Cultural Diversity in the Global Village

The Third International Symposium on Electronic Art

cultural diversity in the global village

The Third International Symposium on Electronic Art

SYDNEY, AUSTRALIA 9-13 NOVEMBER 1992

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On behalf of the members of the Board of the
Australian Network for Art and Technology
I am delighted to be able to welcome delegates
to the Third International Symposium

FRANK McBRIDE of Electronic Art.

Chair

Australian Network for Art and Technology

The Symposium is the result of
complex and thorough programming
by many people over the past two
years. It is not possible to thank them all here by
name, but we are sure that the success of the
symposium will be an acknowledgement of their
contribution.

As the host organisation of TISEA, the Australian
Network for Art and Technology is extending
its programming for the first time into the
international scene. Over the past six years
ANAT has undertaken projects which focus on
research and development, skills acquisition and information management. Our aim is foster the con-
sideration of the cultural value of the integration of new technologies into contemporary art practice.
TISEA provides for us the opportunity to bring together for the first time in this country some of the
most important practitioners and writers in this field. I'm sure the effects of the participation in this
symposium will be long term and broad in art and technology in Australia.
The Australian Network for Art and Technology's future programming will build on the momentum and
success of this most significant event.

We live in an era that is giving rise to the rapid emergence of new fields of creative practice variously represented under the generic titles of 'electronic art', 'new media', 'computer art' and so on. Progressive developments in the technologies that enable the exploration and production of computer graphics and global telecommunications have created the conditions for an unprecedented global neighbourhood of artists and scientists. The shape of this neighbourhood has not yet been determined — nor may it ever be. Fueled by the creative energies of hard-to-categorise practitioners working in a variety of capacities simultaneously, this multi-disciplinary surge stretches at the leading edges of our contemporary technological culture. The Third International Symposium on Electronic Art (TISEA) provides a unique forum to experience, discuss and critically evaluate the implications of these most exciting and controversial mutations emerging from the intersections of art, science, mathematics, technology and culture. At the conclusion of the Second International Symposium on Electronic Art (SISEA) in Groningen, the Netherlands, it was announced that Australia would host the next manifestation of the event, TISEA.

ROSS HARLEY
Director
GARY WARNER
Chair
Third International Symposium on Electronic Art

Since that time, the Australian TISEA Coordinating Committee has been preparing an event that will build upon the achievements of the last two symposia, and experiment with a number of format innovations including an artist's slideshow, a commissioned radio broadcast and an expanded exhibitions program.

TISEA presents a wide range of artists' works, from pen-plotter drawings through computer generated holography to laserdisc interactives and sensed-space environments. This extensive program places artists' works in galleries and museums across the city of Sydney rather than in the often highly compromising circumstances forced through the exigencies of temporary exhibition spaces. TISEA aims to amplify and enhance the experience of the exhibited works through a number of 'face-to-face' events where artists, delegates and members of the public can explore and discuss the issues arising from creative practice involving electronic technologies. An organising strategy of TISEA has been to ensure a high level of direct participation of international visitors, guests and delegates. The program of workshops, papers and panels, and poster sessions has been designed to provide a series of dynamic environments for the presentation of ideas and works that inspire, provoke and fuel current researches.

Two performance evenings, a program of electronic theatre, telecommunications access terminals, a national audio broadcast on ABC Radio — all extend, challenge and confound accepted definitions of what constitutes art practice, technological development, even the bounds of science. The practitioners involved in TISEA shift across media enticing us into unusual realms of thought, performance, interaction and communicative space.

These are but some of the commonalities shared by the many TISEA participants. Individual endeavours are, however, not so easily categorised (even provisionally). The materials gathered together in this publication — from writers, artists, performers and speakers — constitute a unique report from the heart of this global community.

contents

response is the medium

MYRON W. KRUEGER

In the mid-1960s I wanted to find out where the action was, go to the front lines, and participate in making the future happen. In one of the first BASIC classes at Dartmouth College, I discovered the computer. Later as a grad student in Computer Science, I found that my liberal arts background had failed to inculcate the proper engineering values. While I thought of the encounter between human and machine in philosophical terms, to view it as one of the central dramas of our time, the computer science field concerned itself with the optimisation of computer hardware resources. I considered the human being the precious resource and wanted the computer to adapt to me rather than the other way around.

To work towards this goal, I had to understand the essence of the other party in the human-machine dialogue — the computer. At its core, the computer turned out to be a trivial device that could be explained in a few sentences. Its power came from doing its simple things millions of times per second. Since I was well steeped in the scripture of the scientific community — science fiction — I knew the future was going to happen and that technology trends that were already clearly visible would allow the computer and our interface to it to be whatever we could imagine. When I considered the design of such an interface as a scientist, I realised it is not a scientific problem. Science and engineering solve problems by isolating variables, but the

human interface with machines would ultimately be as complex and as varied as the interaction among people.

I decided that the ultimate interface should be judged in aesthetic rather than technical terms. Somewhat later, I began to think of the interface as an art form, and then unexpectedly to think of myself as an artist. My authority for appointing myself to a discipline in which I had no training was that I knew the medium, that I knew how the medium should express itself, and that by letting it do so, I would be communicating a passionately held belief that technology is an inevitable consequence of natural law and should be celebrated the same way that other natural phenomena are.

At that point, I made a number of decisions that have separated me from scientific researchers ever since. While I was aware of Ivan Sutherland's head-mounted display, I did not want to be constrained by an apparatus that was bolted to the ceiling. I wanted to be able to move around freely. Although I thought that I could implement a portable head-mounted display on a modest budget in 1970, I decided that until goggles produced images that were so powerful you could not resist them and were so comfortable that you were unaware you were wearing them, head-mounted displays would be resisted. I still think so. Instead, I decided to use a video projection of computer images to display the computer's responses.

At that time, there were also efforts in the medical community to monitor human movement by attaching transducers to people's joints. Again, I recoiled at the thought of wiring people, because I thought that would complicate my efforts to bring a benign version of technology to the public. Instead, I resolved to make the computer perceive people's movements without encumbering them in any way.
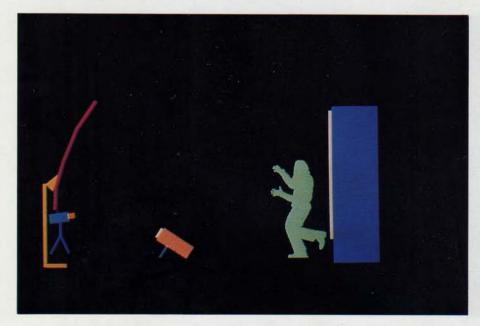
Initially, I perceived participant's movements through a sensory floor. For the first time, computer users could walk freely. Footsteps could be used to play music. They could control the movements of a graphic symbol representing the participant's passage through a graphic maze. Before developing the hardware and software needed to perceive the rest of the participant's body, I faked the interactions that such an interface would allow to see if people would understand them. They did — instantaneously. I projected their video images life-size in front of them. Then, I added the image of a second person from another location so the two participants appeared to be together on the screen. As I hoped, they acted like they were together. Telecommunication as an essential ingredient of virtual reality had been identified.

When I extrapolated what I had learned into future technology, I saw a super-medium that could be used in almost every application area. I thought that the idea was so powerful that it could not be ignored.

In 1974 I proposed the idea of a shared graphic and video telecommunication space as the theme of the US Bicentennial. The name VIDEOPLACE

BODY SURFACING. The participant's actions create abstract three dimensional patterns of pulsing light.

VIDEOPLACE Installation. The participant stands in front of a backlit assembly. The video camera sends information about the participant's position and behaviour to the computer system. A composite image of the participant interacting in an artificial reality is displayed on the video projection screen.

CRITTER, a graphic creature, perceives your movements and engages your video image in a whimsical interplay. CRITTER affords a playful metaphor for one of the central dramas of our time: the encounter between humans and machines.

Hanging by a thread is a two-way interaction between a participant in the VIDEOPLACE and a second participant at the VIDEODESK. The small participant in the VIDEOPLACE is able to make her image swing back and forth, on the graphic string held by the person at the VIDEODESK, by moving her body.

refers to the concept. I wanted to do it world-wide. I argued that VIDEO-PLACE was the perfect way to make the global village palpable. You could see it. You could enter it from anywhere in the world and interact with other people. The rest of humanity could eavesdrop over broadcast television.

By that time I had enough experience with interactive environments to have some strong opinions about what was important. The medium is interactivity. That is what is new. To focus on that, I adopted a minimalist strategy that I believe is still important today. From the beginning there was nothing you saw or heard that was not a direct and understandable response to something you did. In VIDEOPLACE, there is nothing on the screen that you cannot interact with. There are never meaningless backgrounds that you cannot affect. They would simply distract you from the elements that you can influence.

From the very first draft of my dissertation in 1972, I argued that realism is a trap. Since computers have limited capabilities, any effort in achieving realism is at the expense of some aspect of the experience. If interactivity is to be the focus, it is achieved first by understanding participants behaviour in as much detail as possible. If the responses to their actions are intelligible and instantaneous, participants will be pleased, even if the actual feedback is crude. On the other hand, if there is no relationship between participant's actions and the system's responses, completely convincing graphics are irrelevant. Pong, the original video game had minimal graphics, but it was a playable game.

At the moment, full-body interactivity is rewarding in itself. The participants have a new relationship between their body and their senses. While moving, they understand how they are affecting what they see. Participants must try to anticipate the consequences of future actions, formulate the intent to execute those actions, coordinate the actions as they are being performed, and then react to any surprises that occur. This experience can be extremely engrossing. Just as an intense conversation tends to create its own environment, making its physical context unimportant, the scenery in an interactive experience is not the central issue.

Interestingly, the people working with the goggles-and-gloves version of virtual reality have made exactly the opposite decision. They have focussed on ever-more elaborate scenery, more complex lighting effects, more polygons. They have sacrificed instantaneous response to produce more impressive still pictures. While investing in the stagecraft they have neglected the play. There is no engaging activity, no novel relationship with other people, no surprise other than the technology itself. The problem is not with the medium or a limitation of the technology. It is a matter of priorities.

One of my goals has been to improve the aesthetic process in the definition of the technologies that will most intimately touch our lives and define our culture. Until recently, artists have taken pride in not being technologists. Even today, as artists use sophisticated media, they often distance themselves from the technical skills needed to create it. It was not always

so. In ancient Greece, hot-wax casting was high tech. However it would be a surprise if technologists with nothing they wanted to say somehow created tools of great expressive power. The intent to communicate must drive technology rather than be a prisoner of it. Now, when technology has affect, as well as effect, it is important that artists participate in its invention.

exhibitions

YOSHIYUKI ABE
TREVOR BATTEN
PETER BEYLS
SIMON BIGGS
DAVID BLAIR
PHILIPPE BOISSONNET
JOHN COLETTE
LUC COURCHESNE
CHAR DAVIES
ACHAMELEH DEBELA
LINDA DEMENT
JOSEPH DELAPPE
STEWART DICKSON
TESSA ELLIOTT &
JONATHON JONES-MORRIS
BRIAN EVANS
ULRIKE GABRIEL
ALLAN GIDDY
MADGE GLEESON
TIM GRUCHY
IAN HAIG
STEPHEN HAMPER
GRAHAM HARRISON
JEAN PIERRE HEBERT
CHRISTOPH HILDEBRAND
JOHN HUGHES
DIETER JUNG
NELIA JUSTO
EDUARDO KAC
HILLARY KAPAN
BOB LAST
GORDON LESCINSKY
LUCILLE MARTIN
JON McCORMACK
STEWART McSHERRY
ERIC MATTSON &
ALAIN MONGEAU
NANCY PATERSON
TAKURO OSAKA
ELENA POPA
FILOMENA RENZI
CYNTHIA BETH RUBIN
MONA SARKIS
JUNE SAVAGE
PATRICIA SEARCH
JOHN SHERMAN
MARTIN SPANJAARD
GORAN STOJANOVIC
PETER SVEDBERG
CSABA SZAMOSY
CLAUDIA VERA
ROMAN VEROSTKO
EDITE VIDINS
VNS MATRIX
ANNETTE WEINTRAUB
WENYON & GAMBLE
DENNIS WILCOX
ADAM WOLTER

YOSHIYUKI ABE

JAPAN

In 1983, the quaternion images produced by Alan Norton shocked me with features that I had never imagined before. I felt I looked at the place I had to be. An unsatisfied photographer with real objects before the camera lens started his computer-imaging project immediately.

All works exhibited here were generated by ray-tracing algorithms and primitives of hyperbolic-paraboloids. Although we can define parameters such as colours, light sources, surface attributes and so on, it is hard to predict the exact result — especially in abstracts provided by the complicated ray behavour. Many trial images are needed in order to create a work. In fact, I produce numerous images in this time-consuming process. Nevertheless, because it is capable of producing images we have never seen before, math-based imaging is the only method I use in computer graphics.

ROSYLN OXLEY9
Monday 9th November - Saturday 14th November

Work in exhibition:
Communication - Dawn , 1990
Communication - Horizon , 1991
Mathscene #906 , 1990

TREVOR BATTEN   NETHERLANDS

CARNIVAL I - V is a real-time computer performance by a collection of sub-programs working together to form a synthetic (visual) ecology.

Each sub-program produces its own visual transformation of the image similar to the way living creatures transform their environments. Some processes interact directly with the image on the monitor screen or are influenced by the previous data while other processes are completely independent of conditions outside themselves.

Playful blocks of colour cut through the image creating a gentle illusion of space while line and circle segments splatter around them creating diffuse clouds of colour. Suddenly a process fragments the image by 'scrolling' sections of the image towards or away from the centre, moving identical or different distances so that image fragmentation may increase or destroy any symmetry which may be present. Another set of image processes generate organic and geometric circle based forms mediating between the inorganic and organic aspects by echoing structures and textures formed elsewhere.
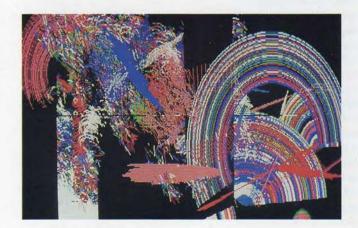
Finally, there is the cellular automata which scans a section of the screen, modifies pixel colours according to the pattern found and maps the new colours back onto the screen in different positions sometimes self-interacting and sometimes creating sub-symmetries within its main symmetry. Sometimes coloured line or circle segments are drawn instead of pixels so that textural variations are introduced and, because these are not mirrored, distortions of the underlying symmetries.

Together the competing elements form a visual world based on games of chance and design, order and chaos, organic and inorganic form, interaction and independence. The slides are selected holiday snapshots taken by the artist as tourist in his own artificially created but functionally independent universe.

AMIGA AT TISEA

Yoshiyuki Abe, *Mathscene #906*, 1990

Trevor Batten, *Carnival*, Artist's software

The objective of my work is conceptual navigation. Pragmatic considerations lead to the design of computerised vehicles allowing elegance and optimal flexibility while playing with ideas. The general approach is cognitive rather than procedural or mechanistic. We conceive and develop machine partners that assist the artist in the process of exploration and discovery. Digital media may encourage intimate machine interaction, i.e. the interactive evaluation of the behavioural potential of a given idea. In addition, the artist learns about the true nature of his intentions through visual feedback.

Consider the development of virtual work spaces of which the artist is both inventor and explorer. The central material component is knowledge, rather than information. This implies that we are interested in the meaning of things rather than their visual appearance. The automatic generation of intricate pictorial complexities as such is of no concern. However, the study of levels of autonomy in the creative process is important since we aim to design computational environments that accommodate mental models of creative behaviour. Computers allow for the manipulation of ideas on the symbolic level. Arbitrary concepts like conflict resolution, adaptation or responsibility are formalised and activated in a simulated, virtual world. The activity in this world manifests itself in pictures. These pictures are visual representations that emerge from the inherent abstract activity and careful selection of physical attributes imposed by the artist. The pictures document themselves.

In summary, the sharing of responsibilities between human and machine — while aiming to create in a common effort — is at the heart of the matter. The initial spark for many incarnations of activity and interactivity is borrowed from examples in nature or it may be a product of human imagination. In either case, our objective remains the interpretation rather than the understanding of the internal dynamics of the cognitive process. The idea is to create a context for the exploration of the psychology of humans as well as the psychology of machines. The final works are side effects of the very activity of navigating in unknown conceptual territories.

PERFORMANCE SPACE
Gallery: Tuesday 10th November - Sunday 29th November

Work in exhibition:
untitled drawings

Peter Beyls, untitled, 1985

SIMON BIGGS NETHERLANDS

Solitary deals with the fragmentary nature of memory through time, and the ensuing fragmentation of identity. What is the relationship between identity and time? How does this indefinable medium within which we are all suspended shape our being? What are the traces we leave on the temporal surface? How do these traces — these shadows of ourselves.—function in constituting our memories of our-selves, and thus our sense of being? Does the relationship between time and memory imply that we are not one, but many selves? Who are these selves, and how do they exist? What is the relationship between our actions, our being, and our sense of time, space and memory?

One viewer at a time may enter a large, dark and silent space. It is entirely empty, but as they move about the space they leave behind them a trace of black and white shadow-like figures. These figures however, are not their own shadows but the shadows of others. Each shadow-figure is composed of a short animation (walking, turning, falling, etc), and over a short period of time each figure decays (fades) to black. Subsequently there are never more than eight shadow-figures present on the wall, each darker than the other, creating the effect of a fading and extremely slow stroboscopic image of other people inhabiting the space with the viewer. The period of time it takes for a figure to fade away, and the number of figures visible, is a function of the viewer's movement. So long as the viewer remains in motion then they will leave an unfolding trace of figures, but as soon as they stop moving the figures soon fade to black, leaving the viewer alone in the dark and silent space. Thus the viewer defines or creates their sense of time through the nature of their action. Time and space are seen as functions of the self.

Within the contours of each shadow-figure there is another animation cycle composed of children's faces (smiling, looking, turning, etc), which follow the shadow-figures animation. The images of child-hood, in black and white, help evoke in the viewer a sense of memory, whilst the otherness of both these faces (who are unknown) and the shadows follow the viewer, as if they were the viewer's own shadow.

Solitary utilises live computer graphics, remote visual sensing techniques and digital projection to immerse the viewer in another sense of time and space. The computer is used not only to make this possible but as a metaphor for the suspension of the self in contemporary information media. This can in turn be seen as a metaphor for the functioning of our own memories and the manner in which we construct our identities in the non-linear and fragmented nature of time and space. At what point does the time/space constitution of the self in the world and in media technology merge or collide? Is there a separation here, or are these two states of being inexorably merging into one world?

ART GALLERY OF NEW SOUTH WALES, Level 2
Saturday 7th November - Sunday 29th November

Work in exhibition:
SOLITARY

Simon Biggs, *Solitary*, 1992
Installation view showing projected images with interacting viewers, Helsinki

WAX or the discovery of television among the bees is set in Alamogordo, New Mexico (1983), where the main character, Jacob Maker, designs gun sight displays at a flight simulation factory. Jacob also keeps bees. His hives are filled with 'Mesopotamian' bees that he has inherited from his grandfather. Through these bees, the dead of the future begin to appear, introducing Jacob to a type of destiny that pushes him away from the normal world, enveloping him in a grotesque miasma of past and synthetic realities. The bees show Jacob the story of his grandfather's acquisition and fatal association with the 'Mesopotamian' bees, in years following the First World War. The bees also lead Jacob away from his home, out to the Alamogordo desert, slowly revealing to him their synthetic/mechanical world, which exists in a darkness beyond the haze of his own-thoughts. Passing through Trinity Site, birthplace of the Plutonium bomb, Jacob arrives at a gigantic cave beneath the desert. There, he enters the odd world of the bees, and fulfils his destiny. Travelling both to the past and the future, Jacob ends at Basra, Iraq, in the year 1991, where he meets a victim that he must kill.

Independently executed over six years, *WAX* combines compelling narrative in the realistic/fantastic vein of Thomas Pynchon or Salman Rushdie with the graphic fluidity of video technique. The result is an odd, new type of story experience, where smooth and sudden transpositions of picture and sound can nimbly follow and fuse with fantastical, suddenly changing, and often accelerated narrative. The result resembles story-telling in animated film. Yet location photography and archive research form the backbone of the piece.

WAX provides an example of a new type of independent 'electronic cinema' that will become more common as the 1990's progress.

SYDNEY OPERA HOUSE – Reception Hall
Tuesday 10th November – Friday 13th November

Work in exhibition:
WAX: or the discovery of television among the bees

The ambiguity of holographic space symbolises intermediate time and space. It characterises that which is in a state of transition or transformation. When I employ the holographic medium, I seek to create a feeling of distance. White light transmission holography, with its rainbow of colours and transparent quality, allows me to more effectively explore the ambiguous and paradoxical relationships between natural and artificial forms. I wish here to emphasise the notions of fading, absence, fragility, emptiness and transparency.
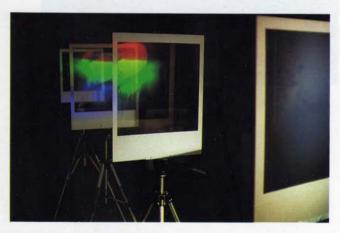
The hologram is lit in order to be viewable from both sides (as a reflection and a transmission) and in order that the front image (from transmission) is reflected four times in four acrylic sheets, in the receding distance. This gives a kind of animated sequence of a repetitive image in a sculptural apparatus. The viewer is invited to look all around and in between the tripods supporting the four reflectors.

This is a self-portrait which is questioning my relationship — and human relationships in general — with technology: alienation or emancipation?
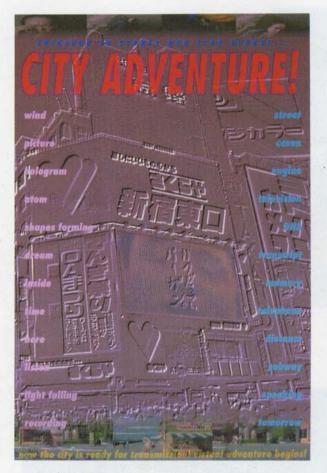
SYDNEY OPERA HOUSE
Tuesday 10th November - Friday 13th November

David Blair, *WAX: or the discovery of television among the bees*

Philippe Boissonnet, *De Profundis*

John Colette, *City Adventure*

JOHN COLETTE   AUSTRALIA

As technology proliferates it is no longer a passive network of mediums but a series of new and changing personalities with whom we each have a relationship. At the same time, new beauty emerges in these new forms, new myths mingle with the old and the individual seems to become both expanded with technological augmentation, and smaller, in the midst of the proliferation of information.

I am interested in the relationship between individual subjectivity and a society based in information and media systems. At this period in history, most human experience (in cities) is mediated by information technology and mass media. For a long time people have been troubled by the idea that there is a conflict between reality and representation, however there is almost nothing left untouched by representation. The new reality is all information.

Images chosen in my work employ many levels of association as I understand them, but I hope the work appears more like an advertisement, a comic book or a billboard. We are all potential units in the demographics and generalisations of market research. We all participate in the simplified narrative structures of advertising. Still, there are other myths and narratives which are important to each of us. If these could be shared alongside the generalisations we make about ourselves as a society in the mass media, then perhaps we could get to know each other better.

TOWN HALL STATION
Monday 2nd November - Saturday 21st November

Work in exhibition:
City Adventure!
Roll call!
History is surrounding me...
Three backlit duratrans dsplays

Marie, a 34 year old French-speaking Montrealer played by actress Paule Ducharme, appears to be lost in reverie. A visitor may try to get her attention: When clicking a mouse on the display, "Excuse me!", Marie suddenly stares at you; then, clicking among new choices of questions like "Do you have the time?", "Are you looking at me?" or simply "May I ask you something?" starts a conversation that will develop according to the visitor's curiosity and Marie's moods. The encounter may be cut short because of a lack of tact, or it may develop, among other topics, into intimate discussions of love in the context of a virtual relationship.

The course of the conversation is determined by the visitor's choice from a set of approximately 300 questions or comments to Marie. The initial choice defines the language of the conversation: French, English or German. In the English and German versions, Marie's answers are subtitled.

Portrait One is the first in a series of six interactive video portraits using the same hardware and software configuration: a 30-minute videodisc (Laservision CAV/NTSC), a television monitor, and HyperCard stacks on a Macintosh computer. In the current version of the installation, the ghostline image of Marie is produced by the reflection of the horizontal video screen on a glass plate facing the visitor.

IVAN DOUGHERTY GALLERY
Thursday 29th October - Saturday 14th November

Work in exhibition:
Portrait One, 1991

LUC COURCHESNE   CANADA

These images explore archetypal correspondences between elements of nature and the organic body/psyche/soul.

This work is the result of ongoing research into ways of circumventing visual conventions inherent to 3D computer technology such as linear perspective and 'objective' realism, which are, I believe, symptomatic of Western culture's separation of mind from body, and self from nature.

The intent of this research is to create metaphorical images that unify subject/object, interior/exterior, and physical/metaphysical realms of being, in order to reaffirm our essential embeddedness in the world.

The images are 'still frames' of three-dimensional computer-generated scenes, created with the 3D animation software SOFTIMAGE. They are exhibited as backlit transparencies as a means of recreating the luminosity of the computer screen, and to suggest the numinosity of archetypes issuing from a universal, morphogenetic ground.

IVAN DOUGHERTY GALLERY
Thursday 29th October – Saturday 14th November

Work in exhibition:
Interior Bodies series
Root, 1991
Stream, 1991
Leaf, 1990

ACHAMELEH DEBELA   USA
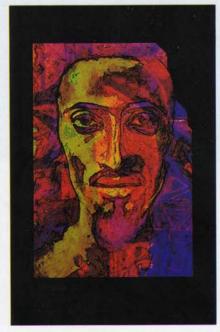
My works are manifestations of moods, movement, reflections, and expressions of experience. Contextually selected imagery or subject matter serves as a departure towards a creative process. In some instances the selected imagery is a conduit between the concept of the initial idea and the final outcome. Ethiopian/African surface decorations, symbolic motifs, masks and figures are deliberately and freely chosen and are integrated as visual vessels of a continuum. In addition to conventional creative means, new images transformed via the use of a new tool (in this case the computer) provides versatility and infinite possibilities. Hence, I enjoy the sanitised world of the computer and its challenge and yet cherish the smell of linseed oil, turpentine, acrylic and the tactile surfaces.

IVAN DOUGHERTY GALLERY
Thursday 29th October – Saturday 14th November
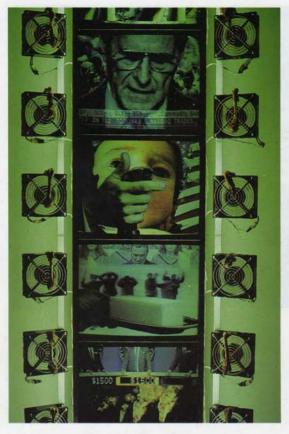
Work in exhibition:
Digital Painting

Char Davies, *Leaf*, 1990

Achameleh Debela, *Self Portait*

Joseph DeLappe, *Gulf War Memories*, 1992

Linda Dement, *Glottis and Stuff (Suck My Cock)*, 1992

JOSEPH DELAPPE   USA

The images for *Gulf War Memories* were culled from cable television broadcasts and videotapes of the Persian Gulf war and commercial advertisements. The image column consists of six 11 x 14 foot back-lit duratrans prints of computer manipulated television, flanked on both sides by eight 4 x 4 foot box fans each blowing towards the viewer the aroma of bones from previously consumed Kentucky Fried chicken. Near the base of the piece is a bracket to house the empty bucket of chicken. This piece sets up associations of sensory information which are intended to provoke thought and contemplation about our nation's recent history. The piece is an absurd memorial for an absurd conflict. The idea for this piece came about after reading of the large increase in fast food sales which took place during the Persian Gulf conflict as people rushed home from work to view the war on T.V. *Gulf War Memories* represents the absurd and ironic nature of our national obsession with this most recent television war which was consumed and forgotten as readily as a fast food dinner.

PERFORMANCE SPACE
Gallery: Tuesday 10th November - Sunday 29th November

Work in exhibition:
Gulf War Memories, 1992

I am currently working with computer imaging, photography and interactivity.

My work is, for me, a way to make tangible and give form to things that are intangible and formless. It deals with sex, violence, corporeality, experiences, memories, madness, desires and passions: things that are nebulous, changing, and not necessarily physical or tangible. I attempt to represent these things in order to be able to live with them.

I am interested in creating work that has intensely personal and corporeal subject matter as well as my own blood and clutter At the same time this is achieved using a technology that is often associated
with the impersonal, with slickness, clean-ness and the commercial world. However, this very contradiction allows for and parallels the shifting associations of the work I make.

PERFORMANCE SPACE
Theatre: Tuesday 10th November - Friday 13th November

Work in exhibition:
Tales of Typhoid Mary, 1992

LINDA DEMENT AUSTRALIA

Humans use tools to extend the range of our senses and our physical selves.
The digital computer is a radically novel tool in the history of human kind. Never before have we
known such a tool with which we can explore the structure of our understanding of ourselves and our
universe.

The computer, as a creative device, is an expressive conduit of our profound internal being. The
image is a loaded visual presentation which stirs the senses and touches the emotions and soul of the
viewer. The viewer senses the sculpture's presence in their personal space by comparison to their
own physicality. I state the image I make to the computer and to other people in concise language,
invented by humans to convey abstract concepts.

The terms of computer art consist of nothing less than the immutable absolutes that form the struc-
ture of the universe. In as much as we are products and part of our universe, we have the potential to
use this extension of ourselves to treat every aspect of our physical and abstract existence. I see this
as a source of great social benefit and cultural change.

ROSYLN OXLEY9
Monday 9th November - Saturday 14th November

Work in exhibition:
Enneper's Surface
Complex Varieties of Fermat's Final Theorum, n=3
Complex Varieties of Fermat's Final Theorum, n=5

TESSA ELLIOTT & JONATHON JONES-MORRIS UK

Emergence is an installation of floating forms
which hover and mutate, multiply and migrate.
A maze of ambiguity, it refers to the illusion of
reality and the eternal inquiry of existence.

The elemental domains of the circle, triangle
and square are activated by movement through
space. The drawings, which apparently lie
below a waxen surface, are revealed as the
body becomes an inscriber and beacon, its
shadow casting light, its gestures making
marks. The resulting drawings are the culmina-
tion of an assemblage of interactions as the
installation continually accumulates the changes
brought about by previous participants. The
work departs from mimicry and simulation. By
centring upon the interplay between shadow
and substance, actual and suggested motion it
creates a subtle, dynamic labyrinth of innumer-
able permutations. In dealing with the elemen-
tal, Emergence aims to redirect the focus of
interaction from the quiescent observation of
external production to introspection and con-
templation.

IVAN DOUGHERTY GALLERY
Thursday 29th October - Saturday 14th November

Work in exhibition:
Emergence, 1992
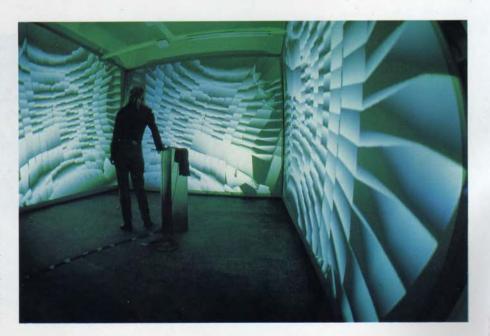
Stewart Dickson, *Genus 4, Three-Ended Minimal Surface*, 1990

Tessa Elliott & Jonathon Jones-Morris, *Emergence*, 1992

Brian Evans, *Untitled*

Ulrike Gabriel, *Breath*, 1992

BRIAN EVANS   USA

Is nature best understood through reasoned mathematical thinking, or through instinct? The mixture of rationality and intuition is volatile yet perhaps necessary in constructing pieces that can catalyse aesthetic experience. Employing techniques and finding a balance in their use is a problem all artists face. Some artists have found number of value for both aspects. Whether the meaning of number for them is divine, or a true expression of nature and reality, or simply a rational principle of organisation and generator of materials, many of the works endure, Number has proven itself, not as the solution to all problems, but as a worthwhile contributor to artistic discourse and aesthetic experience.

ROSYLN OXLEY9
Monday 9th November - Saturday 14th November

Breath is an interactive installation in which the breathing of the user finds its abstract transformation in moving images and sound.

The regulation of one's breath is not a simple matter. On the one hand it is possible to influence it consciously, while on the other hand inhaling involuntarily leads to exhaling and vice-versa.

The realtime processed image, which is an aesthetic frame of a dynamic image world, is based on parameters that can be influenced by monitoring the user's breath through an interface. The resulting image is a visualisation of the user's breathing which in turn influences their subsequent breathing patterns and measured values. As a result, a circuit between inside and outside is established.

In the initial state the image is an ordinary structure (made up of 400 polygons) which moves in space — alone or in groups — but always interdependent of each other.

A sensor belt connects the user to the computer. The belt measures the frequency and volume of the external breathing. The breathing rhythm causes the structure to oscillate. The oscillation triggers image and sound.

The changes in breathing frequency control the image processing. The regular breathing of the user makes the images 'come alive'; irregular breathing 'kills' them.

Breath is a temporal stethoscope. Perception in/of time becomes possible through the observation of the present image structure which vanishes in the next instant (but still visible as an imprint). The image emerges out of a connection between past tendencies and current influences.

PERFORMANCE SPACE
Theatre: Tuesday 10th November - Friday 13th November

Work in exhibition:
Breath, interactive installation, 1992

ULRIKE GABRIEL

GERMANY

This piece is concerned with chance, fate, destiny, or serendipity, (depending on the viewer's spiritual inclination).

It consists of three pinball bumpers positioned in a padded scalene triangle with a perspex base. The unit is mounted on a large spring and strained with three sprung adjustable wire ropes. A steel pinball is placed on the field of operation.

When this machine is disturbed in any way the ball rolls along the surface inevitably colliding with a bumper. This then initiates a chain reaction firing the ball in an agitated manner around the surface which in turn further agitates the machine into a frenzy of agitated reactions. These reactions last from 10 seconds to five minutes.

They are totally random so neither the direction of the ball nor even the duration of the agitation it causes can be predicted. The three pinball bumpers have auxiliary contacts which, when closed, activate a remote solenoid positioned near the keys 0, 1, & SPACE on a computer keyboard.

These three solenoids and their activation allows for communication between the agitated machine and the computer to take place. 0 & 1 use binary code to choose a word from a programmed vocabulary, while SPACE verifies the choice and display it, allowing the selection of another word.

In this way the crude playful machine communicates random and spontaneous movements that are interpreted by the computer.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
untitled (interface)
electromechanical kinetic sculpture

MADGE GLEESON   USA
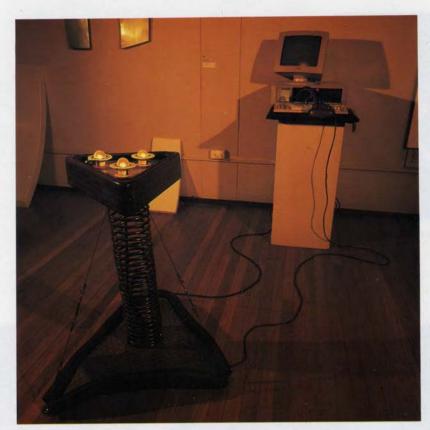
This series reflects my interest in using the computer directly as a drawing device to produce work that could only have resulted from interaction between artist and an electronic toolbox. I've tried to give each piece a gestural sense of hand while at the same time never denying the digital basis of the work.

Blind Man's Bluff is a piece which refers to the gathering and analysis of seemingly disconnected pieces of data inviting the viewer to mix, match and sort the visual information. It was inspired by seeing video footage generated from stereo pairs of satellite photos at Siggraph.
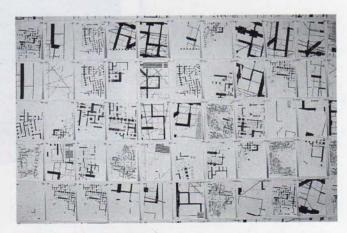
ARS MULTIPLICATA
Monday 9th November - Friday 13th November

Works in exhibition:
Blind Man's Bluff, 1991
installation of laser prints

Madge Gleeson, *Blind Man's Bluff*, 1991

Tim Gruchy working in studio development of 'Space over Time' Brisbane 1992

Ian Haig, scenes from the Interactive Computer Graphic Game, Hack

TIM GRUCHY

As fast as I could learn to integrate systems, they built boxes that could do it all. Hard shells with mysterious inner soft bits. Then at last interactivity, unencumbered. Now, you the inter-actor get to make some of the decisions at least. Puts you in the picture, literally.

The passive experience of the art observer is no longer relevant. Motion and response loop endlessly through time. Space is now sensed but no less sensible.

My art practice is of a complex multi media nature. It utilises audio and visual production and control technology in sophisticated and synaesthetic ways. It manifests as performance, installation, computer graphics and animation, slides, soundtracks, video and prints. It is the crossover and interfacing of these technologies and the ability to create new artforms that par-ticularly interests me, along with placement of body in these contexts. To this end, interactive control over the integrated system is currently being explored.

My conceptual concerns centre primarily in the two areas of dreams and the new technological revolution and the issues raised by it, in socio-logical, practical and moral terms.

MUSEUM OF CONTEMPORARY ART
Monday 2nd November - Saturday 21st November

Work in exhibition:
Space over Time, 1992

This piece involves an interactive graphics display linked to a touch-sensitive screen, controlled by an Amiga 2000 computer with a 20 MB hard drive and using Amiga Vision, Deluxe Paint IV and DigiView 4.0.

The screen displays a top and bottom section of a computer generated face, which the viewer can use to create their own customised computer generated head by using the touch sensitive screen. The features of the face change once the nose, eyes, mouth, hair and so on is touched. The display includes many variables, so that each time the display is used a different configuration of the face becomes possible. The display is never the same twice.

Consisting of over 180 digitised and computer generated heads whose design follows similar lines to my computer graphics work in general: crazy wacky characters, garish colours, and funky design. The work also puts to use other elements such as computer synthesised speech, animation, sound effects and music.

Hack presents computer graphics in an interactive context, to demystify computer generated graph-ics in general and to bring the user into a new sphere of the interactive-creative process. Rather than simply being presented with a finished work, the user/audience is an integral part of the project's real-isation. The project takes the idea of the Frankenstein monster as one of its central themes.

MUSEUM OF CONTEMPORARY ART
Monday 2nd November – Saturday 21st November

Work in exhibition:
Hack, 1992

IAN HAIG
AUSTRALIA

STEPHEN HAMPER

AUSTRALIA

An industrial robot — with neither face, nor legs, and only arms and hands that move and manipulate objects — is the direct outcome of functional design. Fixed steadfast to its pre-determined program on the factory floor, the robot solicits very little emotion from the observer. The machine has no interest in you and is therefore unlikely to arouse affection.

MA-1 is interested in you. Its primary function is to respond to you. *MA-1* waits for you.

We often find an uncanny feeling when a machine responds to our movement, interpreting our body language. An uneasy sense of life emerges from an inanimate object. Here, movement arises where we anticipate stillness, and stillness where we expect movement.

IVAN DOUGHERTY GALLERY
Thursday 29th October - Saturday 14th November

Work in exhibition:
MA-1, 1992

GRAHAM HARRISON   AUSTRALIA
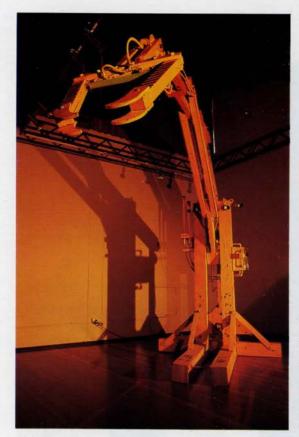
The discarded parts of a microfilm printer are assembled together on a photographic tripod to create a device which attempts to demonstrate an alternative thinking. A thinking which does not require an historical construct. Modifications have been made to the printer so that a computer graphic which has been placed in the optical centre of the projection plane can be projected onto a screen symbolising the future. The image is reversed and rotated by the motorised optics of the printer components. The graphic represents both a human component and a physical component through the choice of colour and design. The graphic is rotated slowly around the optical axis of the projector to symbolise the nature of the human world.

The Instrument for Illuminating the Future deals with the idea that humans perceive the world around them in an historical fashion. It is not necessary for computers to do this. My work confronts this paradigm by using the discarded parts of a microfilm printer to project a computer-graphic into the future. The microfilm construct requires the future. Science is now evolving unique constructs where these questions can be solved using mathematical logic. I believe computers will develop new algorithms currently not accessible to humans. Algorithms which are based on solving the questions raised in my work. The metaphysical point addressed by the idea of projecting into the future would become a model for non-human thinking where the solution of the question can only be resolved using processes which now appear alien. Humans will soon have to accept that the future can be mapped and that the thinking behind these new equations is not linked to a human's ability to apperceive. Humans may not be able to understand this data thinking, at least with the constructs we now use. Humans, therefore, must apply themselves to the task of formulating a kind of Godel thinking which can utilise the advances of computers and science not from the point of view of harnessing them but understanding this new knowledge disclosed by them.

PERFORMANCE SPACE
Gallery: Tuesday 10th November - Sunday 29th November

Work in exhibition:
The Instrument for Illuminating the Future, 1992

Stephen Hamper, *MA-1*, 1992

Graham Harrison, *The Instrument for Illuminating the Future*, 1992

Jean-Pierre Hébert, *Entrelacs, Noir*

Cristoph Hildebrand, *MacToys, 1992*

JEAN-PIERRE HEBERT   USA

Jean-Pierre Hébert is an artist with a background in engineering who first worked with computers in 1959 and began 'drawing' with them in 1979. He has modified an HP plotter to carry large ink reservoirs feeding the pens. Each of his works, generally sized from 5x5cm to 75x100cm, comprises a single unbroken line meandering under the direction of the artist's custom software creating non-repeating but self-similar linear harmonies.

Hébert's original drawings are the artefacts of a poetic exploration of the quality of line, texture and surface possible via the integration of the formal materials of this age-old discipline and the potentials of contemporary technology.

ARS MULTIPLICATA
Monday 9th November - Friday 13th November

Work in exhibition:
Entrelacs, Cobalt & Sepia, 72.5 x 110 cms
Entrelacs, Cobalt & Alizarine, 72.5 x 110 cms
Entrelacs, Alizarine & Sepia, 72.5 x 110 cms

CHRISTOPH HILDEBRAND   GERMANY

This installation shows six plastic toy-TVs (with motor drives) that mechanically move a band of images across the screen of the TV-box.

The design of these custom-built bands is based on the graphical user interface of the Apple-Macintosh. It displays a command line on top of the band, a series of icons on the bottom and pixelated images in the main screen.

The images are constructed out of rough 3D pixels, created with a simple paint program. The command line presents words that contain a double meaning that relates to machine language as well as to human values. The icons depict typical cliches of the modern technological world and symbols of inherited traditional values.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
Mactoys, 1992
Animated plastic toy TVs, computer prints

One Way Street: Fragments for Walter Benjamin
Producer/Director: John Hughes; 16mm,
58 mins, 1992

In September, 1940, on the Franco-Spanish bor-
der, the German Jewish philosopher and critic
Walter Benjamin committed suicide, escaping
the Gestapo. He was 48. During the summer of
that year, with reference to his most valued pos-
session, the painting *Angelus Novus* by Paul
Klee, Benjamin had written:
"His eyes are staring, his mouth is open, his
wings are spread. This is how the angel of history
must look. His face is turned toward the past.
Where we perceive a chain of events, he sees
one single catastrophe which keeps piling
wreckage upon wreckage and hurls it in front of
his feet. The Angel would like to stay, awaken
the dead and make whole what has been
smashed. But a storm is blowing from Paradise;
it has got caught in his wings with such violence
that the angel can no longer close them. This
storm irresistibly propels him into the future to
which his back is turned, while the pile of debris
before him grows skyward. This storm is what
we call progress."

Walter Benjamin is probably best known in
Australia for his essay 'Art in the Age of
Mechanical Reproduction' which he wrote in
1936, while in exile in Paris. Since the heady
days of 1968 this essay has been a central text
for cultural theorists of the left who have wished
to explore the complex phenomena of mass cul-
ture in ways that are not simply pessimistic.

The 'age' of electronic or digital based art
(re)production has not transcended the contra-
dictions of the contexts in which it is produced,
nor has it transformed them. Indeed, the aes-
theticisation of cyberspace can be seen yet
again unfurling its banner of 'progress' in an alle-
gory of the 'return of the same.'

There is a photograph taken by an unknown
photographer in London in 1940, showing the

ruins of the Holland House library in Kensington.
(This is the image with which Lyotard announced
his *Immaterials* exhibition in Paris in 1984.) The
roof of the library has collapsed while book
shelves full of books remain. Debris piled up in
the centre of the frame, the sky where the roof
once was, create a vortex, a perspective which
seems to draw the spectator through the image
into its background. But there are three figures
here: three men, each with certain characteris-
tics. They all face away from the catastrophe
which divides them.

With hands in pockets one man casually
observes volumes on the shelves. Another
stands facing the books, absorbed in reading.
The third is about to select a book from the
shelves, bending slightly, caught at this
moment, in the act of choice.

The image evokes a sense of history; the past,
the 'future' and the present. Unlike the charac-
ters depicted in the image, the spectator has a
sensation of rapid movement both into the
empty vortex while simultaneously being blown
backwards, out of the frame, while the debris
piles up before us. In the still photograph all of
this is present, at a standstill. Somewhere near-
by a firestorm is raging.

One Way Street: an exploration of themes and
ideas in Benjamin's works, places his 'Theses
on the Philosophy of History' in the ruins of the
Holland House library. *One Way Street* works
both against the grain and within the genre of
the 'bio-pic'. The film works as a kind of 'teaser',
a speculative reflection on the texts of Benjamin;
it presents an introduction on some central
ideas and provides biographical background.
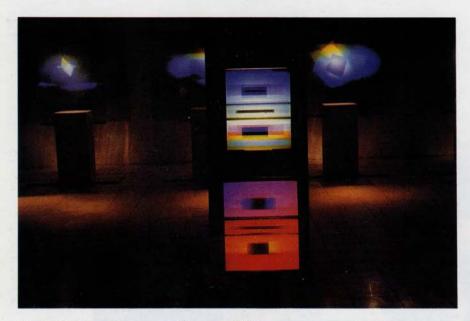
Interviews with leading English language schol-
ars, such as Susan Buck-Moors and Gary Smith,
convey the sense of excitement and signifi-
cance that Benjamin's work has generated. A
montage structure and a heightened visual style
evoke themes and qualities of Benjamin's writings.

One Way Street was funded by the Australian
Film Commission. It will be broadcast on the
ABC in December this year.

AGNSW THEATRETTE
Thursday 1-2pm

John Hughes, *One Way Street*

Dieter Jung, *Motion in space – Space in motion*, installation view, 1989/90

Nelia Justo, *Audio Body Suit: A Second Skin* (detail) Photo: G. Warner

DIETER JUNG   GERMANY

Dieter Jung sees in the hologram a means of preying on and capturing the precise instant at which light, perception and consciousness coincide at a single point — the point at which reality is meant to be created. In other words, Jung is a catcher of rainbows.

His compositions involve rectangular, trapezoidal, parallelogram-like or rhomboid fields of colour, graduated in an optically staggered sequence, which appear to be diagonally offset against each other. The virtual appearance of Jung's computer holograms is thus translated into the classic medium of painting. The onus of completing the simulation of movement passes to the consciousness of the observer, demanding active participation instead of passivity.

The sense of confusion caused by Jung's 'paintings' stems from the general relativity of spatial contexts. Like actors announcing their message from the stage (because it cannot be resubstantialised in any other way) the third dimension can only be a plane of projection by which the fourth dimension is rendered tangible.

Our observation thus arrives at an important point: it touches on a central issue. Holograms that serve solely to transform the three-dimensionality of objects in the outside world into spectral images have failed to exploit the essence of the hologram and have therefore disregarded its true quality. This quality consists in the fact that the hologram is a vehicle capable of projecting the presence of a dimensionality beyond the third dimension. The concept of the fourth dimension has already been used in such an inflated way that it has become jaded and imprecise. It could mean anything. This is why there should be no mention of the fourth dimension, only of determining one of the dimensions situated beyond the three conventional dimensions. It is this added dimension, together with the perception of light, that constitutes the point of convergence of the space within and the space without, where the light of consciousness is sparked. I would like to call them dimensions of consciousness. The rainbow is the allegory.

Eberhard Roters

ROSYLN OXLEY9
Monday 9th November — Saturday 14th November

Work in exhibition:
Into the Rainbow, 43 x 32cm, 1983
Different Space, 42 x 32cm, 1985
Illuminations, 42 x 32cm, 1986
Sundial, 42 x 32cm, 1986
Light - Mill, 20 x 20cm, 1987/88

The use of electronic and mechanical technology in art is a relatively new process in my work. My interest has developed from the abundance of electrical/electronic products that are so infused in our everyday lives. To re-contextualise these products and their components into an art arena, with the theatrical composition of a sculptural installation, I can then begin to examine their socialising/desocialising effects on their human environment.

The cube/box form that I commonly use as a basic structure is always seen in relation to the scale of the human body. These boxes are much like very unsophisticated robots, with limited movement. By incorporating readymade electronic/mechanical devices as an aid to animate these box-like structures, the viewer can begin a dialogue between themselves and the 'essentially' inanimate object. The object never has much utilitarian function, if any. The sound component is always mechanised: recorded, computer voice text, or machine hum.

The Audio Body Suit is a development of previous works dealing with the dialogue between humans and machines. I have brought the machine into a more intimate space with the body. The speakers become a prosthetic-like device to, ironically, transmit speech from within the human body. From the outset it fails as a functional device — the body sounds merely mimic the true sounds (a digital process) — just as the 'skin' has undergone a process from its original owner.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
Audio Body Suit : A Second Skin, 1992
leather, electronic components

The artist wishes to thank Rhys Rees for his magnificent sound mastering and the gentlemen of Jaycar Electronics City Store for their continued assistance.

NELIA JUSTO

AUSTRALIA

My work can be understood in the context of language art and visual poetry, two genres that explore similarities and distinctions between word and image. I create what I call *holographic poems*, or *holopoems*, which are essentially computer-generated holograms that address language both as material and subject matter. Language shapes our thoughts which in turn shape our world. To question the structure of language is to investigate how realities are built. I use holography and computer holography to blur the frontier between words and images and to create an animated syntax that moves words beyond their meaning in ordinary discourse.

The choice of holography as the most suitable medium for my project, and the subsequent use of computer animation, reflects my desire to create experimental texts that move language, and more specifically, written language, beyond the linearity and rigidity that characterise its printed form. I do not adapt existing verbal structures to holography, but try to investigate the possibility of creating verbal texts or artworks that emerge from a genuine holographic syntax.

I am also concerned with the temporal and rhythmic structure of my texts. Most of my pieces deal with time as non-linear (ie discontinuous) and reversible (ie flowing in both directions) in such a way that the viewer/reader can move up or down, back and forth, from left to right, at any speed, and still be able to establish associations between words present in the transitory perceptual field.

I try to create texts that can only signify upon the active perceptual and cognitive engagement on the part of the reader or viewer. My texts don't rest quietly on the surface. When the viewer starts to look for words and their links, the texts will transform themselves, move in three-dimensional space, change colour and meaning, coalesce and disappear. Their choreography is as much a part of the signifying process as the words themselves.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
Souvenir D'Andromeda, 1990
Adhuc, 1991
Astray in Deimos, 1992
white-light transmission holograms

For many years I have been moved by the ideas of Taoist philosophers. Recently, I have been fascinated by the Taoist idea that the world was formed out of formlessness. Somehow, order and form arose naturally from disorder and formlessness. Perhaps life arose as a result of a natural tendency, or Tao, of the universe to generate order from chaos.

For the interactive animation, *Emerging Forms*, I wrote a program for the Macintosh II which can generate organic forms from random fields of dots. By moving a mouse, random patterns can be transformed into organic forms in real-time. Using the program, the viewer can 'paint' with full screen motion and metamorphosis by gesturing with his hand. I hope *Emerging Forms* conveys a sense that the motions and forms in the animation continually arise due to elusive principles and unseen processes.
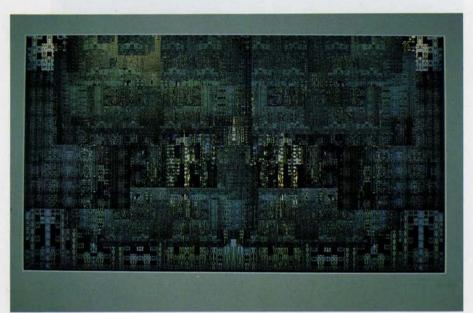
I am moved most by art when I feel that I am peering into the soul of the artist. With interactivity, perhaps the viewer can feel a deep sense of exploring the artist's inner self. In addition, the viewer is invited to become an active participant in the creative process, creating form and motion. The work becomes a tiny world which is explored and even altered by the viewer. I want to encourage deep absorption in the process of discovery while using *Emerging Forms*. The animation and imagery becomes part of the creative exploration by both myself and the viewer — the art is 'half me and half you.'

MUSEUM OF CONTEMPORARY ART
Monday 2nd November - Saturday 21st November

Work in exhibition:
Fingertip, artist's software for Macintosh family of computers

Gordon Lescinsky, *Shroud* (detail)

These works are the result of an automated process. I design a program which relies on randomly generated numbers and parameters supplied by myself, to produce a series of abstract, rather architectural images. These pictures *Shroud* and *Closeup*, are two out of hundreds of various outcomes. *Closeup* is in fact a highly magnified section of *Shroud* (magnified twenty times).

The process I use to create images is recursive, or fractal. All that is defined at the beginning is a set of rules specifying in rough terms how to arrange and colour the basic elements of the image. However, the basic elements themselves are images made using the same general system of rules, and so on *ad infinitum*. This is why *Closeup* is just as fascinating and detailed as *Shroud,* and why a closeup of *Closeup* would be as well.

Each image contains twenty eight million pixels. The images were computed using an AT&T Pixel Machine, a supercomputer specially designed for producing very complex computer graphics.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in exhibition:
Shroud

GORDON LESCINSKY
USA

BOB LAST   SCOTLAND

The piece consists of two 70cm video screens, one viewed through a 850mm x 720mm aperture of fluorescent orange ripstop nylon, and the other through papier-mache aperture culled from the pages of an illustrated encyclopedia.

Each screen presents part of a larger than lifesize face. A young boy and a middle-aged man peer out at the world and away from each other. A blurred landscape passes behind them.

The two fragmentary video portraits are cycled off laser discs, allowing a high resolution continuous loop of a short clip.

ABC ULTIMO
Monday 9th November - Saturday 21st November

Work in exibition:
And.Then.
Laserdisc multi-monitor installation

LUCILLE MARTIN

AUSTRALIA

These works are part of an ongoing series of installations in relation to Nature and Diversity, addressing the notion of the 'Physical Space', from a feminine perspective, using integrated Video, Photography, Photocopy and Computer generated image and text.

Since 1980, Lucille Martin has been working primarily with photocopy and related media to represent the body. Known in particular for the series *Bodyworks* (created by placing the body on the office copier), she has been creating installations which draw together visual and aural impressions to present social, political and environmentally informed works.

As a Visual Communicator the choice of technology has been central to the nature of the work, frequently drawing together complex ideas, layers of information criss-crossing culture, myth, spirit and reality. This interwoven methodology seems to be duplication for the technique itself — collaging of image and idea, through the multi-media function.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in exhibition:
Metaphors for Memory
Worship, 2.2m x 2.1m, 1992
Sisters, 2.2m x 2.1m, 1992

JON McCORMACK

AUSTRALIA

This image evolved from a series of experiments working with light as an algorithmic entity.

The work underscores the notion of computational synergistics — the feedback process between visual representation of computation and human thinking resulting in significantly greater awareness and understanding of the process — a synergy between mind and machine.

Light is represented by symbolic elements within a procedural machine language. I based the work on a study of the 'optical phenomena' known as the Aurora Borealis (Northern Lights) and Aurora Australis (Southern Lights) — featureless, quiescent arcs of light which occur in the ionosphere, most often seen at high latitudes. They are caused by streams of fluorescing electrons, flushed from solar flares and trapped in the Earth's magnetic field relentlessly forced toward the poles.

The procedural specification consists of symbolic replacement rules whose syntax is parsed and recursively applied by the machine. Symbols are interpreted as representing light, colour and textural components of the image.

I prefer to think of these as 'optical forms', polarised arcs of reflection and energy created from a handful of algorithmic rules: signals singing out into the void. Automatic, oblivious and yet inevitable.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
Signals, 1992
Backlit transparency in light box

STEWART McSHERRY

USA

I am interested in applying techniques for photo-realistic rendering to non-representational objects. My current work explores reflection and refraction of light on/through transparent objects.

My focus has primarily been on exploring surface and colour issues as applied to complex abstract models.

Although I have been using computers for ten years now, and supercomputers for the past three years, I am only beginning to explore what is really possible. Perhaps this is why I am so intrigued with using computers for my work.

ROSYLN OXLEY9
Monday 9th November — Saturday 14th November

Work in exhibition:
Cheviot 1 (swarm), 1992

Lucille Martin, *Worship*, 2.2m x 2.1m, 1992 (detail)
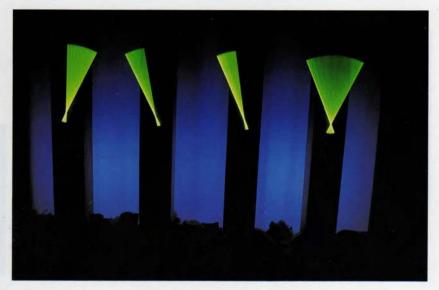
Jon McCormack, *Signals*, 1992

Stewart McSherry, *Cheviot 1 (swarm)*, 1992

Alain Mongeau & Erik Mattson, *Vision Infogothique (Computer animation)*, 1990

Nancy Paterson, *Bicycle TV*

ERIC MATTSON & ALAIN MONGEAU — CANADA

Onyrisk offers an interactive surrogate travel through allegorical representations of dreamlike sequences. It is an experimental work that is set to develop tools for a new interactive art form. It is also meant to explore the limits of interactivity when applied to time-based material. The eerie texture of the visuals combined with an equivalent soundtrack enable a greater connection between the various components. The global interactivity of our work is enriched by its combinatorial potential. (*Onyrisk* is a play on French words: *ony* comes from the term *onirisme* which refers to the dream state; *risk* was added to qualify the unknown involved in the interactive experience.)

The whole concept is relatively simple. The visuals consist of modified film sequences that are stacked on two laserdiscs. Four different soundtracks of ambient music and loops can be constantly accessed (if you combine them, you could count on about ten reasonable combinations). This version of *Onyrisk* is played on a single Macintosh screen using a video switcher and a Raster Ops card. The system is entirely controlled by a Hypercard stack that also loads, when needed, Macromind Director animations (some of which are interactive).

Technically speaking, the installation is 'low-profile'. There is however a highly complex Hypercard programming involved, in the form of an expert system that manages the connectibility of the audiovisuals and matches it to the hardware's possibilities. *Onyrisk* is an attempt to implement true computer interactivity at a deeper level in audiovisual design, tracking and taking note of each of the viewer's decisions before showing the next sequence. The texture of the piece is constantly readjusted by the intelligence at work in the expert system.

This project is the result of team work involving different members of the J.A. de Seve Research Centre: Suzie Dumont, Eric Matson, Serge Roy.

PERFORMANCE SPACE
Theatre: Tuesday 10th November - Friday 13th November

Work in exhibition:
Onyrisk, interactive laserdisc

TAKURO OSAKA — JAPAN

Cities that become centres of the world are compelled to 24 hour activity in all their systems. 24 hour cities must have all kinds of functional systems and various faces operating at all times. Suppose I cut that face with a sound that the city has uttered. What kind of changes could one see in this noise over a 24 hour period?

In this installation a microphone monitors the sounds of the local environment outside of the gallery. These sound signals are then translated into light, allowing me to explore changes in the city's noise/light modulations over time, by corresponding the frequency range with colours and the volume with luminosity.

PERFORMANCE SPACE
Gallery: Tuesday 10th November - Sunday 29th November

Work in exhibition:
Light from Noise Sound,
installation

NANCY PATERSON — CANADA

The archetypal pattern of the maze or labyrinth is echoed in the design of the interactive videodisc world of *Bicycle TV*. Traditionally associated with spiritual initiation, growth and transformation, it is appropriate that the maze presented in *Bicycle TV* serves as a metaphor for the challenges and opportunities offered by new electronic technologies.

Pornography and tourism are the most obvious applications of virtual reality systems, particularly when computer graphics based. Videodisc based systems such as *Bicycle TV* offer alternate realities and experiences without confining them to the level of arcade games or popular culture's equivalent, the pseudo-realities of high budget amusement theme parks.

Museum of Contemporary Art
Work in exhibition:
Bicycle TV

ELENA POPA
AUSTRALIA

Four computer manipulated images of Madonna are mounted together, each identical in size and identical frame. The source of each is identical, but by applying different filters and icons they each are given their own identity.

I use the computer to emulate the silk screen process that Andy Warhol used in his images of Marilyn. Just as Madonna uses Marilyn's images for herself, I use Warhol's style in my Madonna images as a kind of double reference. Subtle changes in the original image allow for the continuous reproduction of work — Madonna's identity changes with each new piece. In the same way that she markets herself as a product whose impact changes with her various styles, her computer identity is easily changed by some Japanese icons or a change of colour. Many more variations of the same image still exist inside the computer. These four are simply a selection. Each new version allows for subtle changes, retaining the 'originality' of digital information versus replicating the same image endlessly. Every piece is the original.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in exhibition:
Madonna
Photoshop images

FILOMENA RENZI   AUSTRALIA

The fundamentals of how we relate to the world of matter and man-made objects are shrouded in myth. We consume and discard what we make as we consume and discard life, forgetting that even the things we make have a story to tell. Whatever the form is in material terms, whether woodcarving or electrical technology, the relationship between them are only changed by the language of the material.

Performance space
Theatre: Tuesday 10th November – Friday 13th November

Work in exibition:
Kinetic robotic installation
Filomena Renzi, Forest of Repeated Action, 1991

MARKUS RIEBE   AUSTRIA

I have been engaged in computer-aided art since 1985. First I created thermal-transfer handprints in small sizes (around 70 x 100 cm). Searching for an efficient method to create larger picture-sizes without having to reproduce them photographically, I began to utilise the facilities of a computer controlled airbrush. After a friend of mine in Great Britain installed such a machine for commercial applications and after some tests I decided to use it for my own artificial works.

In my pictures I design models of technical and biological territories. In varying the matrix of the screen within the medium itself, I reflect the circulation of the digital images until the pictures become stabilised in their analogue print-outs.

Scanned fragments of reality (which seem quite calculated), expressive traces of paint (computed electronically), and simulations of light and shadow melt into an unsolvable unity. These elements lapse into the surface of the picture without any intermediate medium. To me, these canvases provide a place to experiment with the truth of visual statements.

IVAN DOUGHERTY GALLERY
Thursday 29th October - Saturday 14th November
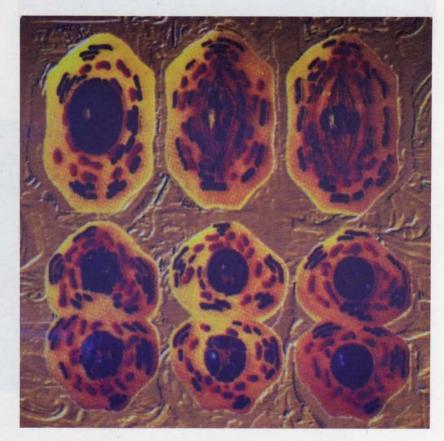
Work in exhibition:
Zelle-1, 170 x 190cm, 1992
Zelle-2, 170 x 180cm, 1992
Zelle-3, 170 x 180cm, 1992
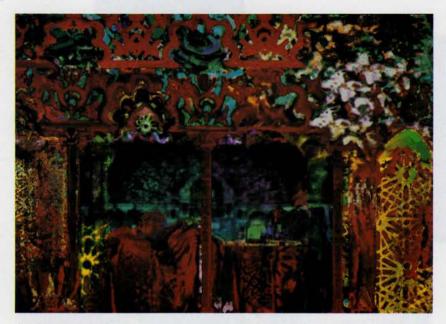
Elena Popa, *Madonna: Live*, 1991

Filomena Renzi, *Forest of Repeated Action*, 1991

Markus Riebe, *Zelle-3* , 1992

Cynthia Beth Rubin, *Toledo Page* , 1992

Mona Sarkis, *KAFERLEIN...* (installation view)

CYNTHIA BETH RUBIN   USA

This series is built on the juxtaposition of fragments from both personal and cultural history. Ironically, the computer has placed me in a new relationship to tradition. It has provided me with the means to access my cultural legacy directly, and I often begin works by placing medieval Hebrew manuscripts inside the computer. I purposely quote sources from different times and places to tell the story of my own culture which comes form migrations over the last several hundred years from place to place, as a subculture which is in and of itself a blended culture.

A single work, for example, might bring together images from a 17th century Hebrew manuscript from Italy, the house I lived in as a young child, 19th century polish synagogues, and trees from the yard of my current home in Vermont.

The work is totally conceived and developed within the computer, as the mechanism for the selective merging, layering, and melding of my sources. How the source images enter the computer (either through my own photographs or direct drawing) is not important, as in any case I must work hours with the sources within the computer to make them truly part of the evolving computer image.

What the computer offers is the means to create, shift, and emphasise hierarchies of both relationship and representation among pieces of the past which I bring together in my images.

IVAN DOUGHERTY GALLERY
Thursday 29th October - Saturday 14th November

Work in exhibition:
Toledo Page, 1991
Remembering Home, 1991
Another Time, 1991
After Cordoba, 1992

This work is an interactive computer installation, but it is to be understood as a work that uses the medium against itself.

I was inspired by a text by Kandinsky in which he compared the progress of each generation with a little beetle running beneath a glass plate. After a while the beetle can see, but can't go any further. Thus I came to the sentence "Little beetle, walk a bit further". It expresses the forward-looking mentality one is exposed to when working with 'interactive' technology. But of course one strives to get away from this dull and stiff programming which excludes any flexibility and freedom. Even though, we still fear the day that we will have truly intelligent computers.

Another problem with interactivity was well pointed out by Herrmann Sturm, who said that true interaction is in fact stopped by so-called interactivity. Human acting is reduced to the pushing of keys; technical effects and results gain monumental proportions. Therefore Sturm's question as whether experience is still possible in this push-button-world, sounds to me quite legitimate.

These objections are reflected in the second sentence "Lone searchers never trust serene lies".

The two sentences are decisive for the work. In German each consists of five words. We have five fingers at each hand and five sensor keys at each side of the monitor. If the viewer wants to hear the whole sentence they must push all five sensor keys simultaneously, which is not so easy. If they want to hear the development of the first into the second sentence, they have to keep pushing. Pushing is 'rewarded' here, as it seems to be our main experience today — viewers will really have to work on their pushing-activity in order to receive the full information.

PERFORMANCE SPACE
Theatre: Tuesday 10th November - Friday 13th November

Work in exhibition:
KAFERLEIN...
interactive installation

MONA SARKIS

GERMANY

JUNE SAVAGE

AUSTRALIA

While the methodologies of art and science may differ, and their social values under capital appear at odds, their systems of representation have interesting commonalities and contingencies. Both encode and reproduce dominant ideologies indirectly and through application. Just as the landscape tradition in art has historically presented an order of human construction as a mythic range of immutable essences, representations of space provide a frontier metaphor for universal wonder and continuity. Landscape and representations of space mirror the phenomenological desires of both science and art which at various times, regard the earth as a finite inherited commodity or an infinite natural disorder that must be tamed through measure and map.

June Savage's wall clocks, whose faces have been replaced by abstract imagery derived from satellite photographs, inhabit an immaterial globe, a world surveyed in data relations, a world of information exchange. Banked in an ordered visual display upon whitewashed art gallery walls, they appear here like radar scanning devices. Only their second hands remain, steadily traversing obscure terrain in a cycle bound to repetition. Without a point of reference or scale of measure, their movement proceeds without limit or intrinsic, rational meaning. They appear as instruments in the service of an undisclosed imperative to monitor, to measure, to survey, but their purpose is classified, and access to the nature of their data remains unavailable except to authorities.

As metaphysical tropes, they may mark the endlessness of time against the uncertainty of matter. Yet the Sublime of nature exists here only as a motif in perverse subjugation. The worlds represented within these small circles, enclosed by these clock frames, measure against the satori moment described by astronauts who experience the earth's biosphere in overview from space beyond. The clocks' moving hands describe technology's relentless circumscription as functionary to a pre-existent ideological apparatus. The images they scan suggest dynamism but present here as still frames, mute, unchanging, ordered, controlled. In their quiet abstraction, they bring certain constituent and referential elements to the fore, supporting a silent interrogation of contexts, specifically the social conditions by which technology, science, and art have developed and are applied.

— Jeffrey Fereday and Susan Fereday 1992

PERFORMANCE SPACE
Gallery: Tuesday 10th November - Sunday 29th November

Work in exhibition:
Scanners
mixed media

I use computer graphics software to create art that is underscored by the purity of geometric forms that represents the poetic resolution of logic and mathematics. Logic and mathematics possess a stoic beauty that is difficult to visualise because rational control is tempered by human insight and intuition.

My art weaves these dimensions into visual statements. In the images there is continual interplay between the physically-defined geometry of three-dimensional forms and the intangible, free-form filaments of colour produced by the medium of light. I am not creating forms with colour; I am 'moulding space with light'.

This ephemeral quality of space — space that is moulded into existence by layers of intangible light — results in multiple dimensions that manifest themselves as various perceptual dichotomies: realism and fantasy, logic and emotion, time and timelessness. The transient quality of light also emphasised the intangible, abstract quality of computer-generated imagery that exists in its 'original' state as the symbolic representation of electronic impulses.

The work is painstakingly slow and extremely expensive because each image takes several weeks of continuous computer time. Despite numerous problems acquiring access to computers, I continue to persevere in computer graphics because no other medium gives me the same visual quality of expression. The geometry of space and time and the translucent qualities of light combine to produce spatial transformations that continually challenge my understanding of colour, form, space, and time while helping me expand my singular vision into a universal message.

ROSYLN OXLEY9
Monday 9th November — Saturday 14th November

Work in exhibition:
From *Portraits in Time* series
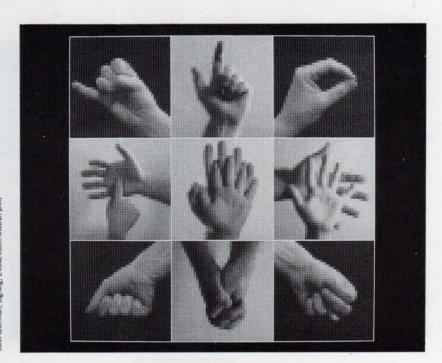
Patricia Search, *Intermezzo*, 1991

Henry See, *A Memory Project*, installation at G-Tech SIGGRAPH '92 Chicago

John Sherman, *Signing*, 240x240cm linotron print

A *Memory Project* is an interactive exploration of memory and forgetfulness in humans and computers. The content is presented from two perspectives: the scientific and the artistic. Areas of interest on the scientific side include the physiology of memory, the psychology of memory, epistemology, artificial intelligence and neural networks. The artisitic side poses questions about the relationship of humans to computers. The project unfolds temporally in two parts. Part 1 looks at memory; Part 2 looks at forgetfulness. The system reflects this change by beginning to forget itself. Menu choices disappear. Sections which were once available are now forgotten. The cartoon agent 'Bob' serves as host and personification of the project. When the system begins to forget, it is through Bob that this forgetting is translated to the user.

PERFORMANCE SPACE
Theatre: Tuesday 10th November - Friday 13th November

Work in exhibition:
A Memory Project
Macintosh Hypercard stack

JOHN SHERMAN USA

This body of work is the first concrete product of a number of ideas I had formulated on fusing design, art, and computer technology. Chief among these ideas was to merge a typographic and visual communication into one unified composition and to accomplish this with unique technical innovations I had developed. This work was both an exercise in experimental typography and computer science.

I describe my work as experimental typography. For most people, this intention is not understood at first glance because all that is seen is an image. On closer inspection of the work, it is discovered that the larger image is constructed by use of smaller images that are combined by the eye. The smaller images are actually characters of a font of type I have designed. In fact, the pictures are a paragraph of text and the font could be changed to another with the result of totally changing or destroying the picture. In a sense, the individual pictures (letterforms) can be seen (read) and combined to form a more complete idea than if my specially designed letterforms had not been used.

The fonts for my work are obviously not he conventional drawings of the letters 'a', 'b', or 'c'. The various font designs I developed are the same in every way to the design and structure of any font. Each character of the font still performs the role of identifying a particular letterform; the letterform, however, ultimately is used as a picture's pixel. The first character of the font represents black, the last character is white, and in between are a range of greys. This opens a variety of creative opportunities as to what the letterform could look like. The letterforms in my fonts are both the symbol of a pixel's value and the value. The only criterion of communication is that it is the correct grey value it symbolises.

A digitised picture is, in a sense, a paragraph of data. Data that in most cases does not give a clue to its content. It would be very difficult to know something about the picture by reading its data. The challenge in this poetic game is to treat a picture as a paragraph and to design letterforms using pictures and text. My intention is to articulate a new, more complex vocabulary of my life and ideas by the unique juxtaposition of symbols, phrases and pictures.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in exhibition:
Signing
240x240cm linotron print

Some Remarks On *Adelbrecht*

I love science, technology, computers — *Adelbrecht* is all of that. *Adelbrecht* functions autonomously and has some knowledge about the world. He is not intelligent, in that he can't adapt to an environment that changes unpredictably. People often ask me: "Why don't you use a faster processor" or "Wouldn't neural nets make him really intelligent?".

To be a work of art, none of this is necessary. He needs not to be as intelligent and as powerful as can be, he needs to be interesting.

The making of *Adelbrecht* has been — and still is — much more difficult than I thought. Working as an independent artist in a not well known field is a tricky business, given limited means to do research (even though I have received substantial funding from the Dutch Foundation for Visual Arts, Design and Architecture and much help of all sort from institutions and people).

On Art: A work of art always is 'about something' it tells things without or within words: implicitly. What it implies and how — through which technolgies and in which style — is up to the individual artist. ART HAS NO DUTY.

Implicit goals as opposed to explicit goals, is the difference between 'art' and what we name the rest of things people wish to do.

A work of art can be said to have quality: how much it grabs the beholder, how well it implies. Quality does NOT determine if something is art. (A bad cigar still is a cigar.)

Except when using one's own body or found and not changed objects, art can only be established through technology, be it charcoal, paper, paint, welding, or electronics. From the viewpoint of art, there is no difference between a painting and a work made from computers.

Like the 'classic' painter, the artist who uses new technologies should master his medium, which is difficult. Especially when the medium changes and evolves as rapidly as high-tech.

PERFORMANCE SPACE
Theatre: Tuesday 10th November - Friday 13th November

Work in exhibition:
Adelbrecht
protozoan robot, 40 cm diameter

GORAN STOJANOVIC AUSTRALIA

The idea is to create a photograph of a memory of the art around us, to photograph toward the inside of our mind.

A picture or a painting never exists alone. It is always a part of a series of a higher wholeness. Each exists exposed to our memory for a period of time, and the impression of each creates a segment of the wholeness.

When the wholeness is completed it becomes a memory and is left in the mind as a feeling.

I take a painting, art, and I subject it to the 20th century grid of the TV tube. I force it into the archetype of a present in order to photograph it.

I destroy the existing art by imposing one layer of it over the other again and again until the moment when I feel that they have become a self-existing wholeness. A layer can be a whole or a part of a work selected by mind in the process of observation of the art.

And that is the picture of a memory of the art that has been stored in our mind.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Works in Exhibition
A Deal, 180 x 123 cm
Saint, 110 x 160 cm
Face 2, 150 x 103 cm

Martin Spanjaard, *Adelbrecht*, protozoan robot, 40cm diameter

Goran Stojanovic, *A Deal*, 180 x 123 cm

Peter Svedberg, *untitled*

Csaba Szamosy,*The Adoration of St Sebastian, 1992*

PETER SVEDBERG   SWEDEN

My intention is to transform, the TV picture beyond the 'corpus' of the TV-set, to take a step out of the given process in which the picture passes through the camera until it comes out as a representation in the TV-set.

Both the camera and the TV-set are in a way 'containers' with a 'glassed' window towards the world. What I do is that I let the TV image pass through an additional 'container' of 'glass' in front of the TV-set. So the 'glass-container' is the primary object whether it's shaped as a camera, TV or a glassobject, while the picture as such, is secondary and variable.

The representations in my glass objects are exchangable and can receive any signal broadcasted. This allows me to be a part of the audience, face to face with my own production.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
untitled
packed glass and TV sets

As in previous projects, I have been interested in drawing some parallel thoughts regarding depths of 'physical' ideas, within the area of computer generated art and related operational procedures as well as in terms of what I call "The Human Body Landscapes" (cells and cell structures) and the interactional relations between these systems.

The majority of my works are centred around the concepts of art and technology, incorporating references to the human body, its cells and their structures. Moreover, the question of religion and its relevance within past and present times.

Within the practice of fine art and in many other situations, it is these concepts that hold particular significant interest to our society of speed, mechanical and technological growth.

The question of where do we belong and why is often asked, as theologies and scientific theories are not compatible, nor trying to be (perhaps due to the false pretences and ignorant attitude by the earlier?).

The old, perceived ideas and accepted forms of expressions are no longer suited to the present day conditions, so trying to identify these concepts and relating them to the close proximity prove to be of concern, and usually come with serious (self) doubts rather than an investigative and explorative approach.

Like most, my works are heavily reliant upon my own 'personal' experiences and symbolisms from past and present momentums of time, the images that hold significance for me. Within the above mentioned figurative appropriations that reach beyond the surface structure.to solidify these concepts, I work with the combinations of the above and electron-microscopic images of human body cells magnified up to 500,000 times.

The *Adoration of St. Sebastian* is about our misconceived sentiments and emotions within our past and present beliefs.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in Exhibition
The Adoration of St Sebastian, 1992
1600x2000mm computer enhanced painting on canvas

CSABA SZAMOSY

AUSTRALIA

CLAUDIA VERA USA

Memories are the sources of my work. They are essential for the development of my ideas. I have discovered that my work was nostalgic even when I thought that I had arbitrarily chosen some particular shape over another. Memories have been furiously pouring images and context into my existence, now memories are my tools.

Sentimentality is also inherent to the conceptual quality of my work. It is present in the sound of tangos and in the language found in the radio shows that I listen to during the long afternoon hours. Sentimentality is part of the colour in which my mother would dress for a walk in the park. It is also an important part of the vocabulary which certain objects have. Objects can carry a semantic quality. The cultural background in which they interact can be purely emotional, making them abstract with their complexity.

I believe in the coexistence of fantasy and reality. For me the division between what is real and what is not doesn't exist. This affirmation is unquestionable. Many works of art have come out of this ground of thought. In my life, dreams are the medium from which my own destiny has a present and a body. It is my desire to suggest or to perceive the scenario for a concrete dialogue to exist. The mediums that I use are distinguished by this interactive concept of emotional reality and fantasy.
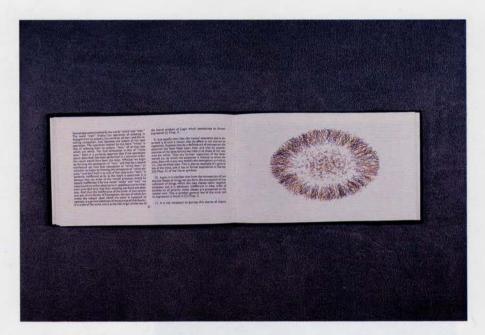
Computers are for me the path for developing imagery. They allow me certain freedom to choose and discard from a wide panorama of images. Conceptually they are a matter of magic. With them, the properties of light can unfold into and image. They take me to the most intimate levels of the image. To the source of colour and forms. The physical qualities of nature that can be found provide the tools for the inexperienced to go ahead and create other levels of life. My hope is to make my work's existence have a meaning in this interaction of the past and the present. I use electrical devices to show my work. I do this so that the electrical light qualities from the medium will be carried on into the viewer's experience. This doesn't happen by copying nature but unfolding nature's meaning.

PERFORMANCE SPACE
Gallery: Tuesday 10th November - Sunday 29th November
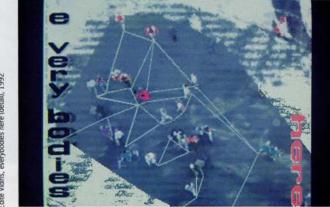
Work in exhibition:
Tango 2, 1992
installation

Claudia Vera, *Tango 2* (detail of installation), 1992

Roman Verostko, *Derivation of the Laws*, pp.21,22, 1991

Edite Vidins, *everybodies here* (detail), 1992

ROMAN VEROSTKO USA

There are many remarkable analogies between computing processes and biological processes (e.g. software generations, computer viruses). We can expect these analogies to become more transparent as computers evolve further. We assume that the 'rulebook' in our universe is the same for every information processing system whether it be the mind of a human or a chimpanzee, an abacus or a Disc Operating System (DOS).

This 'rulebook' fascinated George Boole. He was convinced that if the laws of logic "are really deduced from observation, they have a real existence as laws of the human mind independently of any metaphysical theory". He sought to identify those rules of thought and give them algebraic expression.

In *Proposition IV* he identified "the fundamental law of thought" as Aristotle's principle of contradiction — that "it is imposssible for any being to possess a quality and at the same time not to possess it". George Boole argues from its algebraic equivalent that "what has been commonly regarded as the fundamental axiom of metaphysics is but the consequence of a law of thought, mathematical in its form."

If George Boole were living today he would stand in wonder and amazement pondering the magnificent machine language that has evolved since the publication of the *Laws* in 1854. I think especially that he would be transported to near ecstasy seeing the binary 1's and 0's in computer assembly language which symbolise the 'on' and 'off' bits. This is his *Proposition IV* evolved into a machine language that controls the electric circuits in everything in our daily world, from cash registers, airplanes, and washing machines to Cray Sumpercomputers.

My illustrations have evolved from procedures made possible by Boolean logic. For several illustrations I adjusted my algorithms to use terms from Boole's symbolic logic for the graphic improvisation. In those cases the 1's and 0's were distributed randomly around the centre of attraction. The visual effects are intended to suggest the dynamism inherent in logical systems. It is a tribute to Boole who perceived the value of a symbolic language of logical equivalence in advance of computer graphics.

ARS MULTIPLICATA
Monday 9th November - Friday 13th November

Work in exhibition:
Derivation of the Laws
5 copies of the limited letterpress edition of George Boole's
Derivation of the Laws with code generated illustrations by
Roman Verostko (St Sebastian Press, Minneapolis, Minnesota,
USA, 1991); 125 copies, handpulled, 4 colours, type set in Gill
Sans; 100 regular bindings, 20 deluxe binding, 5 artistes livers.

Works related to the books:
Frontispieces sheet, 92.5 x 100cm
Endpieces sheet, 100 x 60cm
Gaia series, AM2, 100 x 60cm
Gaia series, AQ2, 100 x 60cm

EDITE VIDINS AUSTRALIA

Physically, the works are Canon CLC 500 prints face mounted to acrylic. The two outer panels are digitised images taken by an ion camera of an intersection in the city of Brisbane. At this intersection pedestrians may cross to any corner they wish. The centre image is of a cellular automation.

I used these images together because of the obvious parallels and humour. This is an example of how some of my work concentrates on the philosophical parallels between the relationship of the individual and society with technology and scientific advances.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in exhibition:
everybodies here, 1992
3 x CLC500 colour prints

ANNETTE WEINTRAUB   USA

The *ALL NEW GEN* images presented for TISEA are the first part of a work in progress towards an interactive installation. *ALL NEW GEN* critiques a highly influential form of technology — the 'Gameboy' hand held computer games, originally developed by the Japanese company Nintendo. 'Gameboys' have been on the market now for several years, gaining immense popularity with children and (in particular) adolescent boys. In the 'Gameboy' worlds exemplified by Nintendo's *Donkey Kong* and *Super Mario* and Sega's *Sonic Hedgehog* the rationale is simple — there is a hero and an enemy (or more precisely, a hero who engages with multiple manifestations of enemies and hazards).

ALL NEW GEN is a new contender on the market, a 'Gamegirl' whose enemy is the computer terminal "Big Daddy Mainframe", the essence of a futuristic omnipotent military-industrial complex. With her posse of Homegirls, *ALL NEW GEN* 's mission of sabotage is to act as a virus in the terminal, infiltrating and corrupting the databanks. She is the modem of Big Daddy's discontent, the ultimate mercenary of slime.

In *ALL NEW GEN* VNS Matrix continue their commentaries on the relationship of the body to computers, ethics and technological development and the representation of gender roles in popular culture. VNS Matrix are Virginia Barratt, Francesca da Rimini, Julianne Pierce and Josephine Starrs. The *ALL NEW GEN* installation will be exhibited in late 1993.

AUSTRALIAN CENTRE FOR PHOTOGRAPHY
Monday 9th November - Saturday 28th November

Work in exhibition:
All New Gen, 1992
5 lightboxes with backlit transparencies

My work is about the visual language of architecture. I use this language to represent a world of fragments — remnants marked by traces of urban history in disintegration and regeneration. I am using imagery which evolves out of basic architectural structures and ornamentation. This vocabulary of forms began as a means of exploring pictorial structure but it has taken on other meanings for me. Architectural imagery, with its resonances and associations, has become a means of creating a continuum between the past and present; this work has become a reflection on change, creation and destruction.

In this series *Disintegration/Reconstruction*, I am working with an image of the dissolving city. The disintegrating and evanescent forms in these images are layered and stratified. I wanted this composite imagery to create a continuity between disparate forms and to reflect the discontinuity, rupture and devastation of the urban environment. Through these common elements of the architectural and ornamental vocabulary, are interwoven contrasts of embellishment and abandonment, connection and dislocation, beauty and ugliness, past and present, identity and anonymity.

This work incorporates photographic fragments of historical and contemporary structures as well as core elements of architectural language. I use altered photo fragments in which architectural conventions (such as window, column, arcade, frieze, vault, facade, and figurative ornament) are dematerialised, combined and layered. I also include vernacular artefacts of urban environments in the form of signage and fragments of type. Superimposed over this collage of fragments are transparent linear pattern elements which imply the grid of the city, architectural plans, and cloth patterns — the 'fabric of the city'.

The composites are accomplished through use of a computer; the photo fragments are digitised, then altered, manipulated and repainted. Software enables me to selectively pick up parts of a photographic image, to dissolve, process or manipulate that image, changing brightness, contrast, resolution and sharpness. I repaint these fragments, changing their focus, detail, edge and texture, and incorporate pattern elements which are transparently floated over the architectural elements.
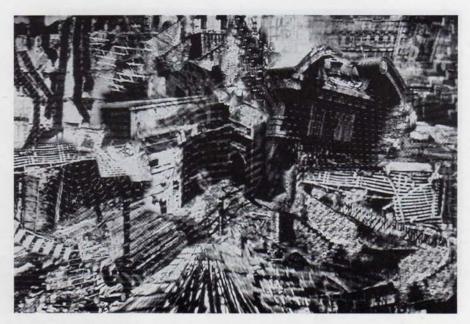
I have chosen to work in a pixelated, low resolution mode, instead of using the capacity of the software to create photo-realistic images. The broken and fragmented quality of the images is consistent with my content and I like the contrast between the broken quality of the image seen close up and its more photographic reading at a distance. Additionally, the pixel/grid element represents a tie between my art in traditional media and the signature imprint of the computer.

The images in this series were output as tiled and laminated laser prints (79.7 x 119.4 cm and 73.7 x 97.8 cm). The grid of tiled pages which are laminated onto a single sheet also reintroduces an element of the patterning grid and repetition of the urban environment. Alternatively, some of the images in this series have been output as one colour photo-lithographs (29.2 x 36.8 cm).

ARS MULTIPLICATA
Monday 9th November - Friday 13th November
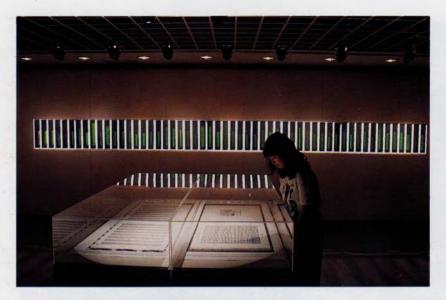
Work in exhibition:
Lifeline, 1992
Sic Transit, 1992
Edification, 1991
Encaved, 1991
Scaffold/Strata, 1991 77.5 x 117.5cm

Annette Weintraub, *Sic Transit*, 1992

Wenyon & Gamble, *Bibliography* at Installation Age, Tokyo Metropolitan Museum of Photography, 1992

Dennis Wilcox, *Untitled*, Pendulum monitor video installation at Performance Space January 1992.

WENYON AND GAMBLE   UK

The Form of the Invisible is the title of a book by the English writer Herbert Read which we were surprised to discover, translated into Japanese, in Tsukuba University library. *The Form of the Invisible* is itself a very good book, that is, a physical object containing immaterial ideas. The role of the book as a carrier of ideas and culture, its changing form and function in a new era of technological media, has been the focus of our recent work.

Our interest in books began in 1986 when we were invited to live and work for a year in the Royal Greenwich Observatory in Sussex, England. This institution was the oldest scientific research institution in Britain and had a wonderful library including many historical books. As strangers to the institution, the library was the one place we could explore freely without having to ask anyone for help. The library was always open, day and night, and we were given permission to use it whenever we wanted. There were many books on astronomy, atlases of the stars and photographs of planets and constellations. In the main library a large circular table was spread out with bulletins and newspapers of daily interest. Images of libraries began to enter our work and books themselves began to be the source of discoveries. In *Newton's Rings*, an image of the library at the Royal Greenwich Observatory is projected behind a hologram of *Newton's Rings*, a phenomena discovered by Newton and explained in his book *Opticks*. Here we were interested in the role of optical science as a kind of language underlying astronomy, rather than in the book as such.

BLACK
Monday 9th November - Saturday 28th November

Work in exhibition:
The Form of the Invisible
installation of holograms

The use of virtual reality models is particular to this system of depth discrimination. A perceptual response to changes in pictorial space can be conditioned by how the viewer may be orientated to an implied or simulated depth. Virtual pictorial space is therefore fundamentally a system of orientation, where the viewer may become relocated or dislocated from an immediate or physical frame of reference.

The subjective experience of perceptual depth discrimination is for me more consistent to a curvilinear visual space that is particular to the peculiar frame of reference of the viewer. Virtual reality systems however are based on an empirical system of linearity. The distinction between the world of immediate and subjective experience and the empiricism of science becomes blurred when ambiguities in visual perception are labelled as incorrect by the interpretation of linear measurement. This results in an assault on the perceptual autonomy of the spectator by conditioning a dependence to this model of field orientation.

As stated by the mathematician Luneburg in 1956: "Visual straightness differs from the straightness we attribute to a total act of perception to objects manufactured with increasing perfection in our physical surroundings."

(This project was assisted by the Art & Development Fund of the Australian Network for Art and Technology)

ABC ULTIMO
Monday 9th November - Saturday 21st November
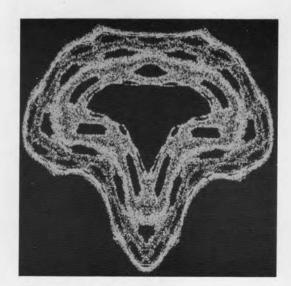
Rotating Monitor Display, 1992
Video-kinetic sculptural installation

DENNIS WILCOX

AUSTRALIA

ADAM WOLTER   AUSTRALIA

Philosophically the most interesting thing about computers is that from the earliest stages of their conception, they were thought of as general purpose machines. Part of their structure has been deliberately left blank and may be readily changed. This part is of course the program. If a computer is made use of for its ability to support a particular small set of programs then it its potential is unrealised.

If artists are truly interested in maximising the scope of their creativity, or in taking more control of the political agenda in their use of computers, then they should get tough and take the hard approach of writing their own programs. This approach requires no more hardware than others (usually less) and can be achieved (somewhat surprisingly) on quite standard personal computer configurations. Further, the results of programming efforts are easily subject to literal deconstruction and reuse in other contexts and are therefore well suited to communal use. The major input to the programming approach is time, usually more abundant to artists than other commodities.

This approach should naturally be leavened with recourse to readymade processes when available, and indeed it is the case that large applications programs which rely primarily on graphic user interfaces are now providing interfaces either to dedicated scripting facilities or to generalised inter-process communications capable of or oriented towards programmed control. More and more, third party provided components may be connected to produce flexible and powerful hybrids.

The communicational connections that constitute these hybrids are at once generalised, specific, arbitrary and structured. They are inevitably expressed in some form of language. The program of events described by that language is limited largely by the ability of artists to express themselves appropriately. Few would disagree that expression is an essential goal for artists.

Work in exibition:
Royal Botanical Gardens, Tisea Registration area
Maiden Theatre

Computor Sandpit

performance

STELARC
PAUL DEMARINIS
PIERRE BASTIEN
ROD BERRY
BARBARA CAMPBELL
DON RITTER
THECLA SCHIPHORST
BURE SOH
YUJI SONE
AMANDA STEWART &
WARREN BURT

BENOIT MAUBREY
MELISSA LOVRIC

Virtual Arm Project

The Virtual Arm is a computer generated human-like manipulator interactively controlled by VPL VR equipment. Data Gloves with flexion and position-orientation sensors and using a gesture-based command language allow real-time intuitive operation and additional extended capabilities. Functions are mapped to finger gestures, with parameters for each function allowing elaboration — for example the continuous rotation function can apply to the fingers as well as the wrist and the speed can be varied. It is also hoped that hand state and motion gestures will also be recognised. The Cyber Glove, with finger abduction and thumb roll sensors will allow a more extensive gesture language. Another strategy that has been used is to only depend on a small number of gestures — with different functions mapped in different tables. By swapping tables, it is possible to access a new set of functions and parameters.

An Arm Editor allows the Virtual Arm to be customised for particular performances and virtual tasks — not being limited by anatomical or engineering constraints of the real world. Use of Limiters provide constraints that define the functional motion. The Virtual Arm is able to behave ambidextrously — as a left hand or right hand by switching the user's control and simulating hands.

Some of the Virtual Arm's extended capabilities include 'stretching' or telescoping of limb and finger segments, 'grafting' of extra hands on the arm and 'cloning' or calling up another arm. The 'record and playback' function allows the sampling and looping of motion sequences. A 'clutch' command enables the operator to freeze the arm, disengaging the simulated hand. For teleoperation systems such features as 'locking' — allowing the fixing of the limb in position for precise operations with the hand; in 'macro mode' complex commands can be generated with a single gesture and in 'fine control' delicate tasks can be completed by the transformation of large operator movements to small movements of the Virtual Arm.
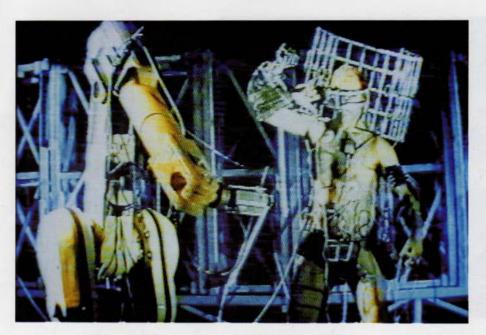
Gesture interaction is an effective and efficient means of remote controlling robot manipulators. As the Virtual Arm is a generalised or universal robot with extended capabilities, it may be useful for teleoperation environments or it can be seen as a sophisticated human-like manipulator for handling objects in a virtual task environment.

HOST BODY/COUPLED GESTURES: EVENT FOR VIRTUAL ARM, ROBOT MANIPULATOR AND THIRD HAND is an interactive event that controls counterpoints and choreographs the motions of the virtual arm, a robot manipulator, an electronic third hand and the arms of the body. It combines real-time gesture control of the Virtual Arm, pre-programmed robot scanning, symbiotic EMG activation of the Third Hand and improvised body movements. Sensors on the head and limbs allow the body to switch images from cameras positioned above the body, on the robot manipulator and from a miniature camera attached to the left arm — with the Virtual Arm being the default image. A relationship between body posture and images is established, with body movements determining the flow of images on the large screen — displayed either singly, superimposed or in split configurations. Amplified body and machine signals acoustically configure the virtual and robot operations. There is an interface and interplay of virtual and machine systems; of simulation and physical action; of actuation and automation. The interest is how electronic systems can extend performance parameters and how the body copes with the complexity of controlling information video and machine loops on-line and in real-time. The artist has always been intrigued by the phantom limb effect that amputees often experience — the body can now experience an additional virtual arm.

1. Stelarc, (video-still), Remote Gestures/
Obsolete Desires: Event for Robot
Manipulator, Involuntary Arm and Third
Hand, Edge Biennale, London, 1992.
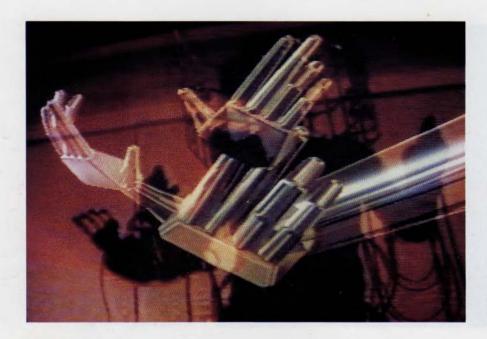
2. Stelarc, (video-still), Remote Gestures/
Obsolete Desires: Event for Robot
Manipulator, Involuntary Arm and Third
Hand, Edge Biennale, London, 1992.

3. Stelarc, (video-still), Graft/Replicate:
Event for Virtual Arm, Amplified Muscles
and Third Hand, GASS, Melbourne, 1992.
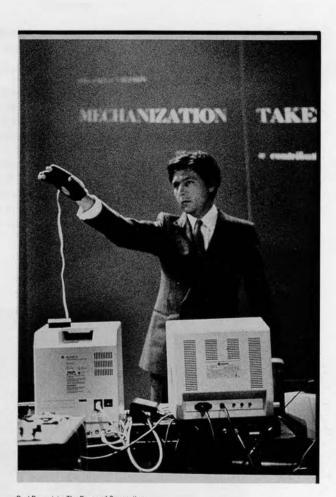
4. Stelarc, (video-still), Graft/Replicate:
Event for Virtual Arm, Amplified Muscles
and Third Hand, GASS, Melbourne, 1992.

PAUL DEMARINIS   USA

The Power of Suggestion

"God is perhaps not so much a region
beyond knowledge as something prior to the
sentences we speak"

Michel Foucault

In many of my recent songs for synthesised
voice I have treated speech melodies as musical
material. By a process of computer analysis and
re-synthesis I extract the melodic line of spoken
language, involve it in a variety of compositional
transformations, and apply the result to digital
musical instruments. Along the way, the original
voice becomes more or less disembodied, but
retains much of the original spirit and meaning.
With the computer analysis model I can alter
voicing – changing the speech into drones or
whispers, articulation rate – speeding or slowing
the speech independent of pitch, as well as a
variety of other effects (many of which sound
unfamilar but agree with the kinematics of the
vocal tract). As I compose, I listen and I think. I
choose vocal sources that interest me, particu-
larly the voices of evangelists, hypnotists and
salesmen because of their great confidence and
enthusiasm.
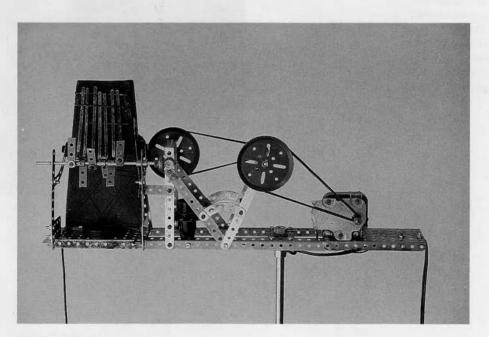
Paul Demarinis, The Power of Suggestion

Mecanium

Bastien has composed music for Dominique Bagouet's ballets, and it was for his *Tartine* production that he made his first musical machine, combining a record-playing engine, a Meccano structure and a cymbal.

The products of a strange cross between modern technology and ethnic folklore, his works are reminiscent of futurist primitivism and dadaism. In the words of Marc Gabriel Malfant, the music of Pierre Bastien has also rediscovered the pure charm of 'air' or tune, the easy-to-whistle-to genre pursued by Bach that has disappeared from the musical vocabulary.

We enter, through music, into a forgotten world where tired machines slowly and obstinately repeat coagulated tunes. The tempo is heavy, decomposed. In this nocturnal milieu, the apparitions have the mysterious walk of the ghosts and their power of fascination. These 'airs' have the elegance of a remembrance... And sometimes, we surprise ourselves whistling a melody of Pierre Bastien while we maintain fixed in our memory the sorrowful calm of Marimba Combo's cornet.

Pierre Bastien, *Mecanium*

ROD BERRY   AUSTRALIA

Rotary Zithers

Although my work has an important visual component, I still view myself primarily as a composer/musician coming from a history and tradition of music.

I see my work as moving away from a model of music as something you sit down and have done to you toward one where the listener takes a more active role in perceiving and interpreting the work. As a student, I imagined pieces of music that one could literally walk around, choosing the order in which various aspects could be experienced. Most of my work has since towards this ideal.

My approach to soundwork has been greatly influenced by electronic and computer music. In this sense, I consider timbrel and spatial concerns (along with more traditional concepts of melody, rhythm and so on) to be of primary importance, even when not using electronic sound sources.

The computer intrigues me for its ability to offer both total control and varying degrees of randomness. In future I wish to produce work that can enter into some kind of dialogue with the observer/listener or even between various parts of itself.

Rod Berry, *Rotary Zithers*
photo by Ian Hobbs

Barbara Campbell, *Cries from the Tower*

BARBARA CAMPBELL   AUSTRALIA

Cries from the Tower

Mary Stuart was removed from her subjects for the last 14 years of her life. She spent most of her period of incarceration alternately writing letters to rally support for her release and embroidering tapestries of exotic and mystical beasts.

"Rapunzel, Rapunzel, let down your hair to me"
— German fairy tale

She was executed on the 8th of February, 1587. Her English captors went to great lengths to dispose of blood-stained remnants of the act so that no holy relics could circulate and inspire a Scottish backlash.

"I felt in my hands and in my heart a confused, singular, continual, sensual desire to bury my fingers in this charming rivulet of dead hair."
— Guy de Maupassant, *A Woman's Hair*

When the executioner held aloft the dead Queen's head, the auburn tresses in his hand came apart from the skull and the head fell to the floor, revealing her real, prematurely greyed hair.

"All your hair, Melisande, all your hair is falling from the tower! I am holding it in my hands, against my mouth, in my arms... It lives like birds between my fingers, and it loves me, loves me more than you."
— Maeterlinck, *Pelleas et Melisande*

Don Ritter, *Interactive Video is a Way of Life*

DON RITTER   CANADA
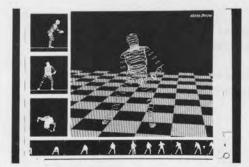
Interactive Video is a Way of Life

As a visual artist, my motivation for creating an interactive video system stemmed from an increasing dissatisfaction with the major limitation of visual media. After finding myself associating with more musicians than visual artists, this limitation became increasingly obvious and an envy developed for musicians and their manner for creating art. These new associations led me to the conclusion that musical media, such as live music, are primarily concerned with life, while visual media, such as painting, drawing and sculpture, are concerned with that opposite state of being, death.

This difference becomes obvious by comparing the experience of visual media with the experience of live music. In a museum or gallery, for example, visitors calmly stare at inanimate objects on display, rarely speaking and never clapping or cheering in approval. These viewers are like the bereaved at a wake, paying respect to a friend who will soon be entombed in the nether world of a gallery's storage room. What could be so different from the experience of the visual art than a live music performance? While music performances come in a variety of styles, from classical to new music to rap, they all provoke audiences to clapping, cheering, dancing and a whole range of physical activities which are strictly *verboten* in a museum of fine arts.

This goal is being pursued through performances containing large video projected imagery and live improvised music. During these events, image selection and cinematic effects are intricately associated with the music's formal structure as an attempt to capture the spontaneity of live music with video.

The result of the pursuance has been the development of an interactive video system and the presentation of numerous international performances in which audiences witness the birth and existence of an interactive video controlled by live improvised music.

Thecla Schiphorst, *Life Forms*

THECLA SCHIPHORST   CANADA

LifeForms

This performance dance piece explores the interactive relationship between the performer's movement, effects on lighting, sound, text and image. LifeForms, a 3 dimensional choreographic tool, is used to create movement for the performer as well as for the virtual performers and images projected into the space. The performer, wearing a wireless microphone controls lighting intensity, colour, and trajectory, via voice and pressure activated triggered events. The performer serves as a link via her own voice, body and movement, and the computer as midi interpreter connecting projected human forms, images, sound, and active moving light sources.

YUJI SONE AUSTRALIA

Nonetheless Marinetti

It seems to be the accepted theory that the prehistory of Performance Art in this century began when the first FUTURIST manifesto was published in 1909 by Filippo Tommasso Marinetti. The main concept of the writing was to attack the establishment value of the arts in that time. The movement created art works negating the limit and boundary of the old art concept.

80 years later, having seen Dada, Bauhaus, Black Mountain College, Happenings, Events, and Fluxus, the core concept of the 1990's Performance Art somehow still seems to resemble that of Futurism.

Should we, performance artists in the 1990's, be criticised as repeaters?

or,

Should we blame societies which always have narrow sectionalism, or which only reluctantly allow interdisciplinary/inter-cultural discipline?

(Do inter-cultural practices exist without leaning against the stronger culture?)

It could be said that one of the functions of performance art has been working as anti-thesis.

In the unstable, uncertain situation (as always) of the 1990's Performance Art, being empowered by electric technology, will survive as a tool to resist exclusionism, closedness, and conservatism.

AMANDA STEWART & WARREN BURT AUSTRALIA

We collaborate because it's fun. It's fun to explore the voice. It's fun to be in a situation of feedback between people, their voices, and machines. It's fun to be in an artistic situation where you don't know what's coming next. It may also be politically useful, socially responsible, and helpful to develop both our own consciousnesses and abilities and those of friends.

The Audio Ballerinas

This is a mobile sound environment project consisting of 7 'Audio Ballerinas' wearing electro-acoustic skirts. This performance series was created on commission for the festival 'Les Arts au Soleil' (the 'Arts in the Sun') in summer of 1990 for the Lille, Pas-de-Calais area of France.

The female performers wear 'Audio Tutus' that are equipped with digital memories and looping devices (essentially mini-samplers) that enable them to interact directly with their environment by recording live sounds and then processing and amplifying them.

In addition to being able to digitally record musical instruments or voices in their proximity, they are also equipped with radio receivers, contact microphones, amplifiers and light sensors that enable them to produce, mix, and multiply their own sounds and compose them as a multi-acoustic and environmental concert.

Each electronic tutu (approximately 20 watts, 12 volt) is made of plexiglass and powered by either solar cells or batteries depending on whether they are performing indoors or outdoors, at night or in the daytime.

Benoit Maubrey, *The Audio Ballerinas*

Benoit Maubrey, *The Audio Ballerinas*

MELISSA LOVRIC

JAPAN

Melissa Lovric is an Australian dance and performance artist now based in Tokyo. She works with movement, computer generated slides and electronically interactive sound in her productions. Her movement piece for TISEA will be for two dancers and draws primarily upon her studies in Japanese butoh dance.

Melissa Lovric, *performance*

digital audio

SCOTT H. FOSTER
ELIZABETH M. WENZEL
R. MICHAEL TAYLOR

BRAD MILLER &
PETER LOWE

telecommunications

VIRTUALLY SPEAKING
CULTURES IN CYBERSPACE
TELEMAT

real time synthesis of complex acoustic environments

SCOTT H. FOSTER

ELIZABETH M. WENZEL

R. MICHAEL TAYLOR

This paper describes some recent efforts to "render" the complex acoustic fields experienced by a listener within an environment. It represents an extension of earlier efforts to synthesise externalised, three-dimensional sound cues over headphones using a very high-speed, signal processor, the Convolvotron (Wenzel, et al., 1988). The synthesis technique involves the digital generation of stimuli using Head-Related Transfer Functions (HRTFs) measured in the ear canals of individual subjects for a large number of equidistant locations in the anechoic chamber (Wightman & Kistler, 1989). The advantage of this technique is that it preserves the complex pattern of interaural differences over the entire spectrum of the stimulus, thus capturing the effects of filtering by the pinnae, head, shoulders and torso.

In the initial version of the Convolvotron, up to four moving, or static sources can be simulated in a head stable, anechoic environment by filtering of arbitary signals with the appropriate HRTFs. Motion trajectories and static locations at greater resolutions than the empirical data are simulated by linear interpolation of the four nearest measured transforms. Also, a simple distance cue is provided via real time scaling of amplitude. Thus, while this system implements only the direct sources to the listener, it possesses a high degree of interactivity. That is, in this simple anechoic space, it is possible to freely manipulate source position, listener position, and listener attitude in a dynamic, real time display.

For a variety of reasons, it is desirable to be able to achieve the same level of interactivity in more complex acoustic environments. One reason is that previous preconceptual research suggests that synthesis of purely anechoic signals can sometimes result in perceptual errors, in particular an increase in front-back reversals and a failure of externalisation (eg. Plenge, 1974; Wenzel, et al., 1991). There is reason to believe that such errors can be alleviated by providing more acoustic cues derived from reverberent environments (Plenge, 1974; Blauert, 1983). Such stimulations would also be quite useful in a variety of application areas including architectural acoustics, advanced human-computer interfaces, telepresence and virtual reality, and as a test bed for psychoacoustical investigations of complex spatial cues.

Previous work examining reverberent fields has emphasised basic measurement techniques in both real environments (see Blauert, 1983; Berkley,1987) as well as perceptual studies of localisation in real environments (see Ando, 1985; Hartmann,1983). Of particular interest here, is the work on the image model for simulating room characteristics using convolution with pre-computed impulse responses (eg Allen and Berkley, 1979) and related ray-tracing techniques for computing impulse responses of modeled rooms based on synthetic early reflections (Schroeder, 1980;

Kendell & Martens, 1984; Moore, 1983; Begault 1987). The more recent ray-tracing techniques implement the directional characteristics of source reflections by convolution with HRTF-based filters. Such models generally require that a new impulse be computed for each source position, listener position and listener attitude. It is also usually assumed that sources are point sources or uniform radiators.

Static Modeling of Acoustic Environments

Our first attempts at modeling complex acoustic environments have been a simple variation on our original synthesis technique. Quite simply, if HRTF measurements are taken in an ordinary environment, instead of an anechoic chamber, the effects of scattering and reflection in the environment will be captured in the measurements. It is then possible to render any of the source locations measured simply by filtering an incoming source signal with an appropriate pair of impulse responses. Unfortunately, for each combination of source position, listener positioner and listener attitude desired in the rendering, a measurement must be made and stored in the rendering machine for real time use. This means that these geometrical parameters must be restricted considerably during real-time implementation. We will call this type of approach "static modeling" because, in general, either the source or the listener (and usually both) are restricted to one position. The computational cost of the technique is further increased by the fact that the length of the impulse response, and thus computation time, increases approximately linearly with the size of the room. So far, only moderately-sized rooms can be implemented in real-time.

In spite of these restrictions, static modeling as implemented in the Convolvotron can be quite useful. For example, it can be applied in the study of architectural acoustics and the perceptual properties of rooms to facilitate the comparison of modeled acoustical properties with measurements of actual environments.

Dynamic Modeling of Acoustic Environments

In order to mitigate some of the restrictions of the static model, we have been experimenting with dynamic reflection models. Following conceptually from the ray-tracing models described above, in this approach we account for the presence of a reflector (eg a wall) in the environment by placing an image-source behind the reflector to account for the reflection of the source signal. Thus, what the listener hears is a superposition of the direct path from the source with the image sources coming from all reflectors in the environment. It is also necessary to consider the filtering effects (if any) of the reflecting surface and propagation effects such as spreading loss, signal delay and high-frequency absorption.

Currently, the filtering effects of the reflecting surface is modeled with a Finite Impulse Response filter that can be changed in real time. The output from the filter is passed into a long delay line with variable tap points for each of the image points to be simulated. Thus the reflecting properties of all the reflecting surfaces are the same in this simulation. The tap points

are adjusted to correspond to the propagation delay from each image being modeled. Finally, the delayed signal for each image source is processed with the appropriate HRTF filter to create one component of the binaural output. The superposition of these components with the original HRTF-filtered source (the direct path from source to listener) is then presented over headphones.

Dynamic modeling requires enormous computational resources for real time implementation in a truly interactive display. Even with a Colvolvotron it is not practical to render more than the first one or two reflections from a very small number of reflecting surfaces. However recent research (Ando, 1985; Barron, 1971; Barron and Marshall, 1981; Begault, 1983; Kendell and Martens, 1984) and our own early experience indicates that much of the useful information is present in these early reflections, particularly lateral reflections. In future work, we plan to extend this simulation to more realistic models of acoustic environments. Some of the issues that need to be addressed are diffuse reflections, scattering reflectors, diffraction and partial obscuration by walls or other objects, atmospheric absorption, near-field effects (eg. head-shadowing), and perceptually-viable methods of simplifying the synthesis technique.

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BRAD MILLER & PETER LOWE   AUSTRALIA

Diminishing Dimensions

We live in a shrinking world. Previously we began by exploring the world around us. Having explored that world we then began to explore the world that was beyond us, the extraterrestrial world. Whilst that project remains unfinished we have now begun to explore another, more intimate world - one that we hardly realised existed before the invention of the microscope: the atomic world.

Nanotechnology is the latest buzzword in the jargon of astrophysicists, molecular biologists, and chemists - the development of which straddles each of these diverse disciplines. It is a development that entails a molecular revolution in the way we are able to perceive and deal with the very building blocks of matter. The term *nano*, meaning a billionth, is an indication of the terms of scale that the new technology deals with.

This program is a fragmented sound map which seeks to image the terrain of fundamental quantum reality. It is a strange world of paradoxical reality. Invariably, when scientists talk of the atomic world, they begin talking about the blurring of the fundamental distinction between energy and matter.

The venture into this endophysical realm has been touted as "the most powerful technology that the world has yet developed". This being so it is seen as a portent of things to come: the abolition of disease, increased longevity, minimised environmental pollution and the like. Yet the new technology has its critics who are concerned about the moral and ethical dilemmas which they see as the outcome of the development of such a radical technology.

The voices of the following will be heard during the program:
K. ERIC DREXLER: Visiting Scholar, Department of Computer Science, Stanford University
PROFESSOR JEAN-MARIE LEHN: Universite Louis Pasteur, Nobel Prize for Chemistry 1989
RICHARD P FEYNMAN: Nobel Prize for Physics 1965
RALPH MERKLE: Xerox, Palo Alto Research Centre
STUART HAMEROFF: anaesthesiologist, Department of Anaesthesiology, University of Arizona
LESTER MILBRATH: Emeritus Professor, Environment and Society, SUNY
STEPHEN MILL: Centre for National Policy Research, Department of Sociology, University of Wollongong

Executive Producer: Tony McGregor
Producers: Brad Miller and Peter Lowe
Mix: Andrew Clarke-Nash
Original recordings: John Jacobs, Ian Andrews and Jason Gee
Pre-production: Steve Tilleys
Special Thanks: Roz Cheney, Heather Grace-Jones, Simon Mahoney and Gary Bradbury

VIRTUALLY SPEAKING

The Symposium will be building its own virtual architecture and inviting artists from around the world to play a part in the TISEA telecommunity. This networked environment will be available through public access terminals at TISEA and will include biographical material, an online library and an electronic forum called "Virtual Cultures on the Net", pulling in responses from around the world.

TELECOMMUNICATIONS
PARTICIPATING SYSTEMS:
AMERICAN INDIAN TELECOMMUNICATIONS/DAKOTA BBS
ARTSNET
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CULTURES IN CYBERSPACE
ACCESS TERMINALS AT ROYAL BOTANICAL GARDENS, ART GALLERY ROAD, DOMAIN

What is culture in cyberspace? In Australia, Canada, the US and parts of Europe, some artists have gained access to computer networks and are using them to make and distribute art. Those working in a Euro-American artistic tradition often experiment with conferencing software to create works that evolve from a process of participatory, interactive communication. Native American artists in the US have developed online graphic share-art, which represents their distinct cultural identity, and feeds their traditional (offline) communities. In many 3rd world countries where poverty is high, and computers and phone lines are rare, networking projects are generally operated by non-governmental organisations or educational institutions, and tend to focus on economic or social development, not cultural preservation or participation.

How will cybercultures evolve? Is it important for cultural participation in cyberspace? And if so, how can and is equitable access made available to all cultural groups? What will happen to cultural groups that remain offline? Will cultural groups that do access cyberspace lose their distinct identities through a process of interaction? And if so, is such an occurrence cultural evolution or homogenisation — something to explore or something to avoid at all costs? What is the role of cybercultural activity in cyberspace itself; what is its role in the ofline culture that initiated it?

As a virtual panel, Cultures in Cyberspace will be conducted as an open panel within a number of computer network communities, ranging from internationally distributed networks, to local BBS. Participants will include cultural workers as well as cyberspace citizens who are interested in the issue. TISEA participants are invited to contribute to the panel discussion, direct from its TISEA site.

TELEMAT

An interactive telematic terminal operated by Scot Art, Jason Gee and System X

Telemat is a guided tour of the virtual terrain of the global network. The visitor is taken through a dataspace which has no physical walls, and may well encompass the world, or may lie in some other direction. The dataspace has been interactively 'designed' from the ground up by a small group of artists over the preceding two years. The interaction has been via System-X, a Sydney-based telecommunications system for artists working in the electronic domain.
Telemat provides interaction via a store-and-forward mechanism between visitors, System-X artists and denizens of the global net. It also incorporates a display terminal for image and sound from the virtual gallery, a System-X project that allows visual and sonic artists to share work and collaborate via the system.
Telemat, like System-X seeks to originate critical thought about the nature of information storage and control, data networks, and how art might be practised in this media. Above all, it seeks to provide a context for participants, local and telematic, to provide their own content.

essays

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global media, common ground, and cultural diversity*

BRENDA LAUREL

Tokyo Dreamspace I'm standing at night in a public square in Shinjuku on my first visit to Tokyo. Down the machine-straight streets off the corners of the square, as far as I can see, neon pulses in vertical collages shoot animated afterimages off into the ambiguous sky. Perspective condenses the neon like sideways gravity. On the faces of buildings, diagonally right and left ten stories up, huge video screens paint the bare legs of hundred-foot women walking in slow-motion, randomly jump-cutting to spinning logos and sleek speeding cars. Half a head taller in my heels than most of the Japanese who pack the square at midnight, I am seeing the place as one who looks into an aquarium at precisely the waterline: above, the photon storm of neon-video light; below, people moving like fish, slowly, not looking up. I bob up and down, breaking and re-breaking the surface tension of the human sea, savouring the instant metabolic transformations. But I am left wondering why these people have made this space? Most of them are not even looking at it.

In *Understanding Media*, Marshall McLuhan offers the notion of media 'temperature' as a way to characterise sensory, cognitive, and cultural effects. He uses 'cool' in two senses: firstly in relation to media which invite participation through low-resolution and incompleteness; and secondly in relation to the 'cooling down' of one's senses in response to 'hot' media. He treats the former as a generally healthy state,

but the latter can become a kind of disease or numbness that is a side-effect of the body's strategy for surviving media assault.

On rereading McLuhan after more than a decade, I wonder what he would say about the phenomena that we now call interactive media. One of the ways he distinguishes 'hot' media from 'cool' is in terms of participation. High-resolution media are non-participatory in that there is not so much for us to fill in. In the 1980s, interactivity was hailed by many as the antidote to the numbing world of TV. But do interactive media necessarily enhance participation?

In Shinagawa we visit the bowling alley — two hundred lanes, each with a video monitor mounted overhead. As a woman approaches the line, the monitor displays her in a frontal long-shot. As she releases the ball, sensors alert the system to cut to a view of the pins. The ball makes contact and the video cuts again to a close-up reaction shot. The 'interactive' video processes the real-life interactivity out of the experience, like shining red light through a red filter.

When I return to Japan a few months later, electrolust draws me back to the neon-video square. The second experience is deeper, more viscous. Perhaps inner rehearsal has made me a better night-driver. There is the same strange and instant exhilaration, but now I am feeling it on my skin rather than in my head. I am inside the experience. I do not have ideas. Fragmentary messages drift by like flotsam in a phosphorescent sea. My senses are cetacean teeth, straining out bits of pattern. I sample indiscriminately. What was once 'hot' to the point of fusion is now the ultimate 'cool', seen and forgotten in the same instant because there is too much to see, too much to remember. Juxtapositions in the mysterious underwater mind make intimate ephemeral poetry out of what was once searing noise. I sweat and tingle, the exquisite feel of cooling off experienced as an inside-out creative act. This does not feel like anaesthesia.

What has changed? Have I popped out the other side of McLuhan's numbness? When we cool down, might the onslaught be transformed into a new form of inviting ambiguity? Or are we acting out a larger evolutionary pattern, emerging from and diving into stranger and stranger seas?

Many recent writings about 'virtual reality' invoke Lewis Carroll's looking glass as a way to describe the nature of the medium. I am reminded, like McLuhan, of Narcissus — the reflective surface traps us in an anaesthetic trance. The deeper power of telepresence awaits below the waterline. One can imagine a transformation spawned by sensory immersion, like the Tokyo night, where the burning sky collapses in upon its content, driving meaning down into a realm that is entirely unsuspected, intimate, and vast.

I am reporting these experiences because they have caused some radical shifts in my thinking. Similar shifts have probably happened to others in their own wanderings through urban landscapes, or perhaps through

immersion in the brain-defying pace of some of the better stuff on MTV. Some things happened to me in Tokyo that led me to a new line of inquiry about the nature of media and experience. As new media enter early adolescence, their distinctive traits begin to assert themselves, pushing through the vestiges of their predecessors.

The emerging characteristics of what I call the supermedia environment demand our attention in new ways. One unanticipated and exhilarating effect of my encounters with Tokyo Dreamspace is that sensory immersion led to submersion into a new interior landscape. It provided me sudden and deep entry into an intimate realm that has been only rarely accessible to me in the past, and never through anything but the most personal, solitary media experiences and contexts. In 'Through the Vanishing Point', McLuhan talks about the revolutionary impact of the development of the vanishing point in perspective painting. The supermedia in Shinjuku accomplishes a revolution of similar magnitude by replacing my old experience of point-of-view with the experience of being *inside-the-viewpoint*.

Being 'inside-the-viewpoint' is not only a perceptual phenomenon, but a cognitive and contextual one as well. It was used (along with other now-familiar overload techniques) by Mark Pennington and his associates in the production of an extraordinary series on MTV called *BUZZ*. There were only six episodes, all produced in 1990, and the series was cancelled ostensibly due to its high production costs. The series' themes were global in nature — racism, sexism, war, and the environment — but the techniques used to present them gave the series a profoundly personal emotional impact.

Another arresting effect of supermedia, whether it be Tokyo's landscape or media productions like *BUZZ*, is the collapse of an overwhelming array of sensory particulars into larger patterns. Our brains dutifully try to interpret sensory data as pieces of information which may, if the transformation is successful, lead to their integration as knowledge or understanding. But in a superabundant sensory environment, this strategy simply cannot work. Naturalist writer Barry Lopez observes that the same holds true in our attempts to apprehend non-technological environments and landscapes[1]. Sense data must be coalesced or collapsed into larger patterns before they can be integrated (before the question of meaning can emerge). In Lopez's view, such patterns replace content with relationship as the dimension of meaning. It could well be that this fundamental shift reveals the essential nature of the landscape of global media, giving us our first view of the common ground of global consciousness.

A third observation demonstrates that the shared experience of this new supermedia landscape has the capacity to call forth both dimensions of participation simultaneously: the deeply intimate and the super-personal. It is a form of experience unmediated by the self-conscious individual sitting inside a sack of skin, intentionally formulating and interpreting communication acts. But the idea of supermedia need not result in breakdown and numbness — it may lead to the perceptual and cognitive transformations

that create the conditions for global consciousness: namely, the linkage of intimate inner experience to the huge electrical hand print of collective experience.

Interactivity What does the notion of supermedia do to the idea of interactivity? Typically, interactive media require a high degree of precision at the interface level in order to enable a human-computer 'conversation.' In contrast, the phenomenon of 'sensory collapse' that I've been describing emphasises ambiguity and imprecision. In a way, specific 'content' becomes unknowable — although like the invisible gene, it has its influence on the shape of the whole. One cannot participate with the specifics in order to derive their meaning; rather one must collapse the multitudinous specifics into a suitably ambiguous whole, cooling them down enough to enter in.

This goes a long way towards explaining why interactivity as it is manifest in contemporary human-computer interaction has not been able to produce a satisfying successor to pre-computer art forms. Interactivity — in the form of menus, soft buttons, metaphorical tools, or even embedded 'user constraints' — ultimately trivialises the dimension of participation and objectifies it, over-specifying what people can do in relation to images or environments. As Rachel Strickland observes, interactivity usurps the kind of deep participation that we have in paintings, films, poetry, or landscapes — the experience of the free imagination collaborating with the work. Overly constrained, overly explicit interactivity stuffs cotton into the portals of imagination. Deep participation is, I believe, an indisputably human need; interactivity is often a counterfeit solution.

In new forms and with new interfaces, computers and video can create a strong connection between inner experience and collective ones. Another example can be found in a little piece of Tokyo experience called *Hyperdelic Video*, produced by two young Australians — Andy Frith and David Richardson — who currently live and work in Tokyo. They give their performances names like *Brainwash TV* and *Spacemen Wear Their Gas Masks*. Describing themselves as 'video disc jockeys', they combine scratching and mixing techniques with real-time video. Their stated goal is "MAXIMUM INFORMATION OVERLOAD":

> The modern generation of TV children, having grown up on a diet of fast-cut commercials, rapid fire news and increasingly larger amounts of compressed information relate well to the concept we call INFORMATION OVERLOAD. This concept parallels the movement in dance music of ever-increasing tempos in conjunction with layers of 'borrowed' information — sound samples, vocal edits, and complex mixing and production techniques.[2]

I saw *Hyperdelic Video* in a smallish basement bar in Roppongi, packed to the rafters with a mostly Japanese, mostly under twenty audience. Only at Grateful Dead shows have I seen a crowd move so much like a single organism. Despite my obviously excessive age, I was easily absorbed into

the hypersensual centre of the scene. A video image of the dancers is woven into the live presentation of their work, creating a downright Dionysian effect (especially when you are one of them). As McLuhan scholar Derrick de Kerkhove observes in the Art Futura catalogue, 1991: "computers have created a new kind of intermediate cognition, a bridge of continuous interaction, a sort of 'corpus callosum' of exchanges between the outside world and our inner selves."

Common Ground How can new media serve as the common ground for a global consciousness? The notion of common ground is employed by cognitive psychologists like Herb Clark and Susan Brennan to mean "mutual knowledge, mutual beliefs, and mutual assumptions"[3]. In distant times and more grounded cultures, real places served as some kind of common ground: the kiva, the agora, the plaza, the marketplace. As landscape is in constant relation to the ecology of mind, so such gathering places are the foundations of both external community and internal belongingness. In America, as in other places around the world, it is no secret that the idea of place is disappearing. Small towns — once connected to rivers, mountain passes, and oases — vanish into the proto-Gibsonian sprawl of suburban development and the artefacts of commerce. One town either comes to look and feel like another, or else it disappears. As John Barlow observes, any street five miles from the centre of any city in America is indistinguishable from any other. Place is an office with standard cubicles, a home of predictable proportions, a freeway, a fast food restaurant. The marketplace is an infinitely interchangeable shopping mall. Yet the sense of place is another of those indisputable human needs, and the surrogate places of the modern world once again plug our receptors with cotton.

If you spend time on computer networks you know that people gravitate to net conferences and special interest groups as if they were places. In 1987, Lucasfilm developed a graphical computer network called *Habitat* that features a two-dimensional graphical universe with thousands of virtual places in it. This system was originally developed for the QuantumLink network, and a version of it called *Club Caribe* still runs in America. But the more complete version runs in Japan on Fujitsu FM-Towns machines. People gather at agreed-upon venues to engage in conversations, games, and other social activities. In a new kind of text-based network system called MUDs (multi-user dungeons), people collectively invent places, complete with qualities, objects, and connections to the larger virtual landscape. As the geographical notion of place fades in American culture, it is enthusiastically revitalised in virtual worlds, but with this difference: the communities that gather in these virtual places do not depend upon accidents of geography to bind them together. These are volitional communities of interest, affinity, and emboldened curiosity. McLuhan foresaw the retribalisation of people through electronic media. Virtual places are both cause and effect of a new kind of ad hoc tribalism in global culture.

Global Media and Cultural Diversity At the second international Cyberspace conference in Santa Cruz at the end of 1991, Randy Farmer and Chip Morningstar, the principal designers of *Habitat*, reported on another dimension of life on the net that becomes crucial when we look at the cultural impact of the medium. Early on in the history of *Habitat*, there was unrest among the citizens. Criminals were afoot, stealing people's heads. When you first log on to *Habitat* you get to choose a body (and therefore a gender) and then you go to the Head Shop and buy yourself a head. In the early days, when you logged off from a session, your body would stay where it was. Part of the fun was wandering around trying to figure out which bodies had somebody 'in there'. But since heads were detachable and had a market value, a certain element began stealing the heads of those who had logged-off. The citizens held a town meeting in the *Habitat* and decided by democratic vote that they wanted head-stealing to be prohibited, and then they got in touch with the system designers. Randy and Chip agreed to enforce a rule that out-lawed head-stealing and other kinds of theft within city limits (the countryside, as usual, remained in the control of outlaws and guerillas). The penalty for stealing a head was to be confined to quarters — sent back to your own apartment in the *Habitat* — for the next several hours of log-on time.

The point here is that self-government had begun on the new frontier of Cyberspace. Here, we are dealing with representations — of self, of place, and of society — that have more than a graphical reality. Another incident from the same conference reinforces this point. I gave a talk on artistic approaches to designing Cyberspace environments and tools. In the question-and-answer period I was challenged by one of the many radical feminists in attendance. She wanted to talk about access and colonialism, in part bouncing off of the *Habitat* presentation. She asked me what people were doing about making Cyberspace accessible to the 'marginalised' — women (who are classically disenfranchised in the techno-domain), ethnic minorities, and third-world cultures. I had to think carefully about my response.

First of all, I reminded her that I was a woman (I believe my exact words were, 'What am I, chopped liver?') and that one way for women to get into Cyberspace was to do what I had done — to get actively involved in the industry rather than sitting on the sidelines waiting for somebody else to make the way smooth. Then I asked her what she had in mind as far as the other groups she mentioned were concerned. Should first-world white heterosexuals build little virtual terrariums for Blacks, Latinos, gays and lesbians — based on their own ideas of what such cultures are like, saturated them with their own liberal hidden agendas? I wondered whether she wasn't preaching to the wrong group. Shouldn't she be evangelising with the marginalised themselves to persuade them to co-opt the technology? I was reminded of the traps I fell into as an idealistic young student trying to work in the Civil Rights movement. It was made clear to me then in a way that I never forgot that white liberals could be excellent spear-carriers in the battle for Black student rights, but it was entirely inappropriate and violently resisted when whites tried to assume leadership roles.

There is no easy way out of this conundrum. Over the last thirty years, awareness of the value of cultural diversity has steadily increased in America and much of the global community. The *hyphae* of Western urbanisation, advertising, industrialisation, and media are penetrating and destroying real and cultural landscapes around the world.

On the one hand there is value in a global culture that replaces nationalism and ethnic strife with a sense of membership in a global community. On the other hand, the mass destruction of the aesthetics, wisdom, and self-esteem of indigenous cultures is not unrelated to the global resurgence of fundamentalism and ethnic violence that could extinguish us as surely as an old-style superpower armageddon.

So here is the pivotal question: how can we empower people the world over through global technology without sacrificing cultural diversity? Can we produce and implement a vision of global media culture that is founded on the wisdom of what the Vulcans call 'Infinite Diversity in Infinite Combinations'? How do we empower people to use computer technology without confining them to the Western constructs that are so deeply embedded in our interfaces, computer languages and the architecture of the technology itself?

I have several observations. All can be derived from a term I learned from Ivan Illich: 'Conviviality.' "Convivial tools are those which give each person who uses them the greatest opportunity to enrich the environment with the fruits of his or her vision."[4]

A person ought to be able to be both an 'author' and a 'reader' in any given medium. An author shapes materials — whether it is clay, paint, pixels or words — into communicative forms in which others may participate. But even before we get to the problem of constructing environments, representations or tools, we encounter the problem of materials. This first crucial hurdle is the ability to assemble data; that is, to bring one's own materials — sounds, gestures, images or speech — into the digital domain.

The second hurdle is tools. In mainstream computing culture we have constructed tools that serve us relatively well. However these tools only work for the initiated — and the concepts and biases that are embedded in that initiation may pose the greatest threat of all to the visions of non-mainstream individuals and cultures. We can learn something about this problem by looking at how artists have gone about gaining access to computer technology over the last two decades. For example, many of the pioneers in computer music simply took it upon themselves to learn the language of computing and construct their own tools. But as Mark Bolas has pointed out, many of the musicians who began grappling with signal processing found to their chagrin that the process had blown a decade-wide hole in their lives as composers and performers.

A counter-example can be found in the work being done at the Advanced Computer Graphics Centre at the Royal Melbourne Institute of Technology in Australia, where a remarkable artistic environment for sculptors has been created by a team of sculptors and programmers working together. This approach might be described as strapping a programmer to an artist, and it points out the profound difference between first- and second-generation tools. In the first generation, the emphasis is on designing tools that facilitate skills-transfer from one domain to another. When the second generation of artists comes along, they're more like those little kids in Marin who know how to swim at six months — because Mom threw them in the pool. They are so intimately conversant with the new medium that they have absorbed the original contradictions from the outset.

Such scenarios could also be true of other unique cultures. I am reminded of Tony Hillerman's Navajo cop, Jim Chee, who has a university degree in anthropology and moonlights as a shaman. He manages to maintain a living connection to his culture by having a foot in both worlds — the one that must be preserved and the one that must be understood in the interest of survival. I believe that our strategy should be to collaborate with native people in other cultures to build a core of technological expertise. Empowered indigenous programmers will strap themselves to their own user-communities and commence the processes of understanding and ultimately, expropriation.

In some very important ways, 'they' are 'us.' We do not have to go to Africa or Asia to encounter disenfranchised cultures and visions, or people whose voices and wisdom must not be allowed to disappear. We have begun and must accelerate the process of designing media and tools that enable access with deep regard for diversity. This is not an idea that the mass market mentality will naturally or inevitably encourage. The 'squash and spread' philosophy exemplified by DOS, Nintendo, and broadcast TV will die long and hard, if at all. I firmly believe that the best strategy is to build examples that can demonstrate the potential profitability of conviviality. The dramatic increases in bandwidth and the number of channels that can be supported by our telecommunications infrastructure are factors that can work in our favour. But the thing that will make the most difference is whether or not we turn our values into examples that we can advocate successfully — not only in a well-meaning and like-minded crowd, but to the people and institutions who have to live by the bottom line.

1 Barry Lopez, *Crossing Open Ground*, New York, Vintage Books, 1989.
2 Andy Frith and David Richardson, *Hyperdelic Video*, 1990
3 Herbert H. Clark and Susan E. Brennan, "Grounding in Communication", in *Socially Shared Cognition*, L.B. Resnick, J. Levine and S.D. Behrend (eds), American Psychological Association, 1990.
4 Ivan Illich, *Tools For Conviviality*, New York, Harper & Row, 1973.

There is nothing more that can prevent inter-
activity from becoming the principle and
essence of life itself: I am interactive there-
fore I am.

Pierre Moeglin, 'Les transes de
l'interactivite'[1]

'Interactive computer art' has become fashion-
able, undoubtedly as part of the current vogue
for anything 'interactive'. Even the art world is
finally showing signs of embracing it.

ERKKI HUHTAMO   One might argue that the proliferation
of forms of computer-mediated inter-
activity in our everyday lives has
already given rise to a new subject position in
relation to modes of audiovisual experience. It
has been in the making in interactive science
museums (such as La Villette in Paris), video
game arcades, flight simulators and by PCs in
homes and offices.

This new subject position is much more dynam-
ic and 'responsive' than those allocated to the
traditional spectator of cinema or television.[2] It
emphasises the 'naturalness', immediacy and
intimacy of the encounter between humans and
technological objects. Instead of the familiar
notion of human-computer *dialogue*, some
observers have started to talk about the com-
mon *ground* between them. According to such
views, an interactive system is not something
distinct facing the user; rather, it is an environ-
ment that *comprises* both human agents and
the synthetically created 'interface agents' as
equal partners.[3]

Such a model implies an 'immersion through the computer screen', and
thus a gradual dissolution of the human-computer interface. This might be
expanded into a cultural statement, eventually announcing the collapse of
the strictly polarised model of the 'two cultures'— the humanist and the
technological—which has persisted throughout the Western tradition since
the Industrial Revolution.[4] In the 1960s of course, Marshall McLuhan was
already a proponent for the idea of a *symbiotic* relationship between man
and machine. The tactile metaphor was characteristic of this thinking —
technology was understood not only as an extension of our 'external' sense
organs, but of our nervous system as well.

In spite of McLuhan's brilliant intuitions, many questions about the quality of
interaction are still open. Do interactive systems have a liberating or a con-
straining effect on us? Should 'immersiveness' be resisted as such? How
much of the 'potential of interaction' is just hype — pseudo interactivity,
perhaps serving someone else's ends? Should users be guided by 'maps'
and 'guides', or left on their own? What possibilities for counter-readings
and counter-uses do interactive systems offer? Does it matter that many of
them are toy-versions of those developed by the military-industrial complex
for surveillance and destruction?

It is possible to start answering some of these questions by looking at
interactive art installations. I assume it is possible to see them as a contin-
uing metacommentary on the state of interactivity, in the terms of which
technological breakthroughs are probed and sometimes anticipated, in
which new applications are found and ethico-philosophical issues arise. One
might suppose that this field is paradoxically the least conditioned by the
concerns of the military-industrial complex at the same time it is the most
concerned about it.

Unfortunately, the field of interactivity is not homogeneous — in terms of
production or exhibition. While some interactive installations are produced
independently or are partly funded by public sources, other pieces claiming
to be 'art' have unquestionably originated within the military-industrial com-
plex. Their intention is, at least partially, to promote products and camou-
flage the less philanthropic aspects of the corporate profile.[5]

The Exchange of Addresses Considering the centrality of the relation-
ship between the interactive system and a human agent, a useful starting
point lies in the analysis of its *modes of address* — ie its method of estab-
lishing and maintaining a relationship with the user. In audiovisual theory
the two main modes of address are 'indirect address' (which is the third
person mode dominant in classical narrative cinema) and 'direct address'
(the first person mode dominant in broadcast television). Most audiovisual
texts are not 'pure'. Rather, they are combinations of different modes of
address with a variety of sub-categories.[6]

In classical cinema the spectator is 'sutured' into the cinematic spectacle
by constant changes in the point-of-view. This impersonal third person

mode dominates, with the characters living in a self-sufficient world and the spectator watching it from the outside. There are moments, however, when the characters seem to talk directly to you, but even in this is motivated from *within* the fictional world. The spectator is called to join in only through identification with the characters' points-of-view. The spectator is thus considered a voyeur, a libidinous outsider.

In broadcast television however, the spectator is constituted as an acknowledged subject of the program flow. A crucial role is played by the presenter or anchor-person who addresses the implied spectator directly. All other material on TV (including re-runs of classical films) is subordinated to this recurring mode of address. The presenter and other familiar screen personalities such as news-readers (who have been granted the privilege of addressing the spectator in the first-person mode) can thus be seen as assuring representatives of the world of television. The spectator is constituted as a 'partner' representing the domestic world. These worlds are connected by a variety of cues, such as home interiors in the studio and so on.

Interactive systems further complicate the situation by requiring the user's active and physical (not just mental) participation. Not only does the interactive piece address the user, but the user also addresses the piece. David Tafler has called this situation "a second person (I-you) exchange".[7] Whereas the television spectator addresses the screen primarily by turning it on or off, or by channel-surfing with the remote control, a constant 'exchange of address' (a *change of direction* of address) may take place between the human and the computer. It is also possible to imagine a situation where the computer-generated world is submitted to the address of the user. Here the separation between direct and indirect address (from the user's point-of-view at least) makes little sense.

While one of the central functions of direct address on television is to keep the spectator watching a single program without changing channels, the direct address of interactive installations requires one *to make a choice*, to reconsider the situation. The recurrence of the direct address may serve a 'binding function' (even when *guiding* the user through the database) as on television. However, the interactive user cannot be carried away by the program flow; the user is kept in a state of constant alertness. Another question that arises here is to what extent this state can become automated, activating a reflex-like psychological challenge/response mechanism. Pessimists already see this happening with the excessive playing of video games.

Intimate Conversations As with television, the direct mode of address in interactive works can take many different forms. The most explicit form can be found in the use of a fictional screen personality as a mediator between the virtual world of the computer and the user. This solution recalls the television experience, particularly if a full-screen talking head is used. A good example of this can be found in Lynn Hershman's *Deep*

Contact (1990). Even its installation component simulates the domestic living-room atmosphere.

In *Deep Contact* we communicate repeatedly with a screen personality named Marion, dressed (or rather undressed) as a hostess from 'Call Girl' spots on TV. Marion appears at certain points in the Macintosh Hypercard-based program addressing and seducing the user. The user selects paths in a landscape representing different sexual fantasies *by touching* (via a touchscreen) parts of Marion's body. The female body (or rather its graphic representation) thus serves as a menu that contains the erotic experiences it promises.

The intimate tactility of the relationship is already created in the first image, where we see Marion knocking on the screen from the inside, begging somebody to touch her body. There is no other way to start the program. The insistence on the connection between direct address and screen-mediated tactility reminds one of Douglas Davis' 1970s television performances — except that here the user does have a way to respond. In their own ways both examples bring forth the enormous distance built into the colloquial direct address encountered during a normal TV-event. While television-images may challenge, they never respond; they lack intimacy, and are one-way only.

The psychological tension between Marion's insistent address and the desire to touch the image is surprisingly high. *Deep Contact* demonstrates that physically touching a representation can still be a problematic thing in a culture where visual communication has traditionally been *mediated*, reduced to an optical-mental operation. While some religious traditions have restricted the visibility of certain sacred images (the shroud of Turin) and allowed tactility in other cases (kissing the statue of the Virgin Mary), 'thou shalt touch the image with your eyes only' has been the rule from classical academic painting to the cinema — and even to ready-mades and found-objects.

Constructed screen personalities have not only been used in the role of a guide. In Hershman's pioneering videodisc *Lorna* (1983) the artificial character was the centre of attention. While learning about Lorna and her problematic life the user was encouraged to help her, to become her psychoanalyst. Luc Courchesne's *Portrait One* (1991) belongs to a 'conversational' genre. It offers an intimate conversation with a remarkably life-like character named Marie, who stares at the user from the screen during the whole session.

Menus and Maps Direct address does not, however, have to be personified in anthropomorphic creatures. It can assume the form of a short casual instruction ('touch the screen', 'click on 'left' or 'right' to proceed', etc.) or that of a menu or a map. The menu is used, for example, in audiovisual 'poetry machines' to provide the user with the instructions and the tools for 'composing' with the database. A good example is provided by Bill

Seaman's *The Exquisite Mechanism of Shivers* (1992), which offers the user multiple ways of treating the audio-visual fragments of poetry stored on a videodisc.

The map can be included in the image program and called on the screen intermitantly, or it can be included as a separate, free-standing 'board', as in Jeffrey Shaw's *The Legible City* (1980-90) and Michael Naimark's *VBK - A Moviemap of Karlsruhe* (1991). In these 'virtual voyaging' or 'surrogate trav-elling' pieces, the map simulates the role of an ordinary city map, helping users orient themselves in the virtual city. Simultaneously, it points out the limits of the virtual world and thus maps the field of interaction.

The opposite of such clearly mapped works are the pieces that refuse to guide the potential user at all. Such works dispense with direct address, or a least suppress its anchoring function. Ken Feingold's *The Surprising Spiral* (1991) doesn't even announce itself as interactive. The spectator is supposed to find out by accident or by inferring from the general design of the installation. What's more, Feingold's piece leaves a doubt about the nature of the interaction — the user who operates the book-shaped touch screen will never be certain of the outcome of their touches. In fact, images and sounds 'randomly' appear in real-time or with a time lag; they may even be the previous user's choices.

Feingold's piece is a labyrinth which neither shows the way through the maze nor is willing to reveal it little by little. The user remains face to face with a mystery object. Some people have been frustrated with the impossi-bility of mastering the rules of the game even after a lot of trying; they attribute their problem to imperfect programming. In so doing they con-form to one of the most common features of interactive systems: that there is a possibility of learning. There is, in fact, a pedagogical subtext inherent in most interactive artworks, whether it is underlined or not. They share this feature with functional, goal-orientated applications of interactivity.

Feingold's own point of view would probably be that *The Surprising Spiral* is a piece of art, and not a video game. An artwork is entitled to retain its ambiguity. A painter or a poet does not provide the keys to their work. Why should an interactive artist be expected to? At this level *The Surprising Spiral* could be read as a *meta-interactive* work. Its aim is to question cer-tain *données* of interactivity, in much the same way as Feingold's videotape *Un chien deliciéux* questioned the ideology of documentary truth. Feingold simply added a fictional voice-over 'translation' to authentic documentary footage, without marking the result as fictional.[8]

Cinema and Interactivity The use of direct address in interactive sys-tems is central because of the constant need to involve the subject. Thus, when indirect address is used it must almost inevitably be subordinated to some form of direct address. This is certainly the case with 'interactive movies' such as the one by the Czechoslovakian filmmaker Raduz Cincéra being shown a the Futuroscope theme park in France. The audience can

decide — at certain moments — the way the story is to proceed by a majority vote, using push-buttons connected to an electronic voting sys-tem. Unfortunately the voting takes place only at certain crucial moments, which are over-determined by multiple forms of direct address: stopping the film, projecting graphic signs on the screen, turning on the lights and even allowing a live hostess appear on the stage to direct the voting! The film itself, *Le vieil arbre et les enfants*, proceeds from a traditional narrative position which does not acknowledge the presence of the audience.

This form of audience participation amounts to little more than an entertain-ing trick. It demonstrates how difficult it is to introduce intelligent interactiv-ity into a multiperson situation. There is some truth in Michael Naimark's observation: "The Movie World Understood Realness But Not Interactivity [...] The Computer World Understands Interactivity But Not Realness."[9] One of the most successful audience participation pieces I have experienced did not involve computers at all. At 'Les arts étonnants' at Toureoing, France in October 1991 artist Alain Fleicher made the audience reflect back towards the screen a movie that was projected towards them by means of individual handheld mirrors. The resulting picture on the screen was a constantly forming and deforming 'pixel-image'.

An interesting attempt to mediate between the movie world and the com-puter world can be found in the interactive cinema pieces by Grahame Weinbren. *The Erl King* (1988, with Roberta Friedman) and *Sonata* (1992) resemble other interactive computer installations, allowing one person to interact via a touchscreen while others form an audience who observe the interaction on monitors incorporated in the installation. The audiovisual material in these pieces (mostly camera-images stored on videodiscs) is heterogeneous in form, ranging from performance and 'emblematic' shots to didactic and narrative sequences. In *Sonata* there is even a complete narrative movie, shot by Weinbren and based on Tolstoy's 'Kreutzer Sonata', hidden in the database.

While interacting with these pieces the user is drawn into a rapid-fire exchange with constantly changing modes of address. None is given absolute authority over the others, even though there seems to be some hierarchical structuring. In *Sonata*, the image of wolves sitting on a tree, staring at the user (from Freud's case history of the Wolf Man) unexpected-ly appears, and seems to provide some kind of interpretative frame. Weinbren himself has referred to the Freudian dream narrative as a sub-text for his compositions. The viewer is meant to be carried in a subjective state, "keenly aware that there are, 'behind' or within each image, other images and image-sets that may not show on screen in the current perfor-mance of the piece".[10]

Even though there are graphic cues included in *The Erl King* to direct users, they are mostly carried by their choices in a relatively unanticipated way. The images in both direct and indirect modes function here in an undifferentiated manner as 'symptoms'. Both may equally attract touches

according to the users' wishes and lead to additional layers of images and sounds. In *Sonata* there are fewer cues on the screen and the interaction is much smoother (thanks to the digitalisation of the signal from the analog videodisc). Still, the 'cognitive map' behind the images and sounds seems easier to master than in *The Erl King*. [11]

There are long segments in *Sonata* during which the hand of the user functions as a real-time film editor. While the 'Kreutzer Sonata' sequence is running, the user can reveal different views (camera-angles, framings) of the same scene by touching the upper side of the screen. Split-screen effects are activated by sliding ones hand laterally across the screen, revealing another story or scene that looks as if it were taking place simultaneously. Here the user's hand intrudes in a *self-sufficient world* (via an indirect mode of address) 'from the outside'.

This situation seems to have a parallel in that large group of video games, which are observed from an objective camera-position and are manipulated (using a joystick) by the player's 'invisible hand'. There is a difference, though: in a video game the player is *represented* by an agent who is controlled by the user, whereas in *Sonata* the user is more genuinely outside. Role playing has more of an effect on the discursive frame (the 'montage' of one layer or between layers) than on the outcome of the 'story' within it. Mythological associations to 'the hand of God' come easily to mind.

Puppeteers as Puppets In terms of mode of address, artificial reality systems provide a peculiar kind of human-computer interface. The user is confronted with their own presence in a computer-generated environment. Technically these systems are a hybrid of closed circuit video and computer technology. The role of video as an input-output loop may recall the closed circuit video installation, which was a favourite form of early video art during the 1960s and 1970s. Such installations allowed the spectator to see their own image in real-time in different configurations of monitors. This created a mirror-like situation which (among other things) investigated the viewing subject's identity in relation to real and virtual spaces.

In artificial reality installations the image of the user's body (scanned in by a video camera) is superimposed on the artificial reality (created on the computer) allowing the user to interact with real-time body movements of the 'puppet on the screen'. This is true of Myron Krueger's *Videoplace* system, which has had numerous incarnations (since 1974) and also applies to the Vivid Group's *Mandala* system (since 1986). In an artificial environment however, the presence of the human agent does not have to be visible — it can also be audible. Body movements can create a soundscape by triggering a variety of virtual sound effectors, as in David Rokeby's *Very Nervous System* (since 1986).

One peculiarity of these systems is their theoretically complex interplay between retaining and annihilating distance simultaneously. Keeping physical distance — remaining in the video camera's field of vision — is a

requirement for immersion in the virtual environment. This situation could be referred to as 'tele-tactility'. *Externalisation* of the body leads to its *internalisation*. The result is a kind of a *bilocation*, an experience whereby the body seems to be in two places simultaneously.

This readily evokes parallels with the literary tradition of the *Doppelgänger* or with the field of paranormal phenomena (in which the subject sees their own body as if from the outside, as in levitation). These parallels don't carry very far. A basic difference can be found in the fact that these fantasies have no 'remote control' relationship between the real and the virtual body. The virtual body is often seen as a threatening independent agent or as a passive, hologram-like image. The split is definitive.

In artificial reality systems there is an immediate, existential relationship between these two bodies. The virtual body is not our rebellious shadow — even though *Videoplace* may sometimes play with this idea. It is an *extension* of the physical body of the user. It is also our representative in the artificial world, but it is a peculiar one. Instead of the more customary situation wherein we select an agent to represent us in the computer world (the protagonist of a video game for instance) here we act as puppeteers directing ourselves as puppets.

Another difference between an artificial reality system and the fantasies mentioned above lies in the fact that levitating bodies and *Doppelgängers* are believed to materialise in the same space the physical body is located. Artificial reality, however, purports to transport the virtual body to *a parallel, alternative reality*, with its own 'natural laws'. It is, according to Krueger, a responsive environment. Ideally, such an environment is 'smart', provided with some artificial intelligence. It does not just respond to external stimuli, but acts on them in unpredictable ways. *Videoplace* may tease, or even 'mutilate' the virtual body on the screen. Artificial reality thus clearly combats the idea of AI as necessarily embodied in anthropomorphic creatures. It is 'spatialised intelligence', which may evoke the Haunted Houses of the early silent cinema.

Controlled Rush Into the Image In most artificial reality installations I have seen, immersiveness has been restricted by the fact that they don't form complete wrap-around surroundings, which would annihilate the sense of real space and involve the subject totally. The *Videoplace* and *Mandala* installations present a clear demarcation between the real and the artificial world. In practice this is provided by the visibility of the frame of the screen — as in painting, photography and cinema — and by the distance of the user from the screen. The refusal to build immersive artificial realities isn't a technical imperative. In Krueger's case it is an ethical stand against 'isolating people' and alienating them from "the other activities that take place in a work environment". [12]

Ideas such as immersion and immersiveness easily evoke negative connotations about losing hold of reality, of being pulled into the eye of the

storm, or of drowning in an interactive environment. An LSD trip, a theme-park ride or an intensive session on an arcade simulator game can all be characterised as immersive experiences. Members of the moral majority groups see television and the media in general as immersive and alienating, dragging their victims away from natural virtues and social life. Here immersion and penetration regain their full sexual connotations.

Some immersive technological spectacles do indeed aim at causing a vertigo by offering an out-of-the-ordinary experience that exceeds customary spatio-temporal limits. Extraordinary speed, supported by synchronised multi-sensory devices is certainly the central attraction of the Showscan 'dynamic cinema' ride. Equally important is the first person point-of-view. Unlike conventional narrative cinema however, there is no exchange of 'looks'. Everything is seen from a subjective camera position, identified with the point-of-view of the spectator. There isn't even a lateral panning camera movement, just the high-speed motion *into* the image along the depth axis.[13]

This kind of immersiveness — understood simply as a pre-programmed penetration into an image — is also encountered in computer-based installations that do not present a complete wrap-around environment. In terms of interactive systems however, we should speak about 'controlled immersion'. The possibility of the rush into the depth is there, but only as one of the options of the system. Even the player of a regular Formula One simulator game is given a certain margin to control the headlong rush into the image. Driving speed and direction can be varied to a certain extent. The driver can also 'pan' with the virtual camera identified with their own point-of-view coupled with the movements of the car.

There is a whole genre of interactive art installations based on this subject position, which I propose to call 'inverted direct address' — referring to the fact that the active, controlling gaze that *addresses the system* belongs to the user. This genre has been variously called 'virtual voyaging' or 'surrogate travelling', and is best represented by the oeuvres of Jeffrey Shaw and Michael Naimark. Naimark actually participated in the production of *Aspen Movie Map* which was produced at MIT in 1978-79 and is usually considered the first of the genre.

In virtual voyaging installations the user is given the sensation of travelling inside a virtual landscape while remaining physically motionless. The virtual landscape can be a city created in 3D computer graphics, as in Shaw's *The Legible City*, or it can be a computer-controlled videodisc with a camera-image reconstruction of an actual city, as in *Aspen Movie Map* or in Naimark's *VBK - A Moviemap of Karlsruhe*. The interface can be anything from a joystick or a spaceball to an adapted surfing board (as in Peter Broadwell's and Rob Myers' *Plasm: Above the Drome*, 1991) or a bicycle (*The Legible City*).

By coupling first-person vision and virtual mobility these installations provide the virtual voyager with a *mobile panavision*. This has restrictions how-

ever. In *The Legible City* the 'virtual camera' (identified with the real-time vision-movements of the user) is limited to a street-level point-of-view. It can, however, be switched to an 'X-ray mode' and penetrate walls. In *VBK - A Moviemap of Karlsruhe* the freedom of vision-movement is restricted to the tramline network of the city, captured through the windscreen of a tram. There also exists the possibility to speed up the motion of the 'virtual tram' into a real phantom ride.

'Unrestricted movement' through virtual space may be a technical goal and a cyberpunk dream, but it isn't necessarily an artistic aim. Restrictions can be artistic principles of composition and used to direct the subject's attention to other levels of-signification. The strength of *The Legible City* lies in the transformation of the act of vision-movement into an act of reading/writing. The idea of realising the rows of houses as letters, words and sentences is rich with cultural implications.

Back to 'Reality' While there is not much interesting artistic work done in the field of totally immersive environments at present, this is certainly one of the upcoming frontiers. Total immersion is not only a logical conclusion of the discourses on the human-machine symbiosis, it is also in sync with trends in contemporary popular culture, neo-psychedelic house dancing and cyberpunk mythology. On the other hand, the attraction towards immersive experiences is a cultural *topos*, which is activated now and again in appropriate cultural circumstances. Early Romanticism for example, gave birth to Blake's visions, Coleridge's Kubla Khan ('received' under the influence of opium) and to the great wrap-around Panoramas of the turn of the century.

Artist-created immersive environments are at their most interesting when they reach a balance between critical distance (vis à vis the most excessive aspects of immersiveness) and sheer sensory delirium. There are obviously two paths to follow, which are related to different ideas about bodies in space. One kind of environment is experienced in the real, while the other kind is experienced in a virtual body. Usually (but not necessarily) this division coincides with another one separating 'multiperson' from 'single person' experiences.

The first option refers to projected environments, where interaction is made possible by sensors installed in the space or worn by visitors. The other refers to virtual reality installations and 'movies', designed to be experienced with head mounted displays (HMD). Unfortunately, the few existing examples of such work with artistic pretensions — Matt Mullican's *Five Into One* (1991), Monica Fleischmann's and Wolfgang Strauss' *Home of the Brain* (1992) and Nicole Stenger's *Angels* (1992) — are all somewhat disappointing.[14]

This is only partly due to the technical deficiencies (uncomfortable interface, slow or rough graphics) and the problems of exhibiting this kind of work. I have a feeling that 'being inside' adds relatively little to the achieve-

ments of installations like *The Legible City*; even as a sensory experience the novelty soon wears off. Doubts can also be expressed about the quality of interaction. Brenda Laurel has remarked: "If a representation of the surface of the moon lets you walk around and look at things, then it probably feels extremely interactive, whether your virtual excursion has any consequences or not."[15]

The consequences are extremely important, but they do not have to be concrete. They can be mental — intellectual and emotional — as well. Many interactive systems still underestimate our capacity to fill in the gaps with our imagination. I therefore see it as desirable for interactive art to look for an equilibrium between technological and mental interaction, as well as between pre-programmed interaction and original real-time creation. The interactive artist should not be content with the role an illusionist, of being a technological magician. They should deal with illusions that bring people back to 'reality', whatever that means.

1 "Dès lors, plus rien n'empeche l'interaction d'apparaitre ni plus ni moins comme le principe et l'essence meme du vivant: je suis interactif, donc je suis". Pierre Moëglin, 'Les transes de l'interactivité', in *Les transinteractifs*, Derrick de Kerckhove and Christian Sévette (eds), Espace SNVB International, Paris, 1990, p. 106.

2 This doesn't imply, however, that the subject position constituted by the cinema or by broadcast television would be totally passive. Different feed-back modes — real and imaginary — are even encouraged. What's more, the spectator as a subject isn't absolutely tied to this position; rather, they have a wide variety of different ways to react, from 'preferred' readings to 'counter-readings'.

3 Brenda Laurel, *Computers as Theatre*, Addison-Wesley, Massachusetts, 1991.

4 Simon Penny, 'Machine Culture', in *SISEA Proceedings*, Wim van der Plas (ed), Groningen, 1991, p. 184-191.

5 William Bricken's statement, "The 3D sound stuff at NASA is art. Myron (Krueger's) work is art. The code is the VEAS [Virtual Environment Authoring System] is art — that is, some coding style considerations are motivated by aesthetics", doesn't really help us out from this dilemma. Neither does Brenda Laurel's article 'Artistic Frontiers in Virtual Reality', from which this quotation is taken (*Siggraph '92 Visual Proceedings*, John Grimes and Gray Lorig (eds), ACM, New York, 1992, p. 60). The corporate people are far too eager to join the artists' ranks, with far too little credits.

6 See for example: Bill Nichols, *Ideology and the Image*, Indiana University Press, Bloomington, 1981, pp. 182-207; Margaret Morse, 'Talk, Talk, Talk — The Space of Discourse in Television', *Screen*, Vol. 26, nr. 2 (March-April 1985), pp. 3-15.

7 David Tafler, 'Beyond Narrative: Notes Toward a Theory of Interactive Cinema', *Millenium Film Journal*, nos. 20-21 (Fall-Winter 1988-89), pp. 122-123.

8 This raised a storm amongst the more traditionally-minded documentary film-people at the 37th Annual Robert Flaherty Seminar in the summer of 1991. See Laura U. Marks' review of the event in *Afterimage*, Vol. 19, No 4 (November 1991), p. 4.

9 Michael Naimark, 'Realness and Interactivity', *The Art of Human-Computer Interface Design*, Brenda Laurel (ed), Addison-Wesley, Massachusetts, 1990, pp. 456-457.

10 Grahame Weinbren, 'An Interactive Cinema: Time, Tense and Some Models', *New Observations*, No 71 (October-November 1989), p. 14.

11 My impressions of *Sonata* are based on a short session in the artist's studio in New York City, August 6, 1992. The impressions usually change during subsequent sessions.

12 Myron W. Krueger, 'Videoplace and the Interface of the Future', in *The Art of Human-Computer Interface Design*, op.cit., p. 420; Myron W. Krueger, *Artificial Reality II*, Addison-Wesley, Massachusetts, 1991.

13 For an intelligent discussion of this, mostly in the context of computer graphics and computerised special effects on television, see Margaret Morse, 'Television Graphics and the Body: Words on the Move', paper for 'Television and the Body', Society for Cinema Studies, Montreal 1987 (unprinted manuscript).

14 I haven't had a chance, at the time of writing, to navigate through Stenger's *Angels*. My impressions are based on a demotape documentation about such a navigation in *ACM Siggraph Video Review*, Issue 83 (1992), and on an article by Louis M. Brill, 'Paradise Found in VR Movie', Siggraph 92 Show Daily, July 29, 1992.

15 Brenda Laurel, *Computers as Theatre*, op.cit., p. 21.

We are no-one. Just whites, marooned in the East by history.

David Ireland,
The Unknown Industrial Prisoner

McKENZIE WARK

To the Vector the Spoils *January 26th, 1988: It was a strange experience, watching those sailing ships, simultaneously entering Sydney Harbour and entering my l iving room — and many thousands of others via the live TV broadcast. It was a re-enactment of the white invasion of the Australian continent, performed 200 years later for the cameras. As with the first arrival of the first fleet, on this second coming the invaders parked their boats and thanked their sponsors. This time they didn't fly the Union Jack and thank God and the monarchy. This time the sponsor was, of course, Coca-cola.*

How to think about new media in the context of contemporary Australian culture — now that's a tough one. For a long time Australian culture has manifested a desperate attempt to fix a few things in consciousness between two great *abstract terrains of movement*. The first is the sea. The cultures that invaded Australia did so using a naval technology that turned the space of nautical dangers into an abstract space of movement, migration, trade and above all, of strategy. This was a history of the transformation of the space of the oceans into a universal space of movement. The project of transforming the antipodes through invasion and settlement presupposes a world of material flows. The 'conquest' of nature and the creation of the

second nature of built environments we mostly inhabit, presupposes this abstract space of flows.

The second abstract space is that of the media *vector*. Australia is an interzone, a node of exchange in the global media flows that constitute postmodernity. This is so at the level of culture: Australia as an avid consumer and producer of media product, particularly music and television. It is true also at the level of strategy. During the Gulf War, when Iraqi commanders order a SCUD missile launch via radio-telephone from Baghdad, orbiting US satellites intercepted the signal. Another satellite may have detected the launch using infra-red sensors. The American military installation at Nurrungar in South Australia down-linked information from both satellites. From there a satellite relayed it to the Pentagon, which routes it to the US command HQ in Saudi Arabia and to Patriot missile bases in Saudi Arabia and Israel.[1] The Australian government has no control over these strategic flows that pass through its territory. It need not even be informed.

The passage from modernity to postmodernity seems to me to involve the passage from one form of abstraction to another — from the second nature of abstract social spaces created by sea and rail transport to the abstract *information landscapes* created by the telegraph, telephone, television and telecommunications. The present phase of development (of digital media) seems to belong to quite a longstanding development in the lines of relationality, which are fundamentally relations of *power*, which organise the globe.[2] This is the neglected dimension of modernity. Viewed from the antipodes, the fundamental thing about modernity is the creation of the globe as an abstract space of movement and strategy. It is not what happened in Europe that is fundamental to modernity, it is Europe's relation to its many antipodes.[3] It is not what is happening in the United States that is fundamental to postmodernity, but what is happening in its relations to its antipodes.[4]

From the antipodes, one can contrast Foucault's notion of the development of regimes of disciplinary technologies (as the most fundamental transformation) with a genealogy of what one might call *vectoral technologies*. It is not the Panopticon but the British Navy that in this latter view emerges as a key technological regime of power in the early modern period. Let's not forget that Bentham's famous pamphlet was called *The Panopticon or New South Wales?* Panoptic power is an enclosure, classification and disciplining of bodies in space. Vectoral power is a blind projection onto an other that is partly mapped but still mostly imagined.[5]

Yet there is a link between the panoptic strategy and the vectoral strategy of transporting surplus, criminalised people to the antipodes. Both are regimes which combine a field of visibility, a technology for enclosing or traversing it, a discourse and its executors. Where the panoptic strategy is one of intensive vectors, subdividing, scrutinising and enclosing space within the city, transportation was an extensive strategy, based on a technology that can project, plan and traverse the globe. The world becomes the

object of the vector, of the potentiality of movement. Bodies, cargoes, weapons, information: this principally naval technology produced, almost as an afterthought, Botany Bay, Sydney, New South Wales, Australia. The antipodean other becomes enmeshed in a strategic grid capable of more mundane valuations of economic and strategic advantage. The other becomes a *project*, not a double for the west.[6] In the development of the vectoral regime of power and the antipodean other as a project, everything depended on the development of *technologies of perception*.[7] Techniques for finding a ship's longitudinal position were decisive.[8] This made possible a much more productive relation between the abstract space of maps, charts and solar calculations and the places through which ships passed on their travels. Every technology of perception — from the compass to VR, from the chronometer to the CCD, from the telescope to the smart bomb nosecam — is simultaneously a technology of vectoral or panoptic power.

The Tyranny of Difference First the sea-lanes, then the railroads created abstract lines of movement in space. Take a look at any atlas, and one finds a jagged mass of twisted lines, the contours of nature. Those contours are filled with dots of various sizes, all enclosed with jagged lines that divide the landmass up into a patchwork of spaces. This is the geography of places, our second nature. The dots mark out cities and towns of various sizes, the borders mark out the territories these towns were able to bring under their control in the modern period. The railways and the newspapers between them defined spaces that were integrated economically, politically and culturally. Regionalism gave way to nationalism. This tendency breaks down the separation of places and aggregates them into bigger, more abstract units. A second nature of productive flows overcame the natural forms and barriers of the land.

Now take out a big red magic marker and start to join up all of the dots. Big fat lines between the big towns, smaller ones between the regional centres. From the telegraph to telecommunications, a new geography has been overlayed on top of the first. The tyranny of distance gives way to a tryanny of difference — of information and its ever more fluid motions. What is distinctive about the telegraph is that it begins a regime of communication where information can travel faster than people or things. The telegraph, telephone, television and telecommunications can be grouped together as the media of *telesthesia*. This handy word, which means perception at a distance, describes a qualitatively different regime of communication. When information can move faster and more freely than people or things, its relation to those other movements and to space itself changes. No longer a space of places, we move on to a space of flows — firstly of information, which comes to direct the flows of people, goods, the military and so forth.

If there is a qualitative change in the organisation of culture which deserves the name of postmodern, perhaps this is it. Or perhaps we could call this state of affairs *third nature*. Second nature, or the geography of cities and roads and railways, is progressively overlayed with a third nature of information flows, creating an information landscape that almost entirely covers the old territories. While this process has been going on since the telegraph, it reached critical mass in the late 1970s. The postmodern is thus a catalogue of its symptoms. Cyberspace is a description of its subjective effects. Both postmodernism in theory and cyberspace in literature are explorations of the landscape of third nature. While third nature has been developing for 150 years, it did not reach a state of self-organisation until the period from the mid-1960s to today.

Autonomy Versus Antipodality The perception of postmodernism, cyberspace, third nature — call it what you will — differs from place to place, and it is high time to start breaking down these rather ethno-centric concepts. The video work of Australian artist Peter Callas has mapped some quite particular perceptions of this terrain of third nature in his *Technology as Territory* series, and I would like to acknowledge the influence of his work in enabling me to think and write about telesthesia and the spaces of cultural flow it creates.[9] In *Night's High Noon: An Anti-Terrain* (1988) Callas shows an image of an Aboriginal standing on the beach, watching the first fleet arrive. Cut to an image of the same headland, some time later and a white figure stands on the beach, watching a mushroom cloud rise on the horizon. Callas manages to portray a place which is always in a relation to an elsewhere, which is always defined by its relation to a powerful other. First the British came and colonised. Then the Americans came and coca-colonised. We are no-one, whoever we are, always oscillating in antipodality with elsewheres.

Antipodality is the feeling of being neither here nor there. It is an experience of identity in relation to the other in which the relation always appears more strongly to consciousness than either the identity it founds or the other it projects. Experiencing antipodality is always very unsettling, sometimes a little schizophrenic. There is nothing uniquely Australian about it, although it is a very common anxiety in Australian culture.[10] I think that thesedays the anxiety of antipodality is growing ever more common. The globalisation of trade flows and cultural flows made possible by information technology re-opens the old wounds of identity, breaking the skin at unexpected places.

The volume and velocity of cultural product in circulation globally keeps rising. Popular music, cinema and television (the raw materials of popular culture) are increasingly sold into global markets in accordance with transnational financing and marketing plans. Suddenly cultural identity looks like it is in flux. The relations and the flows are more clearly in view than the sources or destinations. The symptoms of this condition are usually called postmodernism and are thought of historically and parochially. I think they are symptoms of antipodality that must be thought spatially and globally.

The antipodean experience is the product of two technological regimes. The navies of the imperial powers created the modern geography of places

and flows over 200 years ago. The communications technologies of the postmodern era created a much more intensive inter-relation of cultures in space, the consequences of which are still unfolding. The Bicentennial 'celebration of a nation' in 1988 brought the two together.[11] Antipodean difference is the cultural difference created by the vector. The acceleration of the vectors of transnational communication will make the antipodean experience more common. With *CNN* beaming into every part of the globe that can afford it, many now experience antipodality — the feeling of being caught in a network of cultural trajectories beyond your control.[12]

The Virtues of Moral Ambivalence When one knows what it is like to be both the major and the minor pole of these ambivalent relationships of flow, then one can begin to think about the problem of cultural diversity and the information vector with a little more subtlety and empathy than either the technoboosters or the technophobes who usually hold centre stage in mainstream debates. This moral ambivalence to antipodality is I think very common in Australia, and something to be capitalised on methodologically rather than deplored or ignored. In relation to American culture and economic power, Australia is always on the receiving end of antipodality. Witness, for example, the harm done to Australia's already precarious trade position by the grain subsidy war between the United States and the EC. The hypocrisy and indifference to the Australian position manifested by White House mouthpieces over the theft of the Pakistani market by means of the subsidy crutch is exemplary of what it means to have one's identity organised around antipodal flows that the other controls.

On the terrain of cultural flows, a twofold process has occurred. The integration of the space of the continent into one media market has only taken place quite recently, via satellite technology. At one and the same time broadcasters have integrated the national broadcasting space and hooked it up to the global satellite feeds.[13] Until recently, this tendency towards antipodality was countered by local content rules in television broadcasting. As with local content rules in radio, these were successful in promoting the production of high quality, popular media products, which in turn were successfully marketed overseas. Australian TV programming now has a global audience, and Australia is the Number Three supplier of recorded music to the world market. In all, these policies balanced some degree of autonomy with a cosmopolitan media flow. The combined effect of lunatic 'free market' policies and pressure from American program producers to have services, including cultural ones, included under GATT agreements are steadily leading to an erosion of autonomous Australian cultural intervention into the global flow.[14]

On the other hand, there is very little room for moralising or playing the 'victim' in mainstream Australian culture. 'We' may be no-one, but 'we' were also colonisers, enslavers. The imposition of second nature on this continent, as on continental America, was at the expense of indigenous people. The imposition of third nature, via satellite distributed TV, has only just begun. If the first half of this paper owes a debt to the art of Peter Callas,

the second half owes an even greater one to the writings of Eric Michaels, a 'media anthropologist' who worked with the Warlpiri Aboriginal community of the central desert. By contemplating the work of Eric Michaels, I want to highlight the ambivalence of antipodality in Australia.[15] Our experience is a double one, as coloniser and colonised. It ought, I think, to ground an approach to electronic art and media which is at once compassionate, engaged and analytic — three properties the late Eric Michaels unquestionably had.

Resistance is Community *1st April 1985: daily TV transmission by the Warlpiri Media Association begins at Yuendumu, 300 kilometres north-west of Alice Springs on the edge of the Tanami desert in central Australia. At the time they commenced, the programs were unauthorised, unfunded, uncommercial and illegal. The decision to start broadcasting was taken, after 18 months of fruitless negotiations with the Department of Communications for an experimental licence. The studio and transmitter were installed by the community at its own initiative for a cost $4,000.*

Aboriginal communities quite rightly feared that the introduction of satellite TV would have a detrimental impact on their communities. In setting up their own station, the people of Yuendumu wanted to fight fire with fire. Few remote Aboriginal communities have adequate telephone services, so the prospect of being blasted by an information vector from on high before providing a simple set of vectors for people to communicate amongst themselves is certainly disturbing. The question the Yuendumu people faced, as I would interpret it, is this: if in the postmodern world, one cannot stop the vectoral lines of telesthesia from extending third nature out to remote, traditional communities, how can those communities stop their relationship of antipodality with other, more powerful message producers from overcoming their cultural *autonomy*?

The Yuendumu community had many years experience of 16mm film and VHS home video. They do not underestimate the dangers or potentials of 'new media', and neither should we. Film posed particular problems because it meant assembling people together in close proximity. Traditional restrictions on association were difficult to maintain: mothers-in-law would be too close to sons-in-law; 'promised brides' would be too close to amorous and unsuitable suitors. The films were often shown in settings such as schools or churches, where whites would control the circumstances of discussion and interpretation of the film. The content of even the most innocuous Hollywood films, which stress a romantic concept of 'love' come in conflict with a social order that stresses the transactual role of marriage in connecting people together in ways that sustain and develop the memory of the past and relationality in the present.

Home video provides a partial contrast with this situation. At least with home video the vector connects Hollywood to the central desert people in small groups in their own camps, without white control over the viewing circumstances. This has some at least potentially positive effects. People

can choose what they want to watch, thus escaping from the paternalism of white authorities. Not surprisingly, things like Kung Fu movies were very popular, not least because in them it is mostly whites who are on the receiving end of those gracefully choreographed kicks.

The possible harm or benefit of vectors from without is in part determined by the ability of the local community to control the conditions of reception and interpretation. There is a lesson in this for all media workers involved in the extension and deepening of third nature: rather than orienting media development to a universal goal, Eric Michaels would commit us to enabling the maintenance and development of *autonomous communications practices*. Not a universal model of a future productive system, but diverse and self managed communicational nets. For Michaels, this is what it means to be committed ethically *for a cultural future*.

The most challenging part of Michaels' work lies in its attempt to map out just how communications in the western desert works. Michaels shows a strong connection between information and the land. The significance of this is that in the western imaginary, it is possible to conceive of agriculture or even industry as material practices based on the land, based on the extraction of matter from the earth, on transforming and distributing it in determinate relations. To imagine a connection between *information* and the land, on the other hand, is much harder. Alongside the quantitative media of money, modern media vectors have deterritorialised flows of qualitative information from any sense of place or experience. In showing the Warlpiri confrontation with such a vector, Michaels shows us an experience of information which most of us have lost. *We no longer have roots, we have aerials*.

Warlpiri society retains its autonomy because it retains and reproduces social relations aimed at *restricting information flow*. Aboriginal culture contains mechanisms that regulate the geographic movement of information and which delimit the degree of interpretation and invention possible in its constitutive texts, the "Law" or "Dreaming". The Dreaming always privileges the processes of cultural reproduction over its products. In other words, sensitive information does not proliferate or mutate, although its distribution is flexible and there is room for innovation. This movement and change, however, is permitted in the interests of preserving the relations that produce and distribute information in the first place. It is with this kind of restrictive yet flexible, binding yet non-hierarchical cultural technology that Aboriginal cultures "survived the white man's world" for the last 200 years — and thrived for many thousands of years before that.

We No Longer Have Roots, We Have Aerials Michaels was interested in diverse *practices* of reproducing autonomous culture rather than a single model. In his essay on the Gay & Lesbian Mardi Gras — Sydney's biggest regular public carnival and one of the biggest celebrations of the gay and lesbian community in the world — it is significant that the questions he asks are "Why does carnivale persist in the age of TV and mass media?

How does it encourage *communitas* in an age of isolated, alienated individualism?" Queer culture is a rather different example to the Warlpiri of much the same issue: how to retain cultural autonomy in the face of massive penetration of cultural space by the vector. The answer lies in retaining the ability to create spaces and norms of interpretation and to reproduce these through time. Both the queer communities and Aboriginal communities can deploy any and every kind of cultural technology to do so. Struggling for a cultural future means absorbing and transforming the media flow which traverses the space of identity; it means keeping up with the media tools that are the weapons with which communities can struggle with antipodality.

Sustaining *communion* means developing specific kinds of *information restraint*. The interests of cultural autonomy and opposition to the centralisation of power is not always served by the unrestrained flow of information. The enlightenment ethic of free information flow was essential to overcoming the secretive *ancien regime*. It is still often applicable today — but it is not a universal model of communicative progress. Increased communications flows are not steps towards a 'global village' or a self conscious 'noosphere' — as some of the more ethnocentric fantasies of the media arts community would have it. Everything depends on who gets to do what with the media flows that increasingly traverse a global space of third nature.

The purpose of the elaborate restrictions on who can say what to whom about what in Warlpiri society has a dual purpose: to elevate the reproduction of a functioning culture over the production of information for its own sake, but also to ensure that authority over passing on the Law is distributed over a fair number of individuals so that too much authority cannot accumulate in too few hands. Competence is limited and varies from place to place and situation to situation. Competence is acquired partly by birthright, partly by residing in a given area, and partly by attendance at the appropriate rituals and visits to significant sites. While older people, particularly men, will tend to have more authority, and hence licence to distribute or interpret information than younger people, the culture assures that some authority and competence will accrue to all participants in Warlpiri society, including people associated by marriage or simply by living with the same 'mob' and sharing experience with them. There may also be ritual exchanges with other groups, particularly neighbouring ones.

Michaels did not just observe these cultural practices as they may have operated in 'traditional' settings; he also observed how they were adapted to new media, particularly video. At Yuendumu, the process of producing video was adapted to fit in with traditional social relations, particularly those for the ritual activities. New elaborations of old rules governing the distribution of sacred information and restrictions on mentioning the recently deceased were developed though a consultative and sometimes contentious process. Video was used to record trips to sacred sites and to recount important secular stories. One such visit contains a number of

long, slow pans across the landscape, which Michaels finds a little tedious as an uninitiated viewer, but which contains images of land redolent with varying and rich lodes of meaning for people who have learned the songs and stories of the site. The traditional ritual roles of story-teller and witness or 'helper' were adapted to video production by the Warlpiri by dividing camera 'crew' and on screen 'talent' roles according to traditional kinship rules. In short, left to their own creative resources, the Warlpiri can adapt media technology to their own needs — and use video as a tool for cultural autonomy. Whether such autonomy can persist and adapt to satellite distributed TV is another matter, but what counts is the struggle for cultural futures, out of which autonomy and difference emerges.

The Warlpiri form of social organisation is quite properly described as *rhizomatic* in that every individual is connected to others via networks of kin, place and history, but these loose and sometimes conflicting connections are not something one can draw a boundary around and describe as a "community".[16] There is no "social body" here just as there is no territory around which one can place a boundary. Both the land and kinship are linked by networks which link up in many different directions. What makes Aboriginal society so original is that it can reproduce networks of identity without drawing fixed boundaries around them. The identity of who one is, what collectivity one belongs to, the meaning of a site and who has rights and obligations in respect to it, differ situationally, depending on who is present, where, and with whom.

This whole culture is able to reproduce itself, to attribute quite stable significance to places and people, while maintaining a *mobile* relation to both the social and physical environment. It is as if the whole of central Australia were a space of many little mobile vectors, movements of individuals and movements of groups, all in motion relative to each other. Some movements have meaning only within the lifetime of the participants — people are always telling stories about who did what where with whom. Others take place in a grid that is quite durable and indeed is maintained by movement, not in spite of it. The grid is the dreaming tracks, the so-called "songlines" that regulate the mobile set of vectors which is the Warlpiri and through which Warlpiri country passes over into Pitjanjara or Pintupi and many other "fuzzy sets" of identity all around.

Becoming Abstract It has taken a long time for white Australians to wake up to the extraordinary cultural forms Aboriginal people have relied upon to survive the 200 years since invasion. Putting side by side the mechanisms of cultural autonomy deployed by traditional Aboriginal Australians confronted by white Australians, and white Australians confronted with global cultural flows, illustrates that the problem of sustaining autonomy and cultural diversity on the cultural landscape of third nature is a problem that involves diverse solutions and quite a number of different scales — from that of the individual and community to that of the nation. In thinking about new media tools and the new vectoral trajectories they may open up, we can do worse than look at historical examples of particular

strategies of survival. We need to think tactically about every form of communication, new and old. Media are never simply good or evil; they are always contingent.

In effect I am arguing for two kinds of theory which are normally considered very separate and incompatible. On the one hand, we need to look at the long-term tendency towards the development of more and more *abstract spaces* of movement and flow, created out of every more *flexible vectors*. This process has two, overlapping phases, which are also analytically distinct. The first is a regime of imperial transport; the second of vectoral telesthesia. This second proliferation, of communication vectors radically abstracted and separated from territory, is I think the fundamental movement giving rise to symptoms of postmodernism. These developments have to be thought of as abstract, extensive and historicist, but not as universal. Abstraction is always developed organically out of contingent and local experience. Importing other people's generalised theories unmodified is itself symptomatic of antipodal domination. Hence in this essay I have tried to situate conventional theoretical problematics in communications within Australian cultural history and theoretical practice.

On the other hand, the growth of an abstract space of third nature, covering the whole globe, is in no sense an unambiguously good thing. The enlightenment mythology of the unalloyed good of knowledge and information can mask a very damaging antipodality, in which powerful centres create and control vectors of information. Anglo-Celtic Australians know only too well what it is like to live in the shadow of the powerful flow of the American media. Unlike Europeans, we have neither a strong tradition nor an autonomous language with which to maintain a communion of identity. The *historical trajectory* of the vector puts white Australia in a similar predicament to Aboriginal communities, which have great cultural resources for resistance but have been systematically denied the material resources for *cultural survival*. These situations are however quite different, and have to be approached tactically in their particularities. They may, however, contain pragmatic stories of failure and success worth communicating to other, equally contingent and local contexts.

If the *theory* of media development has to begin from the most abstract aspect, the *ethics* of media practice must begin from the particular, the different, the contingent and the tactical. We no longer have roots, we have aerials. The dialectic of autonomy and antipodality structures an emerging politics of relationality and flow rather than of identity and locality. Our art and technology has to be rethought for this world of third nature we have made, which is very rapidly remaking us. In the third world, people still struggle to wrest freedom from necessity, culture from nature. In the first world, we are having a hard time wresting the freedom for a cultural future from second nature, from the environments we made but which now make us. Increasingly, we struggle to *wrest autonomy from third nature*, from the antipodal flow of communications and the information landscape it creates.

1 Brian Toohey, 'Bases Play a Crucial Role', *The Age*, 3 February, 1991

2 See McKenzie Wark, 'On Technological Time: Virilio's Overexposed City', *Arena*, No. 83, 1988

3 Bernard Smith, *European Vision and the South Pacific*, Oxford University Press, 1989

4 McKenzie Wark, 'From Fordism to Sonyism: Perverse Readings of the New World Order', *New Formations*, No. 16, 1992

5 Compare Bernard Smith's neglected masterpiece *European Vision and the South Pacific* with Michel Foucault's *Discipline and Punish*, Penguin Books, Harmondsworth, 1977

6 Paul Foss, 'Theatrum Nondum Cogitorum' in *The Foreign Bodies Papers*, Local Consumption Series 1, Sydney, 1981

7 McKenzie Wark, 'The Logistics of Perception', *Meanjin*, Vol. 49, No. 1, Autumn 1990,

8 Geoffrey Blainey, *The Tyranny of Distance: How Distance Shaped Australia's History*, Macmillan, Melbourne, 1986

9 Peter Callas, 'Some Liminal Aspects of the Technology Trade', *Mediamatic*, Vol. 5, No. 3, 1990

10 See Ross Gibson's essays, especially his reading of Mad Max in *South of the West*, Indiana University Press, Bloomington, 1992

11 Cf Meaghan Morris, 'Panorama', in Paul Foss (ed), *Islands in the Stream*, Pluto Press, Sydney, 1988

12 McKenzie Wark, 'News Bites: WAR TV in the Gulf', *Meanjin*, Vol. 50, No. 1, 1991

13 Tom O'Regan, 'Towards a High Communications Policy', *Continuum*, Vol. 2, No. 1, 1988

14 Stuart Cunningham, *Framing Culture: Criticism and Policy in Australia*, Allen & Unwin, Sydney, 1992

15 Eric Michaels, 'Constraints on Knowledge in an Economy of Oral Information', *Current Anthropology*, October 1985; *The Aboriginal Invention of Television*, Australian Institute of Aboriginal Studies, Canberra, 1986; *For a Cultural Future*, Artspace Art & Criticism Monograph Series, Sydney 1987; 'My Essay on Postmodernism', in *Art & Text*, No. 25, June 1987. See also the special issue of *Continuum*, Vol. 3, No. 2, 1990

16 Gilles Deleuze and Felix Guattari, *Anti-Oedipus*, Athlone Press, London, 1984; Krim Benterrak, Stephen Muecke and Paddy Roe, *Reading the Country*, Fremantle Arts Centre Press, 1984

Emergent Properties One of the most exciting new concepts to enter the realm of science in recent decades is that of 'emergent properties'. To be sure, the idea — that the property of a whole is not reducible to its individual components — has been around for a long time. But its unfortunate association with scientifically disreputable schools of thought such as vitalism has not encouraged scientists and philosophers to consider it seriously.

MANUEL DE LANDA

Today, the idea that a whole may be more than the sum of its parts is becoming commonplace in physics, biology, economics and other disciplines. In physics for instance, a typical example can be found in metallic alloys. A mixture of two different metals in the right proportions (say, copper and tin) yields a product (bronze) whose strength surpasses the sum of the strengths of either copper or tin taken separately. There is a surplus of strength that emerges, so to speak, out of nowhere. In biology, an often cited example can be found in the emergent behaviour of insect colonies. With the case of termites, each individual carries enough genetic information to perform a set of rather simple tasks, but none as complex as building an elaborate nest. Yet the complex architecture of a termite nest manages to emerge from the decentralised local actions of hundreds of individuals.

Although there are many other examples, these two suffice to illustrate the basic principle: complex global behaviour can spontaneously emerge out of the interactions of a population of simple elements. In philosophical terms, the road towards reductionism has been permanently blocked. If the properties of matter and energy at any given level of organisation cannot be explained by the properties of the underlying levels, it follows that biology cannot be reduced to physics, or anthropology to biology. And beyond this, if emergent properties are as pervasive in nature as they seem to be, not only is one idea eliminated (that of reductionism). A whole method for generating ideas may also need to be modified: the method of analysis.

This method, which has dominated Western thought for many centuries, relies on the assumption that a given system can be dissected into its component parts, the latter analysed in detail, then finally added up together to yield the full system again. But this will obviously not account for emergent properties since the latter, by definition, is that which goes beyond any simple addition of parts. We seem to be in need of a new approach, to complement analysis with synthesis. This is precisely what virtual environments can provide.

In the words of Chris Langton, one of the leading figures of Artificial Life:

> Biology has traditionally started at the top, viewing a living organism as a complex bio-chemical machine, and worked *analytically* downwards from there — through organs, tissues, cells, organelles, membranes, and finally molecules — in the pursuit of the mechanisms of life. Artificial Life starts at the bottom, viewing an organism as a large population of *simple* machines, and works upwards *synthetically* from there — constructing large aggregates of simple rule governed objects which interact with one another nonlinearly in the support of life-like global dynamics. [1]

Artificial Life Unlike the discipline of Artificial Intelligence, where the computer is not only used as a research tool but also as a paradigm of what the mind is taken to be like, in Artificial Life there is no question of viewing ecosystems as computers. Computers are simply the means to create virtual environments where populations of simple programs are allowed to interact with one another in the hope that interesting emergent properties will result. Instead of approaching our subject top-down, we approach it bottom-up, setting loose within a virtual environment a whole population of simple interacting entities so that emergent behaviours can be synthesised. One generates knowledge in this approach by observing the dynamical results of the interactions in order to generate in ourselves new intuitions as to what is going on in real ecosystems. Hence we convert the computer into an 'intuition synthesiser'.

There are, however, some misunderstandings in the current definition of the goals of Artificial Life. In particular, some researchers seem to think that if, for example, one manages to generate within a virtual environment the nest-building behaviour of termites, one has thereby captured some of the essence of life, or the formal basis of living processes. What this formulation overlooks is that the nonlinear dynamics underlying such

emergent behaviours are a common property of both living and nonliving matter — energy, as the case of metallic alloys illustrates. Moreover, the exact same 'abstract mechanisms' responsible for the emergence of oscillatory behaviour in some chemical reactions are also behind spontaneous oscillations in human economic systems (e.g. the Kondratief wave). Similarly, the exact same 'abstract mechanism' behind emergent properties in turbulent flows of water also underlie the coherent behaviour of photons in a laser beam, or the behaviour of countries at the outbreak of war. In other words, it does not seem to matter what the population of elements happens to be (molecules, amoebas, humans). As long as their interactions are nonlinear (and most naturally occurring interactions are), the resulting emergent properties all belong to a small set of possibilities. Hence the philosophical school known as 'essentialism' seems to be condemned to the same future as 'reductionism'. If the essence of coherence in a chemical reaction is the same as that of an economic system, or as in a population of amoebas, then 'essences' (understood as that which makes something what it is) are gone forever.

Computers, or rather, the virtual environments they allow us to create and explore, were also behind the discovery of the universality of the mechanisms behind emergent properties. This was quite a counter-intuitive idea. Discovering it involved studying the dynamical behaviour of the mathematical models of many different systems, and observing them generate the same behaviour regardless of the model involved. This was the case for instance with the discovery by Edgar Feigenbaum of the universality underlying turbulent flows and coherent laser beams (the so-called period-doubling bifurcation).

In James Gleick's words, Feigenbaum:

> ... needed to inquire into [the behaviour of number and functions]. He needed — in a phrase that later became a cliche of the new science — to *create intuition*... Ordinarily a computer user would construct a problem, feed it in, and wait for the machine to calculate its solution — one problem one solution. Feigenbaum and the chaos researchers that followed, needed more. They needed... to create miniature universes and observe their evolution. Then they could change this feature or that and observe the changed paths that would result.[2]

Populations The question of the 'death of essences' can be approached in another way, stressing the fact that in virtual environments we need to deal with entire populations, not with individual entities. The most crucial concept in the modern formulation of Darwinism is not the old-fashioned 'survival of the fittest' idea (which in most versions simply amounts to the truism 'survival of the survivors') but what has come to be called 'population thinking'. This can best be explained by reference to the old Aristotelian view of animal and plant species. According to that tradition, there was an essence of being a zebra, as well as an essence of being an oak. The actual individual zebras and oaks inhabiting the planet were but

imperfect realisations of those essences, so that in a sense all that was truly real was the eternal and unchanging type, not the ever-changing variants. Modern evolutionary theory has stood this on its head. For every real zebra, we can imagine each of its adaptive traits (its hoofs, its camouflage, its mating and feeding habits) as having evolved along different lineages, following different selection pressures. Given enough genetic variation in zebra populations, natural selection simply brought these traits together. Just as they came together, they might not have — had the actual evolutionary history of those populations been different. In other words, while for the Aristotelian tradition the essence was real, the variants were not; in population thinking only the variation is real, while the 'zebra archetype' is not.

One crucial task today is to extend the insights of population thinking to other areas, such as linguistics. Language, far from being a synchronic structure embodied more or less imperfectly in the actual performances of individual speakers, is just like an animal or plant species. It is an historically emergent structure. Real languages evolve out of the daily labour of a population of human users, as the constant stylistic variations to which the latter submits sounds, words and sentences, become selected by a variety of pressures — such as the pressures exerted by a standard language over local dialects or those exerted by dialects on each other. Once this point of view is adopted, linguistics too could make use of virtual environments, to gain insights into the processes that give languages their current form. They could, for instance, create a simulation of the populations of English peasants at the turn of the first millennium, who took a language which to us would seem like German, and transformed it into something we could recognise as English, all in the process of resisting the Norman invaders and their foreign language — French. One can then imagine the linguistics of the future being not of the analytical Chomskian kind (i.e. dissecting a temporal snap-shot of English into generative and transformational rules), but taking instead the synthetic approach — setting loose in a virtual environment populations of rules under stylistic variation and selection pressures, observing how English structure emerged from their dynamical interactions.

Game Theory Another potential use for virtual environments is to unblock some promising, yet untried, analytical approaches to certain problems. Sometimes, after a specific analysis of a given system has become entrenched in academic circles, even if better analytical approaches exist, they will remain unexplored, due to the inhibiting presence of old solutions. In these circumstances, virtual environments can help researchers synthesise fresh intuitions concerning the unexploited capabilities of analysis. A case in point comes from the discipline of game theory, which attempts the formal study of situations involving conflict of interests. Game theory has been used extensively in military think-tanks (such as the RAND corporation) since the early 1950's, as an analytical aid for the exploration of policy alternatives for the negotiations between nations. Game theory deals with rather simplified conflictual situations, where the dynamics of the system can be boiled down to the possible payoffs defining the alternatives available

to each one of the participants in the conflict. A prototypical situation is the one captured by the famous 'Prisoner's Dilemma'. In this imaginary situation, two prisoners accused of the same crime are separately offered the following deal. They can either accuse their accomplice or they can claim innocence and avoid betraying their partner. If both claim innocence, they get a mid-sized sentence; if both betray one another, they get a long sentence; finally, if one betrays, while the other does not, the former walks out free while the other gets the worst possible punishment. The payoffs are so designed as to put the two participants in a dilemma: the best outcome for both would be to claim innocence and avoid betrayal, yet the temptation to betray and walk out free (plus the fear of getting the 'sucker's payoff') are so great that neither one can trust the other — so they both betray. Beyond the apparent artificiality of the example lies a situation which is rather common in real life: in the dynamics of nuclear arms negotiations for example, or in the financial panics known as 'bank runs'. In all these cases, the basic moral seems to be 'nice guys finish last'.

This analytical solution to the dilemma had become so entrenched that other possibilities were routinely overlooked. This is particularly clear in situation where the choice between betraying and cooperating recur over a long period of time. Douglas Hofstadter offers the example of two traders who never see each other, but who leave a bag of goods at a specified place, over and over again. On any one occasion, each trader faces a dilemma similar to the one confronting the prisoners. They can simply leave an empty bag, take the other's goods, and stick him with the 'sucker's payoff'. Because the situation is iterated, and because presumably both traders would want the exchanges to continue into the future, they have added incentives not to betray one another. Despite this crucial difference, the old analytical solution had become so entrenched that researchers did not see that it did not apply in this more realistic case. It was at this point that a virtual environment came to the rescue. Political scientist Robert Axelrod decided to actually stage this trading situation, only he involved many participants. He invited people from many places to submit computer programs capable of carrying on virtual trading with one another. Due to the entrenchment of the old solution, most of the programs submitted were of the betraying kind, and yet when the competition was actually carried out, they all lost. The winner, a program called 'TIT_FOR_TAT', was willing to always cooperate in the first encounter, showing a sign of good faith to initiate a long trading partnership. Yet, if betrayed, it would retaliate immediately by refusing to trade anymore. In addition, it was forgiving, in that after retaliation it was willing to trust other traders again.

The victory of 'TIT_FOR_TAT' was so counter-intuitive that Axelrod ran the tournament again, only this time informing the participants that 'nice, retaliating and forgiving' programs had won, so as to allow them to design betrayer programs that could take advantage of this knowledge. When the competition was run again, 'TIT_FOR_TAT' won again. The reason is simple, since the criterion for winning was not who emerges victorious from single encounters, but who manages to trade the most in the long run. Betrayer

programs though initially successful when confronting 'sucker' programs, soon ran out of partners, and ended up losing against 'TIT_FOR_TAT'. Although there is much more to the story than this simple outline may suggest, this will suffice for our purposes here: what Axelrod did was to first synthesise an intuition that was blocked due to the entrenchment of an old solution, and then went ahead and proved analytically that his results were indeed correct. Or as Hofstadter has put it:

Can cooperation emerge in a world of pure egoists?... Well, as it happens, it has now been demonstrated rigorously and definitively that such cooperation can emerge, and it was done through a computer tournament conducted by political scientist Robert Axelrod... More accurately, Axelrod first studied the ways that cooperation evolved by means of a computer tournament, and when general trends emerged, he was able to spot the underlying principles and prove theorems that established the facts and conditions of cooperation's rise from nowhere.[3]

Beyond 'Virtual Modernism' So far we have given examples of the use of virtual environments as intuition synthesisers in the field of science. A few examples from the world of art could also be examined (e.g. the work of Karl Sims). Yet the majority of virtual reality projects done by artists fall squarely within the realm of modernism. Indeed, nothing I have ever seen going under the label 'postmodern' manages to go beyond the reservoir of formal resources that modernist artists have now exploited for almost a century. It is my belief that in order to go beyond this we need a brand new intuition as to what 'representations' really are. That is, if most modernist tactics and strategies have centred around a critique of the role of language, perspective tonality and other traits of classical representation, we now need new intuitions about what representations really are to break with this approach.

One hint as to what the future may bring in this regard comes from the field of Artificial Intelligence (AI). In this field, much of the work involves the use of virtual environments, so the criterion to distinguish between different approaches is not 'virtual' but a top-down versus a bottom-up strategy. The kind of approach that dominated AI for the fist two decades uses an analytical top-down approach to generate intelligent behaviour. The basic idea behind this strategy is to build representations (rules, programs, referential symbols) directly into a computer, and to apply logical principles (deductive and inductive) to the handling of these symbolic entities in the hope that something like human intelligence will emerge. The main rival of the symbolic strategy — going by the means of 'connectionism', taking the bottom-up approach, building knowledge about the world in the connection patterns and activation dynamics of small populations of extremely simple computers. In the connectionist approach there are no explicit representations built into a system at all. One does not program a connectionist system ('neural nets'); one trains it to perform a given task, in much the same way that one would train a living creature. Representations, or rather, rule-

governed behaviour, emerge spontaneously from these systems, following the same dynamics that characterise most of the self-organising phenomena we have discussed so far (nest-building termites etc).

What this means basically is that 'rationalism' (the school of thought that takes rationality to be the essence of the human animal) will go the same way as 'essentialism' and 'reductionism'. Rationality it turns out, is one of the many things that can emerge from the nonlinear flow of energy, matter and information.

What this also means is that current philosophical schools that are still based on a critique of representation (such as the work of Baudrillard or Derrida) do not manage to go beyond modernism. Only the work of Gilles Deleuze and Felix Guattari is truly 'postmodern' in this regard (if one still insists on using this silly label).[4] It is the non-linear flow of lavas and magmas that produces the structures (rocks, mountains) that inhabit the geosphere. Similarly, the nonlinear flow of flesh (biomass) through food chains, plus the flow of genetic materials in gene pools, are what creates the structures (animals, plants) that inhabit the biosphere. Linguistic structures must be approached exactly same way, as products of lengthy sedimentation of sounds, words and syntactical constructions, and their consolidation into structures over the centuries (e.g. the example of English peasants under Norman rule above). Artists could take the vanguard in the exploration of the nonlinear flow of expressive resources out of which the coagulated, stratified structures we call representations, emerge. Many entrenched notions as to what constitutes art must be debunked, and for that, virtual environments may one day constitute the perfect tool.

1 Christopher Langton, *Artificial Life*, in C. Langton (ed.) Artificial Life, Addison-Wesley, 1989, p 2.

2 James Gleick, *Chaos: the Making of a New Science*, Viking, New York 1987, p 178.

3 Douglas Hofstadter 'The Prisoners Dilemma and the Evolution of Cooperation', *Metamagical Themas*, Basic Books, New York,1985, p 720.

4 Gilles Deleuze and Felix Guattari, 'The Geology of Morals', *A Thousand Plateaus*, University of Minnesota Press, 1987.

abstracts

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JAYANNE ENGLISH
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SHALOM GOREWITZ
MATJAZ HMELJAK
TROY INNOCENT
DALE NASON
BEVERLY J. JONES
CARL EUGENE LOEFFLER
DELLE MAXWELL
JON McCORMACK
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BARBARA MONES-HATTAL
JACQUELINE FORD MORIE
CYNTHIA BETH RUBIN
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MARIA MIRANDA
NANCY PATERSON
SIMON PENNY
BEVERLY REISER
MARK RESCH
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CYNTHIA BETH RUBIN
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REJANE SPITZ
S.V.VADNERKAR
ROMAN VEROSTKO
LINDA WALLACE
McKENZIE WARK
SUSAN WENYON
MICHAEL GAMBLE
ADAM WOLTER
RICHARD WRIGHT
EDWARD ZAJEC

models of collective computing and musical interaction in multi-agent automata

The present paper studies autonomy and intelligence in the realm of interactive composing. The basic idea forwarded is to view aesthetic decision making as a distributed process where a society of simple agents are engaged in local interaction and in global interaction with the outside world. The approach is inspired by recent work in biochemistry, pattern formation in biological work spaces, the study of non-linear systems, fluid dynamics and the cognitive theory suggested in Minsky (1986). Nature itself provides many examples where interesting and coherent overall behaviour results from surprisingly simple, local rules. The observation of this pattern-making potential looks promising in a wish to escape mechanistic performance often prevalent in a rule-based approach to algorithmic composition. Traditional knowledge-

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based methods are based on reasoning over symbolic representations of the problem at hand. An explicit scenario is needed to construct musical objects or to interpret gestures from the outside. Generative grammars, augmented transitions networks and other AI-methods are of limited use in terms of flexibility and complexity — we refer to Beyls (1990, 1991a, 1991b) for a full discussion. Behaviour may be seen as an alternative for knowledge. The composer becomes part of an open system which accommodates the growth and development of animated musical objects. An emergent functionality follows automatically from the definition of the native character of musical agents, the specification of local rules which will guide the formation of a local opinion and the establishment of a control strategy i.e. the creation of a conversational mechanism allowing the composer to interface with the virtual collective of interacting musicians. Our presentation will picture the context of distributed musical responsibility in social computing and discuss the problem of mapping system dynamics to the musical MIDI domain. In addition, we provide examples of two recent, real-time implementations.

pretty pictures, heavy thoughts

Televised science programs often use computer graphics to represent phenomena not only too complex to model without major computer assistance, but also those that have previously been considered too abstract for popular television coverage. Perhaps the prime example of this has been the *Equinox* program 'Chaos', first transmitted on Channel 4 in the UK in 1988, but subsequently screened and rescreened in various countries around the world.

FRANCES BONNER

University of Queensland, Australia

Segments of the program — especially the fractals that dominate the visuals — have been incorporated into and reiterated in, other programs made since.

With computer graphics of this kind, the televisual domination of chemistry and biology has been challenged. Although substantial use of computer graphics is evident across the board, imaging systems have made mathematical theory and the more abstruse regions of physics visually interesting to the lay viewer. In this they have challenged the way in which the field of scientific investigation is popularly viewed. It is debatable whether the prominence would have been the same without the recent higher profile in TV science programs (even in brief TV news bulletins given to stories on the discovery of supporting evidence for the Big Bang theory — which itself depends on computer-enhanced information for its evidence).

The fascination with computer-generated images includes a fascination with the processes of their generation. The most recent area of such fascination is with Virtual Reality. Subsequent attempts to represent a personal 3D experience in a public two-dimensional space (e.g. 'Colonising Cyberspace' on *Horizon*) will be the principal focus of the paper. Television's fascination with investigating this phenomenon (which is already impossible to represent on TV) extends from science programming to 2D cinema.

the techno/cultural interface: tracking the boundaries of high-tech and traditional cultures

the experience of automata: an alternative history of audio-visual media

PAUL CHARLIER
University of Technology, Sydney, Australia

This paper is an extension of one delivered during a panel session at Sound Culture '91 at the Performance Space in Sydney, Australia. It presents an alternate history of audio-visual media (including cinema, video, computer and installations and a 'pre-model' of the inter-relation of sound and image/movement in these media). It is alternative to the usual approach, which exclusively concentrates on the development of individual (usually visual) technologies. The aim here is to demonstrate how these media are part of the larger history of 'automata', which in the widest sense includes mechanical toys, mechanical gardens and theatres, early attempts at automated writing, speaking statues and voice synthesis as well as associated technologies and techniques (such as punch cards) employed within barrel organs and automated looms.

Automata also form part of the history of control systems. Many were built as demonstrations of principles of automated control and give insight into what may be called the 'experience of control' that is both part of reactions to these machines and a fundamental aspect of notions of male creativity. This latter area becomes even more apparent when considering the mythological origins of these machines and techniques within western culture.

The history of automata (including reactions to these technologies) allows for the construction of a second history: that of the experience of AV media.

In a contracting world, real time visual communication may become a hologrammatic nightmare. As high tech applications proliferate, they threaten to accelerate the erradication of cultural difference. Each new system's material reality makes claims on its users; each new wave impacts proportionately on the language, ritual, influence and power among communities. Borders change, territories diminish. As distances diminish, the collision among social forces disrupts, fragments, and eventually destroys contingent customs and practices, particularly those predicted on earlier, now outmoded networks of time and space.

PETER D'AGOSTINO
Temple University, USA

While technology may destabilise frontiers, does technology invariably destroy tradition? Can an indigenously developed telepresence accommodate newer technologies and thus maintain the traditional bridges sustaining older cultures?

> The electronic age is also an age of 'secondary orality,' the orality of telephones, radio and television, which depends on writing and print for its existence.
> (Walter J. Ong. *Orality and Literacy*)

This notion of 'secondary orality' harbours the potential for the continuity of oral cultures without the disruptive and arbitrary shifts to literacy. Examples include the theories of oral performance from the Homeric tradition developed in the 1930s, Worth and Adair's project *Navajos Film Themselves* in the late 1960s and the Walpiri Media Association effort's to make their own television programs in the 1980s, as reported by anthropologist Eric Michaels in his book *For a Cultural Future*. The Walpiri project gave native speakers the means to broadcast indigenous language and culture 'on air'.

Along with these noteworthy film and television projects, other exploratory efforts and pockets of resistance operate along the electronic margins, in the digital arts and sciences. Here, a platform exists for engaging and contesting new influences, for making connections within frameworks determined by (self) community-originating spiritual, ideological, aesthetic and social standards.

Art, the site of collision, of struggle, a breeding ground of renewed resistance against the latest accommodation retains certain rituals. Its conceptual and linguistic patterns

DAVID TAFLER
Widener University, USA

plough the narrow, electronic/mathematic corridors of applications spawned by engineers and technicians. Individual art projects on the cultural edge sustain psychological, ecological, and sociological concerns. This panel will present those individual art projects that examine cultural conditions that arise from living in different climates, topographies, with different day/night cycles, gender relations, and histories, among other variables.

informed artists/users in the post-computer art era

The author will review the emerging paradigm shift currently taking place in the use of digital technology for the creation of art. As the technology of computing becomes further accessible and easier to use, we are seeing more artists engaging these systems to create art that moves beyond technical mastery to speak of critical, aesthetic and conceptual concerns. The author will focus on the so-called 'informed users' who create meaningful works of art, which through their basis in the presentation of issues ranging from the personal to the political, provide models for the effective utilisation of technology to represent ideas and concepts relevant to our ever-changing, multicultural 'global village'. Much of what has been considered 'computer art' in the past twenty years demonstrated high levels of technical proficiency, but often lacked much, if any, artistic merit. The author will focus on artists who move beyond previous notions of 'computer art', utilising digital systems to create works ranging from two-dimensional printworks, artist books (analog and digital) image projections, and public billboards in which the primary objective is to communicate ideas and concepts, presenting challenging, content-based artistic statements. The objective is to create a context for critically understanding the approach of artists who are creating meaningful works through the utilisation of new tools. These artists are not hiding behind pseudo theories of engaging science. Rather, they are more concerned with critical examinations and representations of power and ideology in our mediated personal and cultural environments. The author will cull selected examples of contemporary artists using digital systems in the above described manner from an international call for entries, and from selected invited artists.

JOSEPH DELAPPE
University of South Florida, USA

automated fabrication as a model for extending the philosophy of visual perception

STEWART DICKSON
The Post Group Digital Center, USA

The author has demonstrated computing techniques which allow high-level, mathematical descriptions of geometric structures to directly drive hardcopy devices that produce three-dimensional sculptures. Juxtaposing the resulting objects with their original mathematical descriptions can be philosophically compelling. In this paper we present extensions of this idea in forms of new technology that can be combined with the previous system as well as an expanded philosophical basis for this work.

Some current industrial design systems (in support of a design, prototype, evaluate and redesign cycle) include devices that can simultaneously digitise the surface coloration and the three-dimensional geometry of a prototype. This is an example of a transformation of abstraction into physicality and then back to abstraction.

Consider an artificial intelligence system that assigns abstract identities to objects (such as the pattern recognition involved in robot vision). Processing high-level mathematical symbols into a geometric representation using substitution rules is another use of a traditional artificial intelligence language. By combining these two systems it may be possible to extend inference rules operating on visual identities to include the philosophical basis of an object's identity.

As an artmaking tool, a three-dimensional colour digitiser coupled with a three-dimensional color output device is a system of object facsimile or "photosculpture". CAD tools exist with which 3D collage may be constructed using the computer. This paper will demonstrate a system for combining identity attributes attached to compositional elements in order to arrive at a cumulative philosophical statement describing the completed visual composition. With these new methods, we are not only able to compose three-dimensional structures; we can also express, analyse and develop the reasons they are meaningful to us.

constructing truth using algorithms

There are two kinds of truths; those of reasoning and those of fact. Truths of reasoning are necessary, and their opposite is impossible. And those of fact are contingent, and their opposite is possible.

Gottfried Wilhelm Von Leibniz, *Monadology* (1714)

The belief that complex scientific data translates into effective communication only through collaboration with visual artists is not generally shared amongst scientists. Rather, science is frequently regarded as the method, amongst all others which attempt to 'discover truth', which has primacy and therefore a pedantic approach to the visualisation of data is considered sufficient. However, scientific method would be seen to have a similar authority to practice if scientific 'truths' were demonstrated to be contingent. Then any claims of omni-competence with respect to providing explanations for all phenomena would be diminished and cooperation between practitioners of the two disciplines would need fewer rationalisations.

JAYANNE ENGLISH
Mount Stromlo and Siding Spring Observatories, Australia

Ironically, the recognition that algorithms are an integral part of the tools currently employed by science can contextualise scientific method as only one of many valid cultural endeavours which attempt to describe reality. It would be useful to analyse the various stages of 'production' (from data gathering through to visualisation of data) to determine in depth the algorithm's role in codifying the data, simulations, analysis and theories, in order to demonstrate that the resultant 'truths' are contingent. This paper will rely on a simple presentation of visualised astronomical data, along with their models. to hint at their contingent character. Firstly, visualisations exist in 2-D image space. Therefore they are easy to view as cultural products and even lend themselves to being absorbed (perhaps inappropriately) into the domain of visual art images. Secondly, visualisation algorithms generate scientific content which is neither random nor arbitrary and yet which is not predicted by the unprocessed data or initial equations. In other words, the resultant object can not be determined by reasons alone. Therefore pursuing this aspect of the images demonstrates that scientific observations and interpretations reveal 'contingent' (not 'absolute') truths.

algorithm / abstraction / unity

I propose to discuss the idea of abstraction as a necessary condition of art that aspires to universal truth. This was the lofty goal of the Modernists. The works and writings of artists such as Kandinsky and Mondrian reflect this aspiration. Abstraction allows art to transcend national or cultural biases and so establish a truly global perspective.

Today, many visual artists using electronic media are involved with realism, appropriation, social and political commentary — rehashing old themes with new tools. The issue of finding new ways to abstract information, new paths to universality, has been abandoned by many and is now more aggressively addressed by scientists. From the efforts of these scientists has come the ubiquity of scientific visualisation. The main tool used in visualisation being the

BRIAN EVANS
Vanderbilt University Computer Center, USA

algorithm. Just as the scientist uses the abstract language of mathematics to model the natural world, they now use an abstract visual language, built from the computer algorithm, to investigate these models. Some artists have adopted these methods and continue on the Modernist path.

Heisenberg said, "In art, as in science, we can discern a striving for universality. In the sciences we are endeavouring to interpret all physical phenomena in a unified way, to understand all organisms in terms of a single point of view, and we have already come a long way upon this road. In art we are seeking to present a basis for life common to all men on earth. This striving for unification and bringing together necessarily leads to abstraction, in art probably no less than in science."

will it take sanctions against Australia to get us back into the black?

Australia's population 1770. Australia's population of indigenous without invasion today. How Australia would be today, with an Aboriginal Arts Minister.White Australia's responses to this concept. White Australia's guilt. Aboriginal Australia's guilt to handouts.

Heritage art (white and black). Whose heritage? Is it Australian? What effects this has on the indigenous Australian Cultural industry.

Indigenous Australian Arts. A Queensland Aboriginal perspective. Historical indigenous Queensland Art. Jiman, Nguri and northern Kamilaroi historical art. The use of these images today. The influences of white invasion upon this art.

MARSHALL BELL
Brisbane, Australia

The misuse of our artistic heritage by Australian electronic artists. Copyright for the descendants of those landowners who have been removed. The need for federal and state legislation. Other Australian indigenous artforms that have influenced Qld indigenous artforms today.

The misrepresentation of the Queensland artists. The perpetration of suppression upon the Queensland indigenous art. How this is being perpetrated. Those methods used by Aboriginals. Those methods used by white Australia.

Attempts by Queensland artists to address these problems.Balance 1990.Campfire Consultancy.Queensland database/image bank proposal.Workshop forum, Qld Data Base/Image Bank.Yarrabah ATSI Visual Arts Conference.Arts systems within Australia.

electronic art media and the globalisation of culture

This paper begins by examining the cultural and political assumptions underlying specific cases in the history of electronic network art practice. These assumptions are a starting point in a more general discussion of the condition of art making in the context of a global (cultural) economy which is increasingly subject to the forces of transnational control. Cultural identity and technological empowerment — two issues traditionally examined separately — are here discussed together as aspects of the same condition.

The implications of the demise of the power of the state in the face of growing transnational control is discussed. The cultural product of this demise, the 'dissolution' of the centre, and the implicit impossibility of peripherality or marginality is considered. As the state becomes hollow and a new order of transnational economy arises, the channels by which the transnationals purvey goods, and the goods themselves, are technological: Electronic hardware, media and information networks. Automated technologies transmit the cultural practices of their producers.

Transnational economy works its own hyper-colonialism as the 'margins' are appropriated and reconstituted: this argument is applied both to third world nations and to the art world. Appropriation and reconstitution are achieved through, instantaneous market surveillance and analysis and the flexible production practices allowed by modern, rapidly reprogrammable machine tools. This induces a condition of "hyper-conformity of difference" (Fry).

MARIA FERNANDEZ
Gainsville, USA

The potential for art as a critical activity and the concept of marginality as site of resistance are examined in the context of the rapid rate of change of technological tools and the possibility of intervention. The work of contemporary artists attempting such intervention is discussed.

towards the development of electronic literacy and network-thinking in remote aboriginal communities

I work as an anthropologist on the problem of man-machine relations with an emphasis on electronic communication and information technologies. My subject is techno-culture and we can certainly state that this culture is as 'foreign', 'different', 'other' to the old western mechanics-dominated culture as to many non-European, so-called 'primitive' cultures.

Here we have an interesting point to be investigated. The confrontation with the emerging electronic culture is as new for the (old) western culture as it is for the non-European cultures. A main influence in the building of western culture has been the establishment of a phonetic-alphabet, which introduced an 'intellectual instrument' (as Jack Goody called it in his *Consequences of Literacy*) that has contributed to the development of our linear-sequential thinking. The so-called 'non-literate' cultures that work with an oral system of communication utilise different intellectual instruments. The comparative

ROBERT FISCHER
Zurich, Switzerland

study of literate and of non-literate culture into the age of electronic information and communication technology will allow us (for the first time in history) to gather a body of data to do with the elaboration of codified communication-systems as it is happening.

In 1991, I spent four months in the deserts of Central Australia to study the use of television by remote Aboriginal communities. I discovered that we have a phenomenon here that surpasses the simple 'televisual education' of a non-literate culture and the old literate / non-literate discussion. The reflections of the late American anthropologist Eric Michaels (who worked between 1982 and 1986 on a community-TV project with the Warlpiri of Yuendumu) have not inaugurated a new age of electronic information. Communication technologies have to be developed in the light of the new (theoretical and practical) requirements.

I propose to read the Aboriginal culture-text as a bona fide 'primitive cybernetic system'. In the passage of their culture into the electronic information and communication age, Aboriginal people have an intellectual instrument that is destined to work with the principles of electronic networks. We will have to elaborate a field for western / Aboriginal collaborative efforts in electronic creativity. It is not sufficient to bring some VHS-cameras to remote communities with the hope that some concerned individuals will produce indigenous TV-programs. It will be necessary to set up a media-lab that illustrates (in a non-didactic way) the systemic functions of electronic machinery in the context of the cultural agendas of various communities. The information system of the Gulf-War can be considered as a electronic metaphor of Aboriginal totemic tracks. We have to look at the architecture of the totemic ant-hill as a cybernetic information-system. As western and Aboriginal cultures both are at the same beginners stage in the creative use of electronic devices, we find here a common cultural trait.

My talk will include a proposal for an inter-cultural education-model in cybernetic literacy to be carried out in the deserts of Central Australia. Electronic creativity in remote communities might boost Aboriginal media-art, along the lines of the confrontation of this culture with canvas and acrylic paints.

genetic algorithms and the evolution of form

JOHN FRAZER
University of Ulster, Northern Ireland

This paper will briefly review the development of evolutionary programs in design and art, explaining how genetic algorithms can be applied to technical, design and artistic problems. The main part of the paper will explain and demonstrate the surprising results that can be obtained by linking (quite naturally) evolutionary programs and genetic techniques. A variety of very different applications will be described ranging from evolving proportional letter forms and architectural features through to evolving imaginary forms in space. The special potential for using genetic algorithms with ill-defined or conflicting criteria will also be described. Experiments with the construction of neural nets for form-creating activities will also be shown.

auschwitz/hiroshima

SHALOM GOREWITZ
Ramapo College, USA

This paper will combine text, video, and slides, relating to experiences visiting and making images of and relating to Auschwitz and Hiroshima. It is based on travel to Eastern Europe and Japan with Warner Wada, a Japanese American artist whose uncle survived the Holocaust. A subtext of the presentation, the tapes, and any discussion was our experience of psychological similarities and differences.

The text describes how the Japanese environment effected recordings; feelings about visiting grandparent's home in Sighet, Romania; observation of Hiroshima peace day rituals and Bon week visits to ancestral shrines; chance meeting with Stelarc in Tokyo; theories of blind art; psychological insights; ongoing collaboration with Warner; and relationships to current international crises.

The concurrent images will include original, real time recordings, raw processed images, and completed versions of *Damaged Visions* and *Ten Thousand Things*, slides of computer video systems, computer animations, and opaque projections.

local wisdom in the global village

INGEBORG FULEPP
Zagreb University, Croatia

HEIKO DAXL
Media in Motion, Germany

We live in the time of new and opposing concepts. The traditional views of man and his place in the world are being expended. The development of science and technology introduces new possibilities: satellite communication, interactive television, artificial intelligence, virtual reality... All of these changes have forced us to search for our identiy in a new multicultural society.

Artists are discovering the new technologies while scientists and technicians are turning their attention to the arts. To make artistic reflections on modern information and communication technologies a more important public subject, to question technical developments and to use them for shaping a human environment, to make them visible, will be important contributions to overcoming the problems of the future.

New ways of using multimedia systems such as TV conferencing, and interactive video as well as new models of information science, will influence the structure of traditional institutions.

Together with the Academy of Dramatic Art and Bojan Baletic at the School of Architecture at Zagreb University we have started several interdisciplinary projects for enhancing education of architecture, film and art based on the new multimedia systems.

In this paper we will elaborate our vision and experience of linking knowlege from different fields of art with the help of interactive multimedia systems. By developing new means of electronic communication within our own culture and with other cultures the values of small communities can be integrated into the global village.

a computer-controlled marionette for 'out of the body theater'

Society has created the female robot in what we thought was the male ideal of pleasure and personal servicing. In response, the Marionette constructed in *Feu de Helene* is an alternative to the robot cliche. *Feu de Helene* is a story about a woman's journey as she decomposes and recomposes herself through the use of a computer-controlled Marionette. The computer-controlled Marionette is used as a reflection into the very nature of the Performer.

JENNIFER HALL
Do While Studio, USA

Out Of The Body Theater can be defined as a network of electronic devices that, through their interconnections, service each other in some defined manner. There are also other devices that connect to a real-world environment where Performers and Directors reside. 'Environmental Tracking' refers to the collection by machine of real-world information. This real-world such as the physical movement of the Performer is used in the performance *Feu de Helene* where synchronised activity is important.

MIDI represents a significant breakthrough in coordinating events in *Out Of The Body Theater*. It allows a software sequencer to handle as many of the synchronised events of the performance as required, as well as coordination of sophisticated live work between the computers, other machines, Director, Performer, Marionette and Narrator. It is also a simple tool that helps in the unification of a concept: everything appears exclusive to itself, and is indeed, all together as one.

dance and the computer: a potential for graphic synergy.

This talk will look at the various ways human figures can be represented in computer graphics, and at the methods available for animating such figures.

Dancing will be examined in terms of the principles of human perception of space and time, the conventions of music and dance,

DON HERBISON-EVANS
Sydney University, Australia

and the physical constraints of space and time. These lead to representation of a dance as a sentence in a formal grammar, and as a straightforward way of making a computer figure dance.

The additional problems of two figures dancing together will be discussed, and examples shown of experimental computer animation of two figures dancing together. For comparison, a live demonstration of Australian New Vogue Dancing will be performed.

vik; a video keyboard for time colour structures

In this paper a set of basic elements and colour, structure and time operators is proposed. The elements and operators define a 2-D abstract digital video world. A prototype implementation of a program 'VIK' is described: VIK is a simple video-sequencer that can be used as a video-score interpreter or as an interactive video keyboard. The current version of the program was used to make some short abstract videos ('keyboard exercises'): the same result (given some manual ability) could be obtained with a real time performance of the same score.

The idea of visual music is quite old — starting with Aristoteles (Whitney 1980). Colour structures changing in time produced by a 'visual organ' were used by Skrjabin in the music work *Prometheus, the Poem of Fire* at the beginning of this century (1911) (Storia, 1970). Abstract animation was explored in the movies too — *Fantasia* by Walt Disney, 1938 (Finch 1988). Computers made the exploring of the abstract 2-D movie or video and/or interactive visual systems feasible: Whitney's works, Cohen's *Aaron*, Zajec's *TVC* just to mention a few (Whitney 1971, Cohen 1986, Zajec 1973).

The idea of a 'general purpose visual keyboard' or a 'universal visual organ' is probably a myth, as was the idea of 'THE Universal Programming Language' for artists in the sixties. In fact even for a still image, possibly produced by an aesthetic automaton or program (Cohen, Zajec 1971) the basic colour and structure elements and the possible compositional rules (that have to be defined as a basis for any possible 'general purpose' tool for visual experiments) give so many degrees of freedom that any choice will set up some limits that will prove not satisfactory for other authors. The addition of the time factor adds new choice problems. (Evans 1990, Kawaguchi 1986, Zajec 1983).

This paper presents some work in progress with a simple interactive abstract digital video keyboard, 'VIK', based on a limited set of operators or keys that act on the definition and the changes in time of simple matrix colour structures. The system gives some possibilities to explore the 2-D world defined by these structures. The choices of the basic elements and the operators are partially determined by the interaction goal: all operator and element specification can be given with a single key stroke. In the prototype version the keys are given by the computer keyboard. A personal choice give one of the infinite possible integration schemes of the image structures, colour coding structures and the time variation scheme of the two structures. The element and operator set is an attempt to solve the problem of abstract video work that can convey some meaning with only colour structure changes, without 'actors' or foreground / background figures.

The prototype VIK system is implemented in Think Pascal on a Macintosh II with standard video card (640 x 480 x 8).

MATJAZ HMELJAK
University of Trieste, Italy

theory of cyberdada

This paper sets out to present the public with Cyberdada philosophies and technical specifications. A number of concepts will be explored, including the current thoughts and actions of Cyberdada culture. A major theme of Cyberdada has been creating simulations of simulated reality (ie. cyberspace) using multimedia installations. We will present people with the workings of a future virtual reality, and the kind of society this system will support.

**TROY INNOCENT &
DALE NASON**
Melbourne, Australia

All information (physical, psychological, visual, computer data) is transmitted and received in patterns. Cyberdada proposes new processes for human communication and thought, experimenting with videographics and installation work to set up experience for the physical human interface. Offering information for the computer that doesn't imply or state money/power/consumer materialism, but using technology as a means of creating experiences leading to a higher state of consciousness/new system of communication. Technical aspects of the processes at work within the Cyberdada system include:

– image generation
– cultural referencing
– improvisational computer art techniques
– new methods of animation
– playing with the technology, creating your own way of using the system
– intended telepresence systems
– intended metaphysical integration

cultural maintenance and change: currents in art and technology

Martin Heidegger has stated that "technology is... no mere means. Technology is a way of revealing. If we give heed to this, then another whole realm of the essence of technology will open itself to us. It is the realm of revealing, i.e., of truth.... There was a time when it was not technology alone that bore the name *techne* .... Once there was a time when the bringing forth (*poieses*) of the true (*aletheia*) into the beautiful was called *techne*. And the *poieses* of the fine arts was also called *techne*."

Viewing cultural maintenance and change as interactive and concurrent, this paper addresses areas of knowledge and belief in which computer graphics and other electronic art and information such as computer graphics may reveal or bring forth a new view of truth. As Heidegger states, "It is in revealing, and not as manufacturing or making that *techne* is a bringing forth... Technology is a mode of revealing. Technology comes to presence in the realm where revealing and unconcealment take place, where *aletheia*, truth, happens." The limits of current belief systems within and across cultures are illuminated as new ways of representing and communicating visual information emerge from electronic media. The dominance of prior American and European representational schemes in electronic media is examined with the view that these media may also generate new representation schemes that illuminate the limits of current Euro-American thought. Art and technology are viewed as cultural information bearers with potential to effect cultural maintenance and change. Specific examples of electronic art will be examined as maintaining artistic schools of thought and as revealing the limits of contemporary art theory and practice. Discussions of the boundaries of art in contemporary Euro-American theory will be used to examine a variety of current and past work in electronic media.

BEVERLY J. JONES
University of Oregon, USA

the networked virtual art museum

The Networked Virtual Art Museum project supports the design, development and operation of long distance, multiple user, networked immersion environments.

The project team will design and construct a multi-cultural art museum articulated through networked virtual reality, and established by a grid of participants, or nodes, located in remote geographic locations. The nodes are interconnected using modem to modem, or high bandwidth telecommunications.

Each participating node will have the option to interact with the virtual environment and contribute to its shape and content. Participants will be invited to create additions or galleries, install works, or commission researchers and artists to originate new works for the museum.

Further, guest curators will have the opportunity to organise special exhibitions, explore advanced concepts, and formulate the basis for critical theory pertaining to virtual reality and cultural expression.

The museum can also function as a stand-alone installation and is easily transportable for presentation in cultural or industrial venues.

CARL EUGENE LOEFFLER
Carnegie Mellon University, USA

modelling actions selection and learning in a software pet

For the past couple of years I have been developing models of artificial creatures. These models are not only interesting from a biology point of view (they can be used to test theories about animal behaviour), but also from an entertainment point of view, since they can be used to build autonomous creatures with which a human can have interesting interactions. In particular, I developed an algorithm for motivational competition and selection of behaviours in an artificial creature. In more recent years I added a learning component to this algorithm which allows the creature to change its behaviour selection based on experience and environment feedback. I have built several creatures (robotic and simulated ones) which illustrate and test these algorithms. I will show videos of some of these creatures and most likely give a live demo. I will focus on a recent experiment in which we modelled a live "dog" which lives in a simulated two-dimensional environment. A user can interact with the dog: change its motivational levels, teach it some new behaviours by giving positive and negative feedback and observing the resulting (and sometimes surprising) behaviour.

PATTIE MAES
MIT MediaLab, USA

travels in hyperbolic space

Although working with different representations of space may seem like one of the natural domains of artists, few have had exposure to work involving geometries other than our familiar Euclidean construction of space. As certain branches of mathematics become increasingly visual, computers are being used to view and explore spaces which have previously been described primarily through abstraction. Familiarity and perhaps involvement with these theories may afford the artist who works with new technologies a greater opportunity to explore and influence our conception of how our world is constructed.

Delle Maxwell and Charlie Gunn worked together (with the help of many others) to create a video called *Not Knot*. *Not Knot* tells the story of one way that mathematicians understand knots. The project was initiated to visualise some of the exciting results in three dimensional topology made by mathematicians working with the Geometry Center in Minneapolis, Minnesota — particularly the results of William Thurston in the classification of three-dimensional spaces. His deep geometric intuition was suited to the medium of computer visualisation. Group members brought together skills from mathematics, computer animation, art, design, and computer science.

We chose to feature hyperbolic space because it has great appeal to both mathematical and non-mathematical audiences. It allows people to experience the concept of curved space for the first time in a realistic way, a concept which is of central importance in many physical theories of natural science.

DELLE MAXWELL
Princeton, USA

After a brief introduction, we will show this video tape and will then discuss and illustrate via animation other strange visual characteristics of such spaces. Although the tape was not created as a work of art, it is meant to be a visual experience. As such, we believe it can serve as a catalyst for artists wishing to explore other geometries and to gain more insight into the theories that are shaping our understanding of the space around us.

interactive evolution of forms

JON McCORMACK
Melbourne, Australia

This paper will discuss a symbolic grammar that allows the specification and creation of three-dimensional forms. The language of the grammar provides for control over shape, form, colour and texture over time. The goal is to create Artificial Life environments where the logical production and interaction of the symbols within the grammar can be visualised via three-dimensional computer graphics. The practical results of this process will be illustrated with examples from a recent interactive videodisc installation, *Turbulence*, which was created using the language described in this paper. The work explores the use of algorithmic methods to abstract the structural elements, function and processes of natural life into rule-based systems that can be created and manipulated wholly within the data space of the computer.

Like natural evolution, the interactive genetic evolution paradigm allows the user to evolve models based on aesthetic (as opposed to natural) selection.

Genetic evolution of models involves starting with a base form and mutating that form randomly. Several different mutations of the base forms are shown to the user, who picks the forms that most appeal from the ones presented. That form then becomes the parent of the next generation of mutated children and thus the process is repeated. This technique is applied repeatedly until a suitable form is reached or the user runs out of patience.

The process allows individuals to evolve their own artificial forms according to personal aesthetic selection. The only criteria that determines the final shape and behaviour of the evolved entity is the choices of the user and the random mutations created by the machine.

It will be argued that this is a powerful technique for the creation of complex models that would be difficult or impossible to implement by direct methods. In much the same way that life on earth has evolved its complexity and function through progressive selection, these techniques allow us to visualise 'life-as-it-could-be', via personal aesthetic evolution.

a question of antagonism? identity, representation of self and new media in thailand

HELEN MICHAELSEN
Chiangmai University, Thailand

My starting point is the central question: how do we actually know that we are in fact at the beginning of a global culture which is more than a mere continuation or extension of a former, most likely, European/Western culture?

In reference to this question, if one looks at the popular culture in Thailand (namely the apparent ease in seeking, using and appropriating foreign patterns, techniques and technologies) this seems to 'support' the thesis that it is only a mere continuation/extension of Western culture.

The Fine Arts Departments of Silpakorn University, Chulalongkorn University and Chiangmai University are pushing to establish media departments, which to date do not exist in Thailand. Only in the last five years have intensive contacts with foreign art institutions and artists been made — in terms of art exhibitions, artist residencies and exchange programs (which have increased steadily ever since). The internal discussion about these developments has been controversial. In dealing with foreign-cultured art within the framework of receptive processes concerning the entire culture, the central arguments are to do with a fear of loss of identity and tradition, which in turn raises questions about self-representation the readiness to develop old internal structures into something new, to gain equal access and actively participate in the global culture.

These contrasting standpoints are reflected in the three major directions of Thai contemporary art — a) to resume traditional subjects and forms and to develop them further, but not in conjunction with foreign art; b) to be strongly influenced by European art developments and at the same time to be critical towards their own tradition; and c) to try to establish a synthesis between their own tradition/history and foreign elements, which is neither a mere continuation of the old traditions nor a mere imitation of art directions from outside. Besides describing some of these problems, the paper will attempt to examine what it might possibly mean to gain access to new media and to ask what practical problems (e.g. language, access to information, art market, social status of artists) might arise in this context, for the artists as well as the art institutions.

diagnosing the computer user: addicted, infected, technophiliac?

**NORIE NEUMARK &
MARIA MIRANDA**
University of Technology, Sydney, Australia

This paper will present a humorous and excessive exploration of how computer culture is altering the subjectivity of computer users. Although this raises serious theoretical issues about conceptualising technology in relation to subjectivity, our approach will be to come at the theory through concrete examples, in an accessible, though not simplistic way. For instance, we will foreground the way language and metaphors of the human body and social body alter with computers and how this affects people's experience of themselves. The mechanical self of plumbing and tubes and sparking on all four cylinders has given way to the hardwired self with serious identity crises about its insufficient memory banks. These are the sorts of issues that have raised theoretical interest in cyborgs (Donna Haraway), hackers (Sherry Turkle) and gender activated techno-dreaming (Kathleen Mary Fallon and Sherre DeLys). Our own approach is somewhat different in being more from the inside, making use of the technology (computer art and audio art) to carry out a diagnosis of 'the' computer user. (A search for ourselves inside our tech heads?)

The form of the paper fits the material. It will be a paper with an audiovisual performative slant. The read text could sound somewhat like this... First step in the diagnosis: identify symptoms. Second step: prescribe the treatment. For example. Addiction: Symptoms: obsessive need to own the latest software; projection of emotions onto your screensize; neurotic need to spend megabucks on megabytes; compulsion to merge with the loved object – the computer. The treatment: attendance at user group meetings; entering the computer user '12 step program' (including a recognition that there is a higher power and this higher power is Apple). This diagnostic process will be elaborated for addiction and extended to infection and technophilia. It will of course be accompanied by scientific computer imagery of the brain and bodies of the various users as well as telltale sonic symptoms in an audio bed. As subjective reality shifts with computer culture, so too does surreality, and the surrealistic visual and audio components will explore this through a montage of images and language and music.

the ambiguous zone: which dimension am i in?

This panel will attempt to explore the working methodologies of three artists from three different backgrounds — painting (2D), ceramic and sculpture (3D), and virtual environments (4D) — who utilise computer technology for their art. The focus of the panel will be on the role of DIMENSION in the process of ideation and design. Since the computer can expedite the potentially seamless integration of historically separate approaches to art (e.g. 2D, 3D and 4D) many dimensional ambiguities may result in the final artworks.

BARBARA MONES-HATTAL
George Mason University, USA

Art as a thought process transcends dimension. However, many artists limit themselves by 'buying into' the labels of particular software packages. Thinking beyond these labels can remove these limitations, but it may also result in a quandary for those viewing the works: in what category does the art fit? All too often these dimensional categories are used to determine the validity of a particular work. Most enduring works of art do not lend themselves to simple interpretation, but rather draw us back time and time again to explore and see new things with each viewing.

JACQUELYN FORD MORIE
University of Central Florida, USA

Ambiguity is a form of communication which is a potent method for jolting people out of their established modes of perception.

How the ambiguity of dimension can manifest itself in computer art is the theme of this panel. As each artist has specific and often contradictory views about how their artwork demonstrates this quality of ambiguity, the discussion promises to be very lively.

CYNTHIA BETH RUBIN
University of Vermont, USA

The computer-artist synergy is still in its infancy. The distinctions between dimensions may be an indication of this infancy. As it grows and matures these distinctions may fade into arbitrariness, and computer art may earn the recognition it deserves as a rich new medium.

lust and wanderlust:
sex and tourism in a virtual world

This paper will present recent developments and current applications of virtual reality technologies in the pornographic publishing and tourist industries.

The 'recreational' industries of tourism and pornography have already been changed by the western world's tendency toward the creation of virtual environments and experiences. Telephone sex and high budget amusement theme parks offer the opportunity to momentarily escape into alternate worlds.

The World Travel and Tourism Council, reporting that world travel generates a figure equalling 5.5% of the planet's gross national product, described tourism as the world's largest industry. Pornography also generates high revenues. The release or escape which these industries enable, will be heightened through the development and application of virtual reality systems which provide the environments and experience with none of the inconveniences or distractions.

NANCY PATERSON
Charles Street Video, Canada

virtual bodybuilding:
the cultural specificity of virtual reality design

This paper examines the formulation of virtual worlds and the virtual bodies placed in them in terms of western cultural history. This history places conventions and controls on the nature of representation within VR. It is emphasised that, as VR is a representation technology, it must be culturally specific, and therefore not universally accessible.

A cultural pre-history of VR is related, examining technologies of simulation from Classical Greece down the line of conventional western cultural history through the nineteenth century expansion of mechanised image technologies to VR research.

The phenomenon of technological utopianism is examined, and similarities of form between the rhetoric of VR and previous episodes of technological euphoria are discussed. The parallel evolution of such technologies in the military and civilian spheres is considered in this context. The potential for automated surveillance within VR is discussed with respect to recent writings of Gilles Deleuze.

SIMON PENNY
University of Florida, USA

The formulation of the body in VR (also a cultural construct) is considered as a form of representation; examined from the perspective of Christian dogma, contemporary theory, the psychology of perception and cognitive science. The central issue to the paper, the problematic of a representation which is simultaneously a lived physical experience is discussed with reference to recent critical theory, and a new paradigm for its analysis is proposed.

Finally, a politics of interactive system design is proposed, with reference to the work of Winnograd and Flores, Weinbren and others.

the end of the two cultures

We live in the post-modern, post-communist, post-industrial world, a time that has been called the end of the historical era. We are past the first days of the information age with its whirring mainframes and images of massive data unreachable and unintelligible to the denizens of popular culture.

Ours is the third generation of the information age. The culture is forming anew — old paradigms no longer apply. Ones that were significant a generation ago no longer hold. Our moment is no longer governed by paradigms from the 1950s. Our moment is the end of the two cultures.

MARK RESCH
SIGGRAPH 93, USA

In his 1959 Rede lecture at Cambridge, C.P Snow described his milieu: "There have been plenty of days when I have spent the working hours with scientists and then gone off at night with some literary colleagues. I mean that literally. I have had, of course, intimate friends among both scientists and writers. It was through living among these groups and much more, I think, through moving regularly from one to the other and back again that I got occupied with the problem of what, long before I put it on paper, I christened to myself as the 'two cultures'."

His concerns in the lecture were: education, international competitiveness, the success of the Soviet Union, institutional barriers to success, how to improve the future, emerging Japanese economic competition ... what to do at the end of the empire? He saw the artificial divisions in society, separated Art from Science and the Applied from either creating a sure recipe for disaster. Two generations have passed. The rate of change seems to have increased dramatically. Computers are causing all kinds of trouble for the old paradigm and system. Industrial society is near collapse because it is unable to understand digital scrutiny. Must we still abide by remnants of the high point of the industrial revolution — the division of the two cultures? For many reasons we should not.

Personal computers have become a part of the mass culture without any formal government encouragement. During the past 30 years their influence has become enormous. Children know that the machines they use for games are really computers and they do not need keyboards to control them, they use gloves, floormats, goggles, tiny hand-held controls, their voices. They live in a world where computers are ubiquitous.

Scientists are able to acquire results across networks. They discuss theories and debate significant events from their homes. The pure and the applied no longer have clear boundaries. Symposia and conferences are offered where the topics include discussions of the aesthetics of scientific visualisation. Artists again use technology commonly, with a renewed emphasis on the message, not the medium, writing programs communicating via electronic salons, speaking of teraflops or data or imagebases.

The world has changed. The old metaphor of technology was the *broadcast*. It has been replaced with the *login*. Today the more digitally educated (digerati?) build their own idiosyncratic worlds with many more choices than Snow's two cultures.

what is 'ylem'?

YLEM is a thriving organisation of artists and art lovers who look to science and technology for ideas and inspiration.

That particularly mean artists who work with video, ionised gases, computers, lasers, holograms, robotics and other new media. It also includes artists who use traditional media in new ways.

YLEM helps keep members informed of opportunities to show their work in upcoming exhibits, competitions, conferences, etc. It also brings members' work directly to the public through its own publications, events and exhibits.

BEVERLY REISER
YLEM, USA

The membership includes many well-known figures in the arts and sciences, as well as collectors, educators, students, art agents, architects and engineers, physicists and mathematicians.

Diverse techno-aesthetic interests are demonstrated every other month at the YLEM Forums. They include presentations by practicing scientists who appreciate the aesthetic values within their disciplines, and artists who enjoy the science and technology that underlie art.

YLEM's feature annual publication is the *Directory of Artists Using Science and Technology*. This is a directory of the over two hundred current members of YLEM. The directory brings these artists into contact with curators, art collectors, gallery owners, educators — and other artists.

YLEM also publishes a monthly newsletter that features short articles about and by members on the tech-art scene. The YLEM newsletter lists the latest information on exhibits, openings, art opportunities, forums, and networking events. This includes visits to studios of creative Bay Area figures in the arts and sciences.

possibilities offered by digital technologies in the field of interactive educational documents with an artistic content

This paper will present possibilities offered by digital technologies based on a Macintosh environment in the field of interactive educational documents with an artistic content. the presentation will be based on an existing document: 'The Inert and the Living Matter', and interactive digital museum in which the visitor can freely access various subjects and levels in a hypermedia environment. The paper will not limit itself to this document, and will address more generally the possibilities and problems of this technology and information concept.

The paper will address technical, information access and presentation modes issues. The museum design as well as the graphics and sound environments have been developed with a concern for artistic quality and content. The originality of this document, other than the technologies used, resides in the mix between artistic work and scientific content. This concern will be emphasised in the paper.

FREDERIC ROVERSELLI
Le Groupe Nexus, CANADA

quoting and appropriation: whose art is it?

CYNTHIA BETH RUBIN
University of Vermont, USA

When Picasso placed images of African masks in his painting *Des Demoiselles d'Avignon*, viewers were reasonably certain that he either personally observed African masks, or at the very least had access to quality reproductions. The very fact that his hand recreated the forms of the masks on canvas confirms that he did some careful looking. Had he done the same in constructing a computer image, viewers would not be so sure.

Because the computer can be the instrument which transmits and stores information, as well as the construction tool, it places the artist in a different relation to source materials. Today, Picasso could have bought a laser disk on African art, cut out a mask with only a passing glance at the visual qualities of the object, and then placed it into his painted image.

Is one form of appropriation more sincere than the other? Does actually holding the mask show more respect for the culture which produced it? Does working with it inside the computer help us to understand it, or is it always theft? How can we use the computer to expand the cultural materials with which we build our art, without exploitation?

lifeforms: design tools for choreography · and character animation

Lifeforms is a three dimensional computer compositional tool for choreography, and for the creation of character motion. It provides an interactive, graphical interface that enables a choreographer or animator to stretch out movement ideas in time and space. Merce Cunningham, the renowned choreographer who presaged the post-modern dance movement with his choreographic innovation, has been using Lifeforms in new York City for the past three years, to support his creation and exploration of new dance work. Originally envisioned as a creative tool for choreographers, Lifeforms has also received a great deal of interest from animators, directors, athletic coaches and motion planners. It began as a research project of the Simon Fraser University Computer Graphics Research Lab under Dr Thomas W. Clavert, where it has been under development for about six years. Development for character animation and rendering has contin-

THECLA SCHIPHORST
Emily Carr College of Art and Design, Canada

ued through Kinetic Effects Inc. Lifeforms enables you to create, edit and store human and character movement sequences. An important underlying research interest that has kindled the development of Lifeforms has been the study of the design or compositional process with a view to applying what we understand of this process to the ongoing design of the Lifeforms interface. In Lifeforms, movement sequences can be keyframed by directly manipulating a body interactively using inverse kinematics. In a recent development, user-defined skeletons other than the human body can be used inside Lifeforms with the same ease and flexibility that initially allowed choreographers to create dance. The large libraries of predefined movement sequences provide a source of material that can be performed by multiple human figures (or multiple user-defined figures). Movement paths can be viewed, and the animation of the movement sequence is interpolated by the computer to be viewed for playback in real time. Audio files can be selected, cued to in and out points, and played synchronously with the movement. A MIDI interface enables sequences to be displayed under MIDI control for projection or interactive live performance.

This paper sets out to present the public with the Cyberdata philosophies and the technical specifications. A number of concepts will be explored, including the current thoughts and actions of the Cyberdata culture.

A major theme of Cyberdata has been creating simulations of simulated reality (ie. cyberspace) using multimedia installation. We will present people with the workings of a future virtual reality, and the kind of society this system will support.

All information (physical, psychological, visual, computer data) is transmitted and received in patterns. Cyberdata propose new processes for human communication and thought, experimenting with videographics and installation work to set up experience for the physical human interface. Offering information for the computer that doesn't imply or state money/power/consumer materialism, but using technology as a means of creating experiences leading to a higher state of consciousness/new system of communication.

Technical aspects of the processes at work within the Cyberdata system including image generation, cultural referencing, improvisational computer art techniques, new methods of animation, playing with the technology, creating your own way of using the system, intended telepresence systems, and intended metaphysical integration.

the rhythm and structure of multicultural communication

Computer networks are revolutionising communication by eliminating spatial-temporal barriers and creating new avenues for interactive, global communication. Although these networks make it possible to quickly exchange words and images, cultural differences that reflect the psychological, historical, and social forces that form the foundation of individual cultures are usually lost in the translation. This problem can be attributed to the fact that cultural diversity has traditionally evolved from a long history of oral and action-oriented communication. As a result, cultural differences are often expressed through the use of symbols and gestures that are derived from spatial-kinaesthetic interaction with individuals, objects, and the physical environment. Computer networks replace the tactile and sensory levels of spatial perception with a highly abstract interface that exists

PATRICIA SEARCH
Rensselaer Polytechnic Institute, USA

in a two-dimensional plane. This paper uses research in cognitive psychology, computer-mediated communication, and the author's own research in hypermedia communication to show how computer networking is changing the content and syntax of communication, redefining concepts of authorship and invention, and reshaping the social structure of interpersonal communication.

The paper also proposes guidelines for designing global networks that preserve and strengthen the fabric of cultural diversity. In particular, this section shows how artists using electronic media are an important link to understanding the rhythm and structure of multicultural communication. By studying the works of these artists, we can gain valuable insights into how to integrate layers of audio-visual data into multidimensional networks that preserve individual cultural identities and channel the energy from these diverse perspectives into new levels of global awareness, sensitivity, and creativity.

interactive evolution of equations for procedural models

This paper describes how the evolutionary mechanisms of variation and selection can be used to 'evolve' complex equations used by procedural models for computer graphics and animation. An interactive process between the user and the computer allows the user to guide evolving equations by observing results and providing aesthetic information at each step of the process. The computer automatically generates random mutations of equations and combinations between equations to create new generations of results. This repeated interaction between user and computer allows the user to search hyperspaces of possible equations without being required to design the equations by hand or even understand them. Three examples of these techniques have been implemented and are described: procedurally generated pictures and textures, three-dimensional shapes represented by parametric equations, and two-dimensional dynamic systems described by sets of differential equations. It is proposed that these methods have potential as powerful tools for exploring procedural models and achieving flexible complexity with a minimum of user input and knowledge of details.

KARL SIMS
Thinking Machines Corporation, USA

fractal sphere reflections and sphere fractals

It was recently discovered that the inter-reflections of light between highly reflective spheres is fractal in nature. The work investigates this phenomena through ray tracing using very high levels of recursion; this allows many levels of reflection to be traced. The fractal nature of the inter-reflections means that no matter how much we enlarge parts of the images created by the ray tracing, we always see more and more reflective images of the spheres. These images do not form any regular pattern, but are arranged in seemingly random patterns. By ray tracing spheres of different colours and textures, interesting artistic effects can be achieved.

The ray tracing technique is also applied to three dimensional osculatory packings of spheres. These are three-dimensional arrangements of spheres of different sizes that just touch each other. They are fractal in nature because an osculatory packing can contain an infinite number of spheres in a given region of space with no regularity in the shape or size of the spheres. When the fractal ray tracing technique is applied to these packings we obtain images that contain two types of fractal information: one from the arrangement of the spheres themselves, and one from the inter-reflections.

KEVIN G. SUFFERN & IAIN SINCLAIR
University of Technology, Sydney, Australia

the effect of culture on cognition

Increasingly the use of computer graphics technology in the world raises questions about its effectiveness as a cross-cultural means of expression and communication. This paper discusses the effect of culture on cognition, and how this may affect the way artists and designers from different cultural backgrounds perceive and use computers in their work.
The complexity of the use of pictorial codes in different cultural contexts is highlighted, leading to a discussion on the existence of a universal pattern of communication based on iconic representations. The extent to which cultural differences may influence computer graphics' aesthetics is examined, and examples of Brazilian Computer Graphics works will be presented. It is argued that, in spite of a trend of continuous internationalisation of computer graphics softwares and equipments, culture still plays a fundamental role as it affects computer graphics' artistic approach, methodology and results.

REJANE SPITZ
Pontificia Universidade Catolica do Rio de Janeiro, Brazil

art & algorithm: classical traditions revisited

Ars Sine Scientia Nihil

Jean Vignot, 1392

Advances in computer graphics have made it possible to visualise worlds of form never before seen by the human eye. Artists have been creating art derived from these unseen worlds. In this paper we are interested in works generated by algorithms which the artist understands and employs as an integral part of a form-making idea or procedure. Scientists, artists and philosophers have been drawn into an intense dialogue over the aesthetic value of these art forms.

Prototypes for such procedures appeared historically when canons of form based on number and measure evolved from philosophical or religious ideas about cosmic order. Consider the work of the 15th Century humanist and architect, Leon Battista Alberti. Following classical tradition he employed proportion in relating architectural members to each other and the whole to achieve the harmony referred to as concinnitas. This harmony was likened to a cosmic harmony and constituted an essential part of his 'form-creating' process. In a similar way, there are artists today who employ an algorithm — a step by step calculation of form — in their art making process.

This paper proposes that such algorithms can embody essential features of an artist's art-making process and that there are artists today whose work is substantially algorithmic and aesthetically successful. The precedents for this assertion permeate the history of art. Artists, musicians and architects have repeatedly and untiringly sought the cosmic secrets of number and proportion for their work.

ROMAN VEROSTKO
Minneapolis College of Art and Design, USA

presenting music in pictorial form

Music is a universally common subject. It has common elements for its compositional construction. Musicians have evolved different scripts for recording music but these were unable to disclose through its basic educative value. Music has common universal notes but due to changes in planning structure it makes distinctive music of the world.

Educative information should be accessible to common society. In his book *Education through Art*, the late Sir Herbert Read says that art is defined as skill and skill should be used in education to remove delusion removing the barrier of language and culture. Much importance is given to visual images.

At a cursory glance over visual art, one will find that an appealing sound pattern of prayer, Hymn, Joyous mood, etc., was never carved or rendered to enrich its meaning, where it will communicate music and disclose basic educative value to widen the perspective of world music. Learning and communication is no longer linear, people are learning through mosaics or collages of images put together.

My two researches 'Presenting Music in Pictorial Form by media of Art and Science' offers ennumerable images of musical tunes of the world and Musiography system simulation of Pictorial Music on Computer helps to listen to music and print out images on computer to distribute among children. It helped to harness the significant advantages in General Music Education, Art, Museum, Architecture to exhibit musical tunes of any state and nation with composer's skill of presenting musical notes distinctively in synoptic form as a piece of Art, Music from book pages into drawing form in Art of mosaic of texture in architecture to popularise compositional planning science through structural analytical common media and experiencing music on computer showing oneness and harmony between music of various countries. I came to this idea because I sing, play sitar and can reproduce any tune on piano.

S.V. VADNERKAR
Gandhinagar, India

will

The aim of *WILL* is to examine the likely future impacts on Australian technology-based art and artists of 1) New technologies, and 2) Australia's re-orientation from that of a colonial European culture, to becoming part of a new geo-politic reality — 'Asia'. This 'future' speculation will be grounded in an analysis of the current situation.

LINDA WALLACE
Sydney, Australia

WILL speculate on the role Australian artists and designers can play in an Asia of rapid economic growth, particularly in regards the current trend of a shift in state support from heavy industry to a high-tech 'clean' industries by those Asian countries with a growing 'environmentally-aware' middle class.

WILL posit the appearance of an Asian junk-tech culture, and what this might look like.

WILL consider future notions of nationalism, with particular reference to the impact of new communications technologies e.g. fibre-optics and satellite technology on national boundaries.

WiLL operate on a number of different levels and will move between a rigorous, analytic mode, to something more in the realm of the imaginary — a poetics.

suck on this, planet of noise!

McKENZIE WARK
Macquarie University, Australia

The gulf war sparked off a long overdue examination of the impact of the globalisation of media vectors, and not before time, but the gulf war was hardly an unprecedented event of this type. Nor are many of the analyses that have been offered in conventional paradigms entirely convincing. This paper presents a summary of research on weird global media events of this type that I have undertaken since 1987. The gulf war, the fall of the Berlin wall, the Tiananmen Square massacre and the 'Black Monday' stock market crash are all examined as examples of a new type of *singularity* in media events. A theory of the kind of media space they operate in and its effects is advanced, building on Paul Virilio's concept of the vector. The concept of 'global village' is refuted, as are some of the entirely pessimistic responses, particularly in the US, to the gulf war. Concepts introduced in my TISEA catalogue essay, such as 'third nature' and 'telesthesia' are further explored in relation to spin-out transnational media events.

the programmed artwork

ADAM WOLTER
Brisbane, Australia

Programming as a technique for creating individ-ual artworks is employed by very few. Acquisition of sufficient programming skill to express non-trivial algorithms may be consid-ered an excessive investment of time or devia-tion from principle for fine artists, particularly when applications software is as powerful and accessible as it has recently become. What are the bene-fits to be gained in this more difficult approach? How much time does it take? What kinds of images does it produce? Will it stifle your creativity or give you a pain in the head? Programming is considered with regard to the ability of the computer to embody process, par-ticularly of a non-linear kind. It is this ability which distinguishes the computer as a medium from others. The level of abstraction of possible descriptions of this process has profound impact conceptually and visually on final imagery. The power of non-programming techniques to represent this abstraction is considered and contrasted. Difficulties of the programming approach with regard to fine art education are considered. Illustrations and exemplifications are made from the artists own work.

the form of the invisible

This seems an appropriate moment to consider the role of the book as a vulnerable artefact of late 20th-Century culture, as new electronic media are being demonstrated and promoted. In the last year we have made more than 125 holograms of books, using a documentary form of hologram developed to record rare and valu-able objects in museums of the former Soviet Union. Each of our holograms contains a three-dimensional image of an individual book with its spine (and title) visible and the body of the book receding into blackness; the holograms were cut to be the same shape as a book, tall and narrow. This type of hologram, called a Denisyuk hologram after its inventor, is a very 'straight' form of hologram without any 'artistic' effect.

At the time we were visiting professors in the art department of Tsukuba University, Japan. We chose all of the books from a single library in the art department — Japanese and English texts ranging from books on optics to books on art. Some were very recent, others much older, including European technical and scientific books imported during the last century when Japan opened itself to the rest of the world. The book presented itself as a common cultural carrier, an object with equal traditions in East and West and a suitable point to contemplate our own situation in relation to the culture we found ourselves in.

After making holograms of books we started to draw books on a computer and to manipulate scanned images of books using digital photography software. We see this as providing an opportuni-ty for a more imaginative, more plastic investigation of the book than that allowed by the rigour of the holograph-ic project we set ourselves. The drawings explore the concrete forms of Western and Japanese texts in graphic abstractions without words. Scanned images of book spines become the starting point for us to invent a series of new titles derived from the title of a text and often at odds to the sentiments of the original.

**SUSAN WENYON &
MICHAEL GAMBLE**
London, UK

fractal media and the overexpressive

And the Lord said, Behold, the people is one, and they have all one language... and now nothing will be restrained from them, which they have imagined to do.

The Tower of Babel, *Genesis* 11:6

That awkward term 'Computer Art' has finally succumbed to diversity and individual pre-occupations, celebrated away by the flurry of grandiose exhibitions, conferences and competition of the late eighties. All eager to disprove the image of the computer as the advocate of dry and dreary order and logic, they promoted a multitudinous range of applications to cover every facet of artistic activity. From hypermediated conceptual streamlined post-appropriation talking pieces to commercial shoot-from-the-hip videographics, they confirmed the computers' unmatched ability to contribute to the most obscure example of cultural fall-out, completely effacing its own cultural identity in the process. The fractal geometry of computer media endlessly subdivides into new options and alternatives, washing away the bulwarks of cultural praxis and the freedom it offers us threatens to reduce all our language to an incoherent babble. After 50 years of striving to build a mighty tower of the perfect communication machine, the gods have taken their revenge and replaced the Rule of Number by the Licence of Formalism, and Babel has fallen again.

RICHARD WRIGHT
City of London Polytechnic, UK

Computer manufacturers have inherited a notion of The Artist as the bearer of a weight of semantic 'stuff' needing to be expressed or unburdened and requiring as tolerant a medium as possible to accept all the nuances and facets of their creative will. But this passivity that the computer provides does not make it an ideal medium, a transparent carrier of pure artistic motions. This subject-centred model of creativity instead makes the computer over-expressive. Each function of a menu option accounts for a little part of the landscape of human imagination, eroding differences and points of reference and making media categories arbitrary. Through computer technology, the medium has now surrendered, it offers no resistance to the desires of the user and overwhelms us by its aimless potential. The problem in engaging such new media is the frustration at not finding the oppositions and difference that build the dichotomy of meaning.

orphics: computer graphics and the feasibility of a preferred colour model

EDWARD ZAJEC
Syracuse University, USA

With the aid of computers colour has lost its permanent form and has become as transient as sound. The need for some system of notation has become increasingly pressing. In my two previous papers, 'Orphics: Computer Graphics and the Shaping of Time with Colour,' and 'Orphics: Computer Graphics and the Temporal Dimension of Electronic Colour,' I discussed some ideas and techniques for the fluid articulation of color in space and in time, without relying on a preferred colour model. The possibility of defining a colour theory of a fundamental colour tuning, comparable to the harmonic theory and tempered scale in music, remains an open question. The object of this writing is to articulate the above question by discussing the nature of a preferred colour model in which the laws of colour creation are intimately interwoven with the principles of colour classification.