fields and meeting places are created spontaneously and together with the open contents they get their own structure. Access is individual and possible from everywhere and the performing and still isolating effect of installation works seems to dissolve. As in the projects mentioned above, personal contact in a selfconstructed cyberspace is in the center of attraction. Subjective experience and knowledge is brought from the personal room to change autodynamically the data room. Nevertheless in this the term online is very important to make the distinction between a just simpler and faster plop in your mail box and the metaphore of the inhabitants of the global village.

In a first conclusion we find out that instead of communicating with a machine to discover informations, an effective interactive work has to be a media based surrounding which offers the most highest level of involving the viewers personality. Like the symbolic immersion by taking over the identity of the film hero in a dark cinema for two hours, also the virtual room has still to be based upon the participants imagination and creativity to find more intellectual and complex ways to interact. The technology has to disappear as much as possible in this, to make the sensual shift of real and virtual worlds possible.

The more a viewer is able to integrate his body and mind and establish a communication, the more an interface turns out to be "interhuman" - as a projection field of the viewers world - the more a cyberspace changes from a place of escape or observation into a place of reflection and momentary reality, so that we might talk of a virtual consciousness as a metaphore. As a consequence It is necessary to question the terms a bit more in the theoretical discussion. Interactivity is no more an exciting phenonema, which garantees anyhow the new kick, it is even nearly a hundred years old and was called identification or intellectual dialog, as I tried to symbolize at the beginning. Within this evolutionary process of taking more and more part in a media work, "interactivity' has to be replaced by new terms like the potential of access, activity and interference, to clarify the steps ahead for a more decent analysis. The virtual room and its interaction has to split up into new categories and a catalogue of esthetical means. Like in the beginning of the century the formgiving drama in the technological experiment is not found yet. Therefore a more detailed and critical evaluation of the dif-

ferences between actual narrative structures, fictional meeting-points, symbolism and at least effectiveness in new technologies is necessary and interesting.

324